



STEEL **INDUSTRY** **PURGING SYSTEMS**

CALDERYS PERFORMANCE YOU CAN TRUST

For all industries with extreme temperatures and working conditions, Caldersys 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 relationships 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.



CALDERYS SOLUTIONS FOR LANCES ZONING OPTIMISATION

Desulphurisation Lances for Pig Iron

Slag line and metal bath

Lower temperature

CALDE® CAST MF 45 CFM RSH

Higher temperature

CALDE® CAST FM 50 G 12 RSH

High-stressed conditions

CALDE® CAST MF 50 CFM RSH

CALDE® CAST MF 49 CFM RSH

Lances for Steel Bubbling

Slag line and metal bath

CALDE® CAST LB 85 G 8 RSH

CALDE® CAST UC 84

CALDE® CAST UB 90 RSH

CALDE® CAST UT 85

CALDE® SOL CAST B 84 G10 RSH 2CP

Repairs

Fine cracks

CALDE® PATCH PC 96 U

