

STEEL INDUSTRY

STEEL
LADLES

REFRACTORY
CONCEPT
SOLUTIONS

AT CALDERYS, OUR MISSION IS TO
**DELIVER VALUE
TO OUR CUSTOMERS.**

We are a world leader in providing refractory solutions and services. Our value proposition to you is built on combining our world-class refractory product portfolio with our ability to deliver high-quality project management services - from planning and installation, to turnkey delivery and commissioning.

Across all the industries we serve – Iron, Steel, Foundry, Aluminium, Cement, Power, and Petrochem - we deliver to you our promise of superior product performance and value-adding service, thanks to our global network of specialised industry experts and project management professionals.

Our journey of 100 years is a testimony of our commitment to our customers. We listen to you and understand your requirements. We believe in working as one team with you and aiming for continuous improvement.

Together, we always reach an extra mile for our customers in our mission of delivering MORE.

Over 2,500 employees across

31 COUNTRIES

3 R&D CENTERS

and 11 Design & Engineering Centers

18 PLANTS

in 16 Countries

Annual Revenue of over

500 MILLION EUROS

Wholly-owned Subsidiary of

IMERYS GROUP

PARTNERING YOU IN THE STEEL INDUSTRY FOR MORE

As a leading provider of refractory solutions and services to the global steel industry, Calderys is considered a reference supplier by steel makers across the globe. Our team of steel industry experts ensure that we propose products most suitable for your process requirements and deliver 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 services.



WE BRING TO STEEL MAKERS:

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

By contributing to ensure the best possible steel quality and cleanliness results, whilst adhering to strict environmental regulations in operations

OUR END-TO-END PRODUCTS AND SERVICES DEDICATED TO STEEL INDUSTRY ENCOMPASS:

PRODUCT PORTFOLIO

Our comprehensive product portfolio for 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, and
- 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 equipments and through use of optimal installation techniques. This ensures 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.

Calderys ADAPTS TO MEET ALL CLIENT NEEDS

The steelmaking process largely determines material selection. It is possible to provide standard concepts for typical steelmaking parameters, but individual circumstances will always be closely examined by Calderys to determine optimum product selection for all steelmaking needs, including:

- Vacuum Oxygen Decarburisation (VOD)
 - Vacuum Arc Degassing (VAD)
 - RH Degasser Refining
 - CAS OB Refining
 - Secondary Metallurgy Treatment Stations
 - Ladle Furnaces

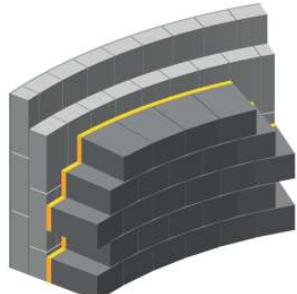
This brochure covers the full spectrum of refractory lining configurations for steel ladles offered under the CALDE™ brand.

BRICK SOLUTIONS

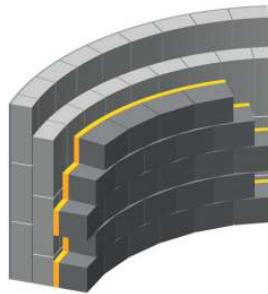
BRICK AND MONOLITHIC MIXED SOLUTIONS

MONOLITHIC SOLUTIONS

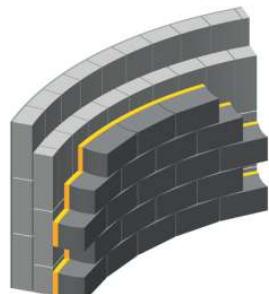
THE CALDE™ BRICK RANGE COVERS ALL INDUSTRY STANDARD SIZES:



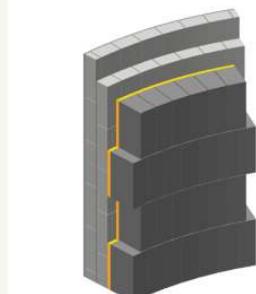
Standard Key Series



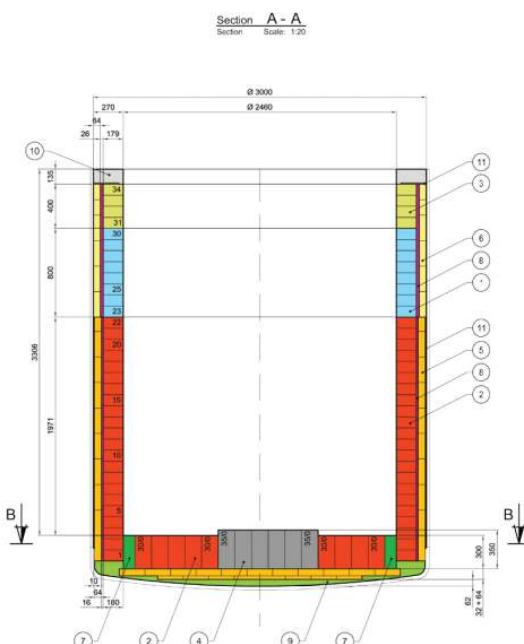
Mini Key Series



Semi Universal Series



Side Arch (P-) Series



Calderys

A TRUSTED SUPPLIER IN THE STEEL INDUSTRY

A world leader in refractory solutions, Calderys has a full product portfolio for all refractory needs including **monolithic refractories** and a range of **bricks**. This provides a full package refractory solution covering any possible client need including:

- Increasing efficiency thanks to design optimization
- Resisting common ladle stresses and preserving high steel quality with product optimization
- Increasing the availability of ladle fleet, bringing total cost optimization

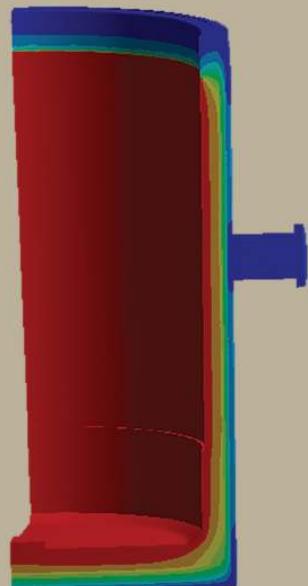
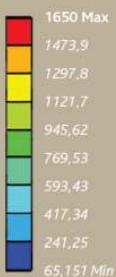
Calderys is considered a reference supplier in the steel industry, offering value-added solutions based on tailor-made designs and engineering to provide refractory linings for optimal performance. Our comprehensive technology and services are a result of a world-class R&D network, local expertise from over 30 locations around the globe, and over 100 years of experience in the refractory business.

Alongside the products themselves, Calderys provides a complete range of services:

- Design
- Product selection
- Thermal calculations
- CFD analysis
- Installation
- Labour & machinery
- Supervision
- Repair service support
- Full refractory project management

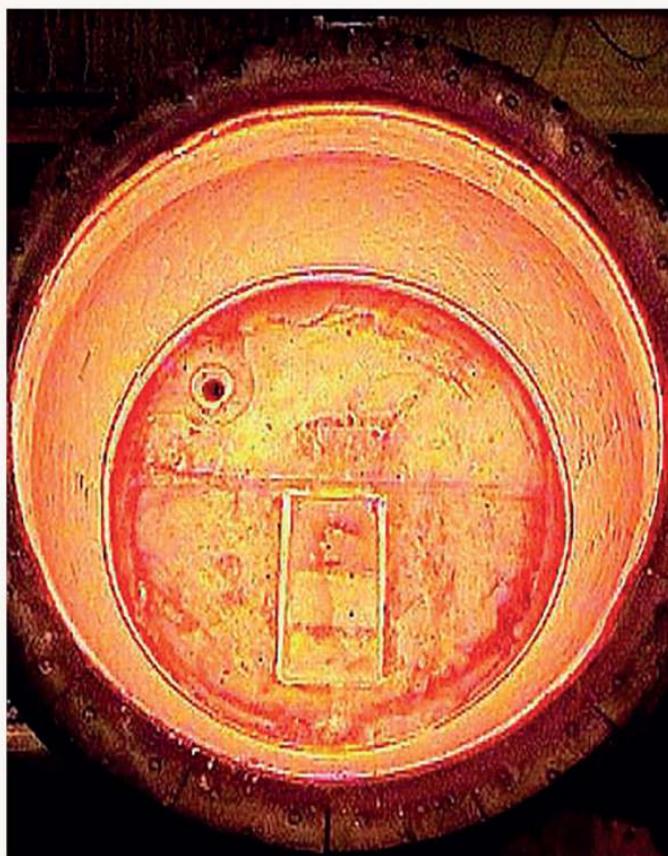


B: Steady-State
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CALDE™ brand

THE COMPLETE REFRACTORY SOLUTION FOR STEEL LADLES

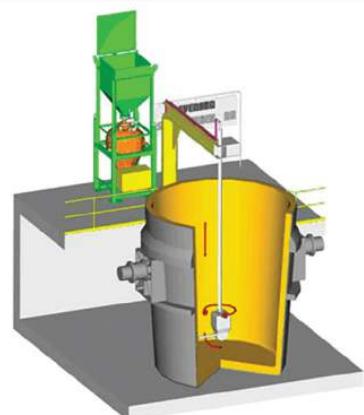


FOCUS: CALDERYS MACHINES FOR STEEL LADLE MAINTENANCE

Calderys offers 3 main machines for ladle maintenance which can be used for all types of alumina or basic refractories:

- CALDE™ MACHINE DRY GUN: Rotary dry gunning machine
- CALDE™ MACHINE LADLE H: Horizontal gunning device for hot or cold maintenance
- CALDE™ MACHINE LADLE V: Vertical gunning device for hot or cold maintenance

Ask our team of steel experts for a quote and to find out about our references with industry leaders.



Calderys solutions are customized depending on the size of the ladle and the operating requirements, and thanks to the CALDE™ BRICK product line there is full flexibility to offer any type of lining (including the insulating, safety and wear linings) in the **ideal ratio of bricks and monolithics** to meet all customer needs. The bricks are available in all standard shapes and are **designed to resist common steel ladle stresses such as corrosion, oxidation, erosion, impact resistance, and thermal shock**.

We have particularly developed our offering to meet the changes in ladle refining processes (alloying, deoxidising, degassing and the reheating and stirring of the bath); our ladle designs are aimed at increasing efficiency while preserving steel quality (for example, minimizing carbon pickup).



Calderys

PRODUCT AND DESIGN TECHNOLOGY EXPERTISE

PRODUCT SELECTION

As a global partner to the steel industry we offer high-end refractory products and solutions, complete packages and services for all production units and processes in relation to Steel. For the secondary metallurgy sector, it is possible to fulfill all specific requirements in close technical partnership with our customers.

- We offer the complete range of products, from Magnesia Carbon, Fired Magnesia and Alumina Magnesia Carbon, to Fired Dolomite, Dolomite Carbon and a range of oxide bonded qualities.
- We offer dedicated, tailor made solutions with products available in all standard shapes and packagings, complete with specifically focused service concepts that include our best value in use gunning mixes, castables and installation machinery.

Our technical leadership is gained from decades of intensive and innovative research and development programs, all aimed at improving our products and evolving our high grade technologies to meet the ever increasing demands of steel applications and processes.

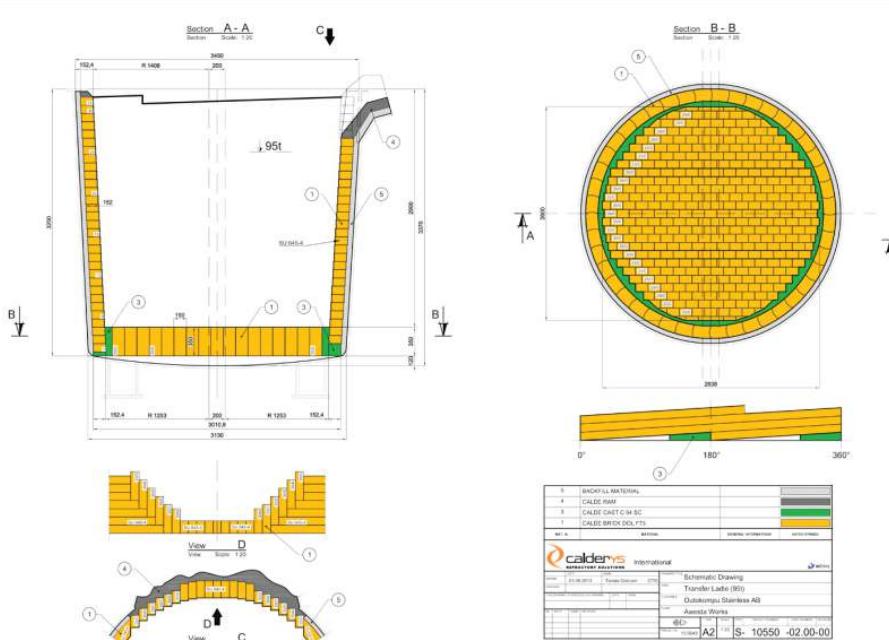
DESIGN OPTIMIZATION

In addition to product selection considerations, there are considerable benefits to be gained by optimizing the design aspects of the steel vessel, such as specialized zoning of product qualities within lining configurations that can help improve wear characteristics against specific wear criteria.

Overall, the selection of products and vessel designs should both:

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

Such targets are typically met with a close working relationship between steelmaker and refractory engineer.



BRICK SOLUTIONS FOR STEEL LADLES

FOR VOD/VAD STEEL TREATMENT: SUPER DUTY LADLE SOLUTIONS

FOCUS: VACUUM OXYGEN DECARBURISATION LADLE (VOD)

The most severe operation condition with extremely long treatment times, as well as aggressive synthetic slag usage. Temperatures during operation can be in excess of 1800°C, and consequently specific consumption can be high.

FOCUS: VACUUM ARC DEGASSING LADLE (VAD)

Due to high temperatures and extended residence times, heavy duty refractories are necessary for these applications. Very high quality Magnesia Carbon is considered for the slag zone whilst intermediate repair is often necessary.

Area	Normal Recommendations	Chemical Analysis (Averages)						Residual Carbon %	Bulk Density g/cm³	Apparent Porosity %	CCS MPa	Anti oxidants
		MgO %	CaO %	Fe₂O₃ %	SiO₂ %	Al₂O₃ %						
Lip Ring	CALDE™ RAM B 80	-	-	1.9	15	80	-	2.82	-	25	No	
Free Board	CALDE™ BRICK MC R 504-B	96.5	1	0.8	0.8	0.1	12	3.02	4.0	45	Yes	
Slag Zone	CALDE™ BRICK MC R 706-B	97.5	1	0.6	0.5	0.1	15	3.00	2.3	35	Yes	
Side Wall	CALDE™ BRICK MC R 604-B	97	1.1	0.65	0.55	0.1	12	3.04	3.4	45	Yes	
Bottom	CALDE™ BRICK MC R 502-N	96.5	1.6	0.8	0.8	0.1	6	3.10	4.7	60	No	
Impact Area	CALDE™ BRICK MC R 602-A	97	1	0.6	0.5	0.1	6	3.07	4.0	60	Yes	
	CALDE™ BRICK AMC 5-85X	6	0.5	3.3	1.8	82.4	5.3	3.20	6.4	75	Yes	
Permanent Lining	CALDE™ BRICK B 70	0.1	1	1.9	26	68.5	-	2.65	16.0	60	No	
	CALDE™ MAG BRICK FM 91	91	2	2	4	2	-	2.90	18.0	50	No	

STANDARD STEEL TREATMENT CASTING LADLES: MEDIUM DUTY LADLE SOLUTIONS

FOCUS: LARGE BOF LADLE (PREDOMINANTLY AL KILLED)

Requirements are generally stable, with standard quality products required within the barrel zone, with higher product quality required for the slag zone.

Area	Normal Recommendations	Chemical Analysis (Averages)						Residual Carbon %	Bulk Density g/cm³	Apparent Porosity %	CCS MPa	Anti oxidants
		MgO %	CaO %	Fe₂O₃ %	SiO₂ %	Al₂O₃ %						
Lip Ring	CALDE™ RAM B 80	-	-	1.9	15	80	-	2.82	-	25	No	
Free Board	CALDE™ BRICK MC R 212-N	97	0.9	0.7	0.9	0.1	6	2.99	6	60	No	
Slag Zone, Side Wall	CALDE™ BRICK MC R 534-N	96.5	1.6	0.8	0.8	0.1	12	3.01	3.8	45	No	
Bottom	CALDE™ BRICK MC R 212-N	97	0.9	0.7	0.9	0.1	6	2.99	6	60	No	
Impact Area	CALDE™ BRICK MC R 502-A	96.5	1.6	0.8	0.8	0.1	6	3.08	4.8	60	Yes	
	CALDE™ BRICK AMC 5-72	8	0.3	1.5	5	82	5	3	6	100	No	
Permanent Lining	CALDE™ BRICK B 70	0.1	1	1.9	26	68.5	-	2.65	16.0	60	No	
	CALDE™ MAG BRICK FM 91	91.0	2	2	4	2	-	2.90	18.0	50	No	

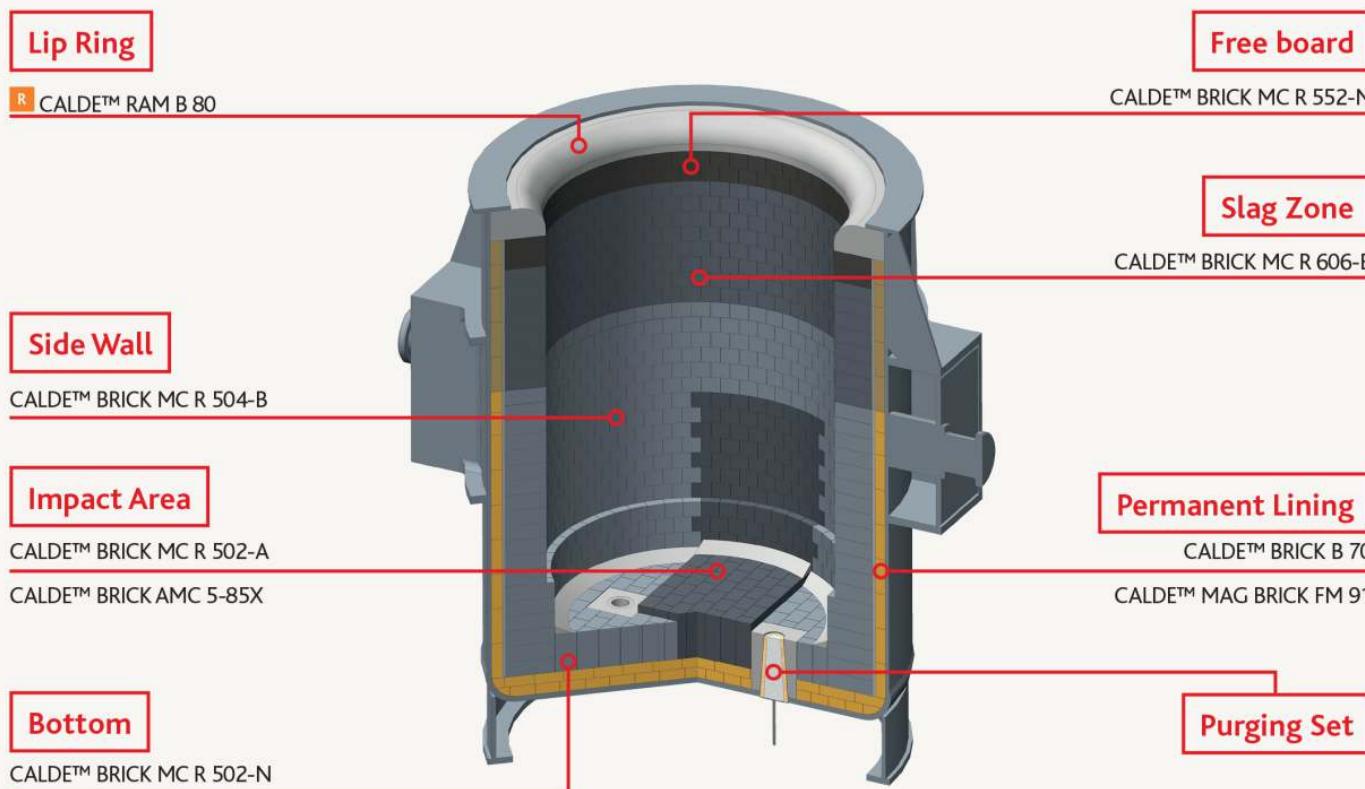
FOR RH DEGASSER AND CAS-OB PROCESSES: HIGH DUTY LADLE SOLUTIONS



FOCUS: SLAB AND THIN SLAB CASTER / FLAT PRODUCTS (PREDOMINANTLY AL KILLED)

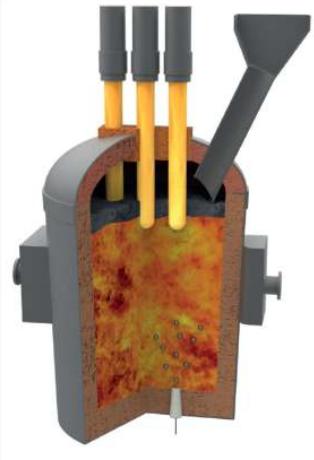
RH Degasser / CAS OB secondary refining can influence the wear profiles within the ladle vessel, with higher resultant wear within the slag line area. Standard Magnesia Carbon and Alumina Magnesia Carbon products within the barrel are the proven technologies for this application.

Area	Normal Recommendations	Chemical Analysis (Averages)						Residual Carbon %	Bulk Density g/cm³	Apparent Porosity %	CCS MPa	Anti oxidants
		MgO %	CaO %	Fe₂O₃ %	SiO₂ %	Al₂O₃ %						
Lip Ring	CALDE™ RAM B 80	-	-	1.9	15	80	-	2.82	-	25	No	
Free Board	CALDE™ BRICK MC R 552-N	96.5	1.6	0.8	0.8	0.1	6	3.02	6.5	60	No	
Slag Zone	CALDE™ BRICK MC R 606-B	97	1.1	0.65	0.55	0.1	15	3.00	3.0	35	Yes	
Side Wall	CALDE™ BRICK MC R 504-B	96.5	1	0.8	0.8	0.1	12	3.02	4.0	45	Yes	
Bottom	CALDE™ BRICK MC R 502-N	96.5	1.6	0.8	0.8	0.1	6	3.10	4.7	60	No	
Impact Area	CALDE™ BRICK MC R 502-A	96.5	1.6	0.8	0.8	0.1	6	3.08	4.8	60	Yes	
	CALDE™ BRICK AMC 5-85X	6.0	0.5	3.3	1.8	82.4	5.3	3.20	6.4	75	Yes	
Permanent Lining	CALDE™ BRICK B 70	0.1	1	1.9	26	68.5	-	2.65	16.0	60	No	
	CALDE™ MAG BRICK FM 91	91.0	2	2	4	2	-	2.90	18.0	50	No	



DOLOMITE BRICK SOLUTIONS FOR STAINLESS STEEL

ADAPTED TO THE CHARACTERISTICS
OF STAINLESS STEEL PRODUCTION



FOCUS: MINI MILLS – LONG PRODUCTS (Predominantly Si Killed Steels – Stainless Steel)

For continuous and disciplined operations, Dolomite remains a cost effective option. However, volume stability and shelf life remain limiting factors. Alternatively, cost effective Magnesia Carbon products are now more competitive and are becoming more widely accepted.

FIRED DOLOMITE BRICK SOLUTIONS:^{*} FOR STAINLESS STEEL WITH ULTRA-LOW CARBON SPECIFICATIONS

Area	Normal Recommendations	Chemical Analysis (Averages)						Residual Carbon %	Bulk Density g/cm ³	Apparent Porosity %	CCS MPa	Anti oxidants
		MgO %	CaO %	Fe ₂ O ₃ %	SiO ₂ %	Al ₂ O ₃ %						
Lip Ring,	CALDE™ BRICK DOL F 63	63.5	31.1	1.2	1.3	0.4	-	2.93	14.5	80	No	
Free Board	CALDE™ BRICK DOL F 65	65.5	30.5	0.9	1.1	0.4	-	2.93	14.5	80	No	
Slag Zone	CALDE™ BRICK DOL F 73	73.8	20.6	1.2	1.3	0.4	-	2.93	14.5	80	No	
	CALDE™ BRICK DOL F 75	75.2	20.6	0.9	1.1	0.4	-	2.93	14.5	80	No	
Side Wall, Bottom, Impact Area, Permanent Lining	CALDE™ BRICK DOL F 63	63.5	31.1	1.2	1.3	0.4	-	2.93	14.5	80	No	
	CALDE™ BRICK DOL F 65	65.5	30.5	0.9	1.1	0.4	-	2.93	14.5	80	No	

CARBON BONDED DOLOMITE BRICK SOLUTIONS: FOR HIGH THERMAL SHOCK AND IMPACT RESISTANCE

Area	Normal Recommendations	Chemical Analysis (Averages)						Residual Carbon %	Bulk Density g/cm ³	Apparent Porosity %	CCS MPa	Anti oxidants
		MgO %	CaO %	Fe ₂ O ₃ %	SiO ₂ %	Al ₂ O ₃ %						
Lip Ring,	CALDE™ BRICK DOL R 724	72.5	21.5	1	1.2	0.3	4.4	2.90	4.2	42	No	
Free Board	CALDE™ BRICK DOL R 743	74.4	21.2	1.1	1.1	0.3	2.9	2.92	4.1	44	No	
Slag Zone	CALDE™ BRICK DOL F 73	73.8	20.6	1.2	1.3	0.4	-	2.93	14.5	80	No	
	CALDE™ BRICK DOL F 75	75.2	20.6	0.9	1.1	0.4	-	2.93	14.5	80	No	
Side Wall, Bottom, Impact Area, Permanent Lining	CALDE™ BRICK DOL R 724	72.5	21.5	1	1.2	0.3	4.4	2.90	4.2	42	No	
	CALDE™ BRICK DOL R 743	74.4	21.2	1.1	1.1	0.3	2.9	2.92	4.1	44	No	

^{*}In order to improve hydration resistance Dolomite Bricks can be supplied wax impregnated.



ALTERNATE BRICK SOLUTION: ALUMINA-MAGNESIA-CARBON BRICKS Alternative lining to adapt to client needs

Area	Normal Recommendations	Chemical Analysis (Averages)						Residual Carbon %	Bulk Density g/cm³	Apparent Porosity %	CCS MPa	Anti oxidants
		MgO %	CaO %	Fe₂O₃ %	SiO₂ %	Al₂O₃ %						
Lip Ring	CALDE™ RAM B 80	-	-	1.9	15	80	-	2.82	-	25	No	
Free Board	CALDE™ BRICK MC R 552-N	96.5	1.6	0.8	0.8	0.1	6	3.02	6.5	60	No	
Slag Zone	CALDE™ BRICK MC R 606-B	97	1.1	0.65	0.55	0.1	15	3.00	3.0	35	Yes	
Side Wall	CALDE™ BRICK AMC 7-70X	17	0.7	0.9	1.5	70	7	3.13	7	70	Yes	
Bottom	CALDE™ BRICK AMC 5-72	8	0.3	1.5	5	82	5	3	6	100	No	
Impact Area	CALDE™ BRICK AMC 5-85X	6.0	0.5	3.3	1.8	82.4	5.3	3.20	6.4	75	Yes	
Permanent Lining	CALDE™ BRICK B 70	0.1	1	1.9	26	68.5	-	2.65	16.0	60	No	
	CALDE™ MAG BRICK FM 91	91.0	2	2	4	2	-	2.90	18.0	50	No	

MONOLITHIC & BRICK LADLE SOLUTIONS

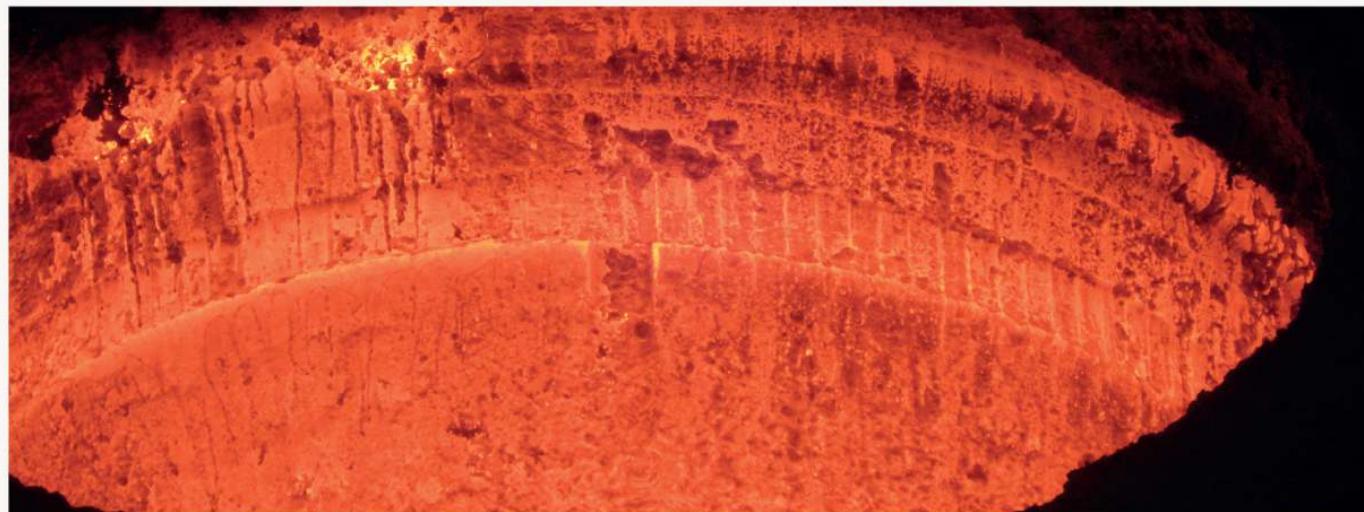
FOR ULTRA-LOW CARBON
STEEL & SPECIFIC
STEELMAKING REQUIREMENTS

FOCUS: HOT GUNNING FOR STEEL LADLE MAINTENANCE

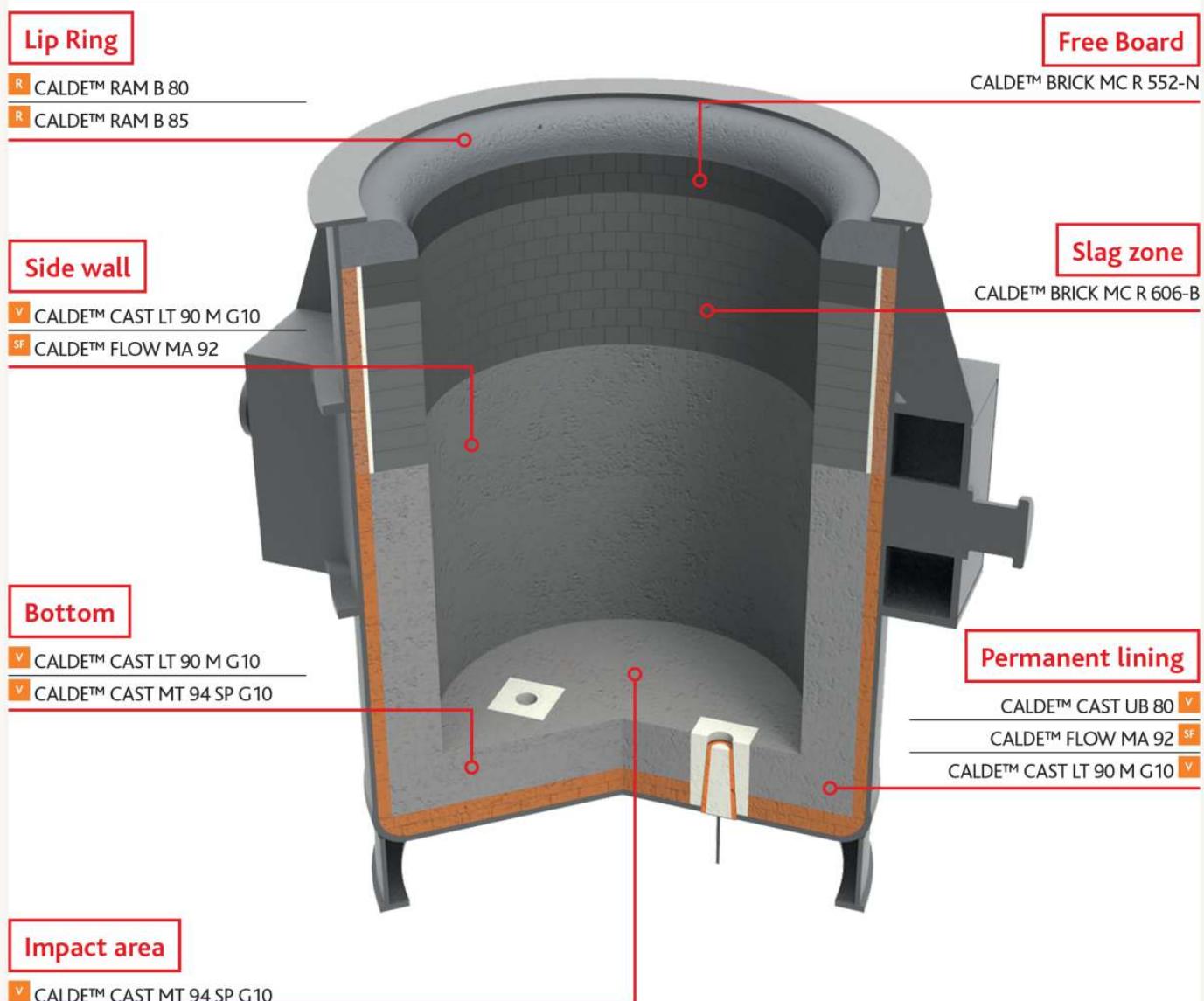
The value of monolithic refractories is seen over time because repairs and relinings are greatly simplified, achieving a balanced wear profile and therefore maximising potential performance of ladles for a lower cost than is possible with bricks.

Calderys provides solutions for hot gunning spray installation, particularly from the CALDE™ MAG GUN product range, used for hot repair to prolong ladle service life. There are 2 main zones that benefit from hot gunning with Calderys products:

- Slag line area: The aggressive slag from secondary metallurgy weakens Magnesia Carbon bricks, so to reach an even level of wear along the wall hot gunning is necessary at the slag line. This can be done by machines in vertical or horizontal position or manually by the operators at the ladle turret.
- Well block & tap hole: Around the well block of the plug repairs are needed due to back attack, while around the tap hole they are needed due to the vortex created during steel casting. Here the maintenance is normally done manually.



Area	Normal Recommendations	Chemical Analysis (Averages)									
		MgO %	CaO %	Fe ₂ O ₃ %	SiO ₂ %	Al ₂ O ₃ %	Residual Carbon %	Bulk Density g/cm ³	Apparent Porosity %	CCS MPa	Anti oxidants
Lip Ring	CALDE™ RAM B 80	-	-	1.9	15	80	-	2.82	-	25	No
	CALDE™ RAM B 85	-	-	1.5	10	84	-	2.80	-	5	No
Free Board	CALDE™ BRICK MC R 552-N	96.5	1.6	0.8	0.8	0.1	6	3.02	6.5	60	No
Slag Zone	CALDE™ BRICK MC R 606-B	97	1.1	0.65	0.55	0.1	15	3.00	3.0	35	Yes
Side Wall	CALDE™ CAST LT 90 M G10	6.7	1.5	0.1	0.4	90.6	-	3.10	18.0	77	No
	CALDE™ FLOW MA 92	5.4	1.7	-	0.6	92	-	2.95	21.0	60	No
Bottom	CALDE™ CAST LT 90 M G10	6.7	1.5	0.1	0.4	90.6	-	3.10	18.0	77	No
	CALDE™ CAST MT 94 SP G10	2.9	2.9	0.1	-	93.5	-	3.16	14.0	185	No
Impact Area	CALDE™ CAST MT 94 SP G10	2.9	2.9	0.1	-	93.5	-	3.16	14.0	185	No
Permanent Lining	CALDE™ CAST UB 80	-	1	1.3	12	82	-	2.80	14.0	80	No
	CALDE™ FLOW MA 92	5.4	1.7	-	0.6	92	-	2.95	21.0	60	No
	CALDE™ CAST LT 90 M G10	6.7	1.5	0.1	0.4	90.6	-	3.10	18.0	77	No

**FOCUS: ULTRA-LOW CARBON STEELMAKING**

Low residual carbon technology products are required to achieve expected decarburization aspects, specifically for ultra-low carbon steel qualities.

G	Gunned
Hot	Hot installation
R	Rammed
RS/V	Ready Shaped/Vibrating
SC	Spraycast
SF	Self-Flow
V	Vibrated

MONOLITHIC LADLE SOLUTIONS

THE LATEST REFRactory TECHNOLOGY
TO MAXIMIZE LONG-TERM COST
EFFECTIVENESS AND STEEL QUALITY

INSULATING & SAFETY LININGS

G	Gunned
Hot	Hot installation
R	Rammed
RS/V	Ready Shaped/Vibrating
SC	Spraycast
SF	Self-Flow
V	Vibrated

Insulating Lining Line

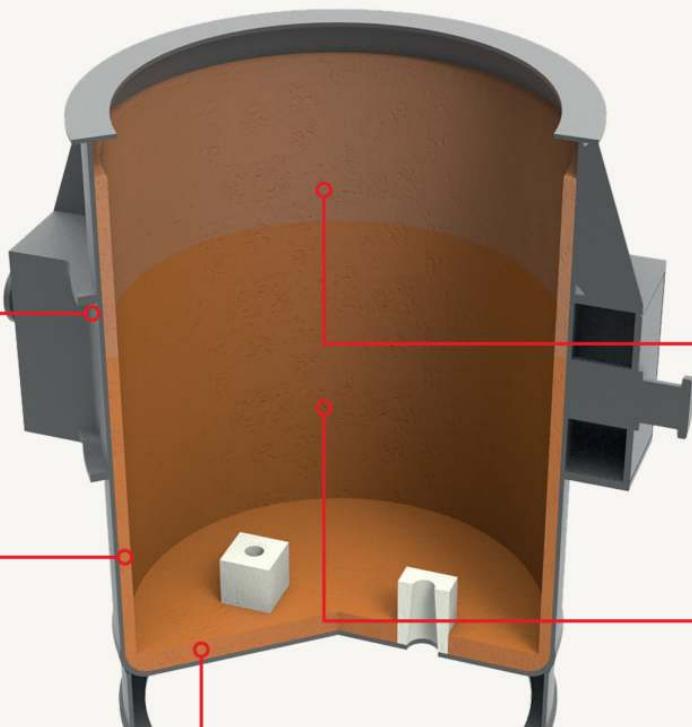
- G CALDE™ CAST LW 134 CO C/G
- G CALDE™ GUN MW STRONG LITE

Backfill

- V R CALDE™ MAG DRY S 70
- V R CALDE™ MAG DRY S 80
- V R CALDE™ MAG RAM S 91
(Backfill/Safety Lining)

Bottom

- V CALDE™ CAST LM 62 Z
- V CALDE™ CAST UB 80
- SF CALDE™ FLOW UB 80



Slag Line

- CALDE™ CAST LM 62 Z V
- CALDE™ CAST LT 94 SP V
- CALDE™ CAST UB 80 V
- CALDE™ FLOW MA 92 SF
- CALDE™ FLOW UB 80 SF
- CALDE™ SPRAYCAST BX 85 SC

Barrel

- CALDE™ CAST LM 62 Z V
- CALDE™ CAST UB 80 V
- CALDE™ FLOW UB 80 SF
- CALDE™ SPRAYCAST BX 85 SC

FOCUS: SAFETY LINING OPTIMIZATION

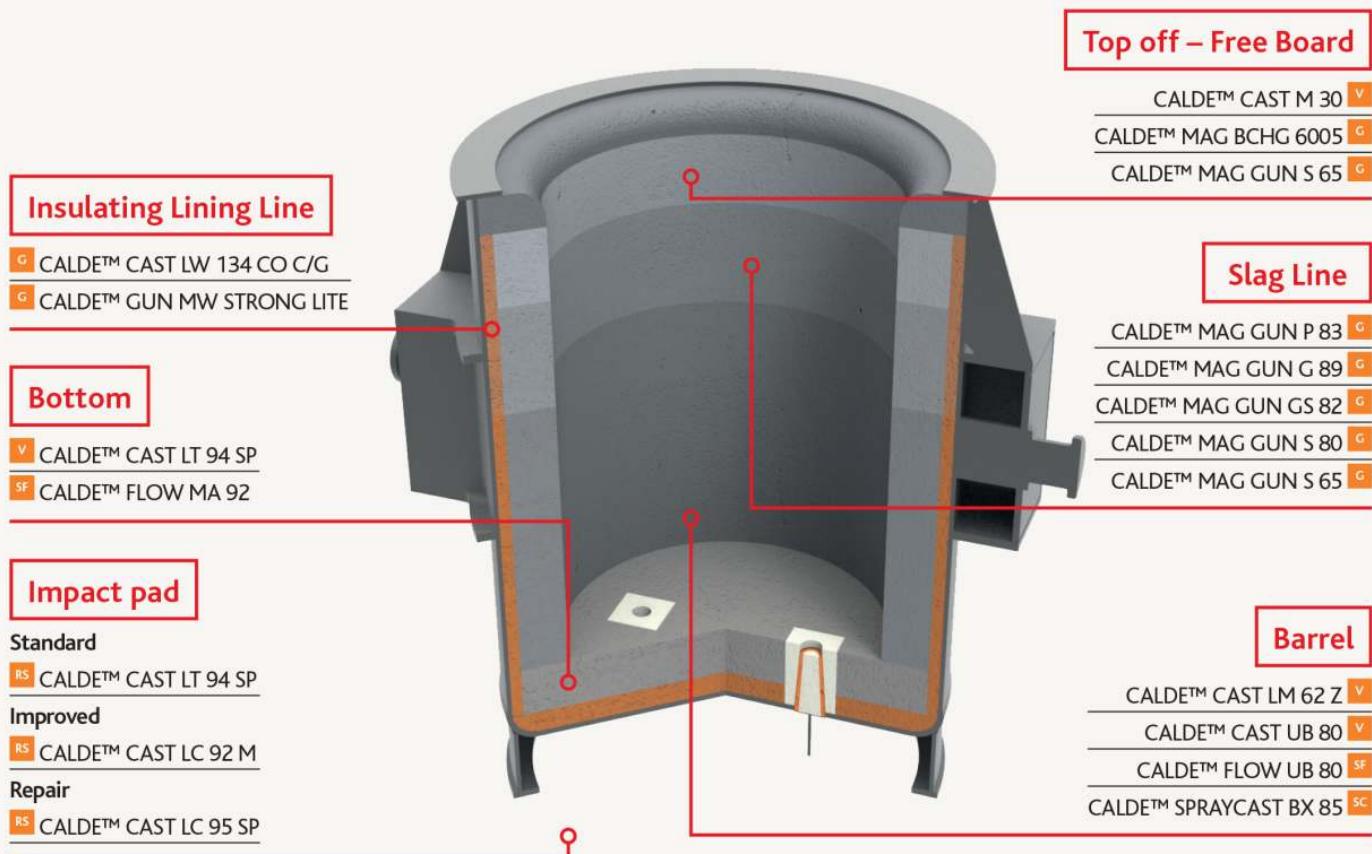
The importance of the safety lining is often overlooked and lower quality refractory materials are sometimes used. As a result the safety lining cannot withstand liquid metal/slag attack in the event of working lining failure, defeating the purpose of this safety layer.

Inefficiencies can also occur as the operator may not be exploiting the full potential of ladle working lining. The ladle could be put down for repair prematurely despite comfortable left-over-lining thickness.

To minimize these risks at the slag line, Calderys' recommended castables, such as CALDE™ FLOW MA 92, can easily withstand the onslaught of slag and metal on the safety lining. As a result even if the working lining is compromised, ladle puncture will not take place. This will allow ample time for the operator to react and save the heat before any hazardous damage takes place.

For more product info, see monolithic refractory technical specifications on page 15.

WEAR LINING



FOCUS: SHOTCRETING FOR SAFETY LINING & LIP RING MAINTENANCE

For highest installation efficiency of the ladle safety lining, clients look to the CALDE™ SPRAYCAST product range. With this shotcreting method, the addition of a setting agent in the machine lance ensures that the castable stiffens immediately when sprayed. CALDE™ SPRAYCAST products are also a proven option for maintenance of the lip ring in cold conditions. Benefits include:

- fast installation rate (rates can be from 6 to 10 tons per hour, compared with normal gunning which does not exceed 2 tons per hour),
- products easily installed anywhere to any desired thickness,
- extremely low rebound as the material is sprayed wet, and
- mechanical characteristics which remain identical as per casting.

FOCUS: PRECAST LADLE BOTTOMS FOR SAFETY AND WEAR LININGS

For a trusted time-saving method for installation of the ladle bottom, Calderys can provide large precast ready shapes to fit a client's ladle specifications. Self-flow castable is then only applied in the gaps to finish the installation.

Precast bottoms can be created for both safety and wear linings, with the wear lining presenting an opportunity for additional benefits. Calderys recommends a 3% slope in the bottom because this inclined wear lining bottom is shown to increase ladle yield:

- In a 250 t ladle the yield can be increased 1-2 tons/heat.
- This is a yearly possibility of more than 20 000 tons of additional crude steel and related additional earnings.

LADLE ACCESSORIES FROM CALDERYS

Joints

Standard

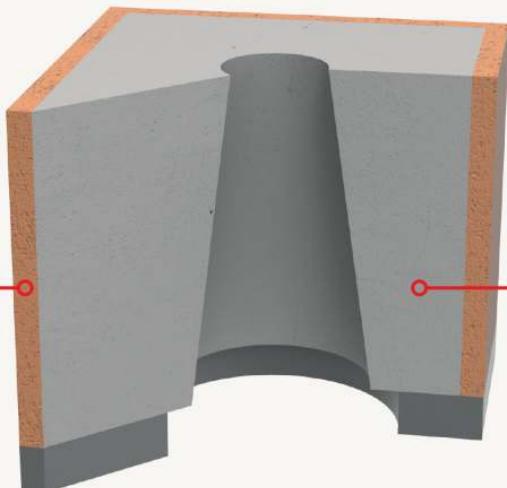
CALDE™ CAST LC 93

CALDE™ RAM PB 84

Improved

CALDE™ FLOW MA 92

CALDE™ RAM PC 94



Seating blocks

Standard

CALDE™ CAST 41

CALDE™ CAST LT 98

Improved

CALDE™ CAST LT 90 SP G8

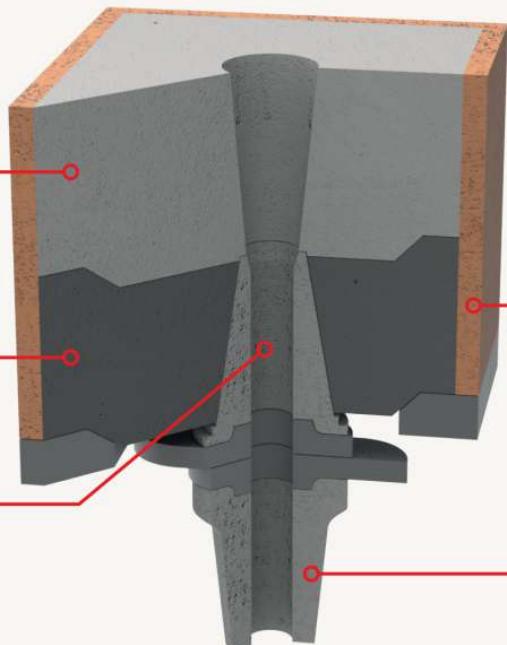
CALDE™ CAST LT 96 SP

G	Gunned
Hot	Hot installation
R	Rammed
RS/V	Ready Shaped/Vibrating
SC	Spraycast
SF	Self-Flow
V	Vibrated
FF	Free Flowing

Upper well blocks

CALDE™ CAST LT 90 SP G8

CALDE™ CAST LT 96 SP



Joints

Standard

CALDE™ CAST LC 93

CALDE™ RAM PB 84

Improved

CALDE™ FLOW MA 92

CALDE™ RAM PC 94

Lower well blocks

CALDE™ CAST LC 93

CALDE™ CAST UB 85

Inner nozzle

CALDE™ FLOW UT 92 SP

Ladle Wellfiller

PHLOX DRY SD 40

Collector nozzle

Standard

CALDE™ CAST T 95 G3

CALDE™ CAST UB 80

MONOLITHIC REFRACTORY: TECHNICAL DATA

Product Name	Main Component	Binding System	Max. Recomm. Temp. (°C)	Max. Grain Size (mm)	Chemical Analysis (average %)		
					Al ₂ O ₃	MgO	SiO ₂
CALDE™ CAST 41	Tabular alumina	Hydraulic	1750	6	96	-	0,1
CALDE™ CAST LC 90 M	Corundum	Hydraulic	1700	6	90	5,5	1,7
CALDE™ CAST LC 92 M	Corundum, Magnesia	Hydraulic	1750	6	91,8	6	1
CALDE™ CAST LC 93	Corundum	Hydraulic	1700	6	93	-	4,5
CALDE™ CAST LC 95 SP	Corundum, Spinel	Hydraulic	1800	6	95	2,3	0,1
CALDE™ CAST LM 62 Z	High alumina	Hydraulic	1600	6	62	-	30
CALDE™ CAST LT 90 M G10	Tabular alumina, Magnesia	Hydraulic	1850	10	90,6	6,7	0,4
CALDE™ CAST LT 90 SP G8	Tabular alumina, Spinel	Hydraulic	1750	10	92	5	0,1
CALDE™ CAST LT 94 SP	Tabular alumina, Spinel	Hydraulic	1850	7	92,5	5,3	-
CALDE™ CAST LT 96 SP	Tabular alumina, Spinel	Hydraulic	1750	6	96	2,2	0,1
CALDE™ CAST LT 98	Tabular alumina	Hydraulic	1850	6	98	-	0,1
CALDE™ CAST LW 134 CO C/G	Chamotte, Perlite	Hydraulic	1350	5	42	-	45
CALDE™ CAST M 30	Bauxite, Chamotte	Hydraulic	1650	6	58	-	35
CALDE™ CAST T 95 G3	Tabular alumina	Hydraulic	1870	3	94,5	-	0,1
CALDE™ CAST UB 80	Bauxite	Hydraulic	1650	6	82	-	12
CALDE™ CAST UB 85	Bauxite	Hydraulic	1680	6	83,5	-	11,6
CALDE™ DCMV 1001	Tabular alumina, Spinel	Hydraulic	1750	10	93,5	2,9	-
CALDE™ FLOW MA 92	Tabular alumina, Spinel	Hydraulic	1850	6	92	5,4	0,6
CALDE™ FLOW UB 80	Bauxite	Hydraulic	1600	6	83	-	14
CALDE™ FLOW UT 92 SP	Tabular alumina, Spinel	Hydraulic	1750	6	92	6,3	0,1
CALDE™ GUN LT 95 SP	Tabular alumina, Spinel	Hydraulic	1850	7	92,5	5,4	-
CALDE™ GUN MW STRONG LITE	Light-weight chamotte	Hydraulic	1320	4	39	-	40
CALDE™ MAG BCHG 6005	Magnesia, Olivine	Chemical	1650	3,5	-	60,5	28
CALDE™ MAG DRY S 70	Magnesia, Olivine	Chemical	1750	3	-	70	22
CALDE™ MAG DRY S 75	Magnesia	Chemical	1700	3	-	79	10,5
CALDE™ MAG DRY S 80	Magnesia	Chemical	1750	3	-	80,5	11
CALDE™ MAG GUN G 89	Magnesia	Chemical	1750	3,5	1	86	9,3
CALDE™ MAG GUN GS 82	Magnesia	Chemical	1700	4	-	82	9,3
CALDE™ MAG GUN P 83	Magnesia	Chemical	1750	3,5	0,6	83	8,8
CALDE™ MAG GUN S 65	Magnesia	Chemical	1700	3,15	-	65	12
CALDE™ MAG GUN S 80	Magnesia	Chemical	1750	3,5	0,6	80,9	12,5
CALDE™ RAM B 80	Bauxite	Ceramic	1630	3	80	-	15
CALDE™ RAM B 85	Bauxite	Ceramic	1700	6	84	-	10
CALDE™ RAM PB 84	Bauxite	Chemical	1650	6	84	-	10
CALDE™ RAM PC 94	Corundum	Chemical	1780	4	96	-	1,3
CALDE™ SPRAYCAST BX 85*	Bauxite	Hydraulic	1700	6	84	-	11
PHLOX DRY SD 40	Chromite	Ceramic	1750	1	13,5	-	15

*Required component: SPRAYCAST WET ADDITIVE

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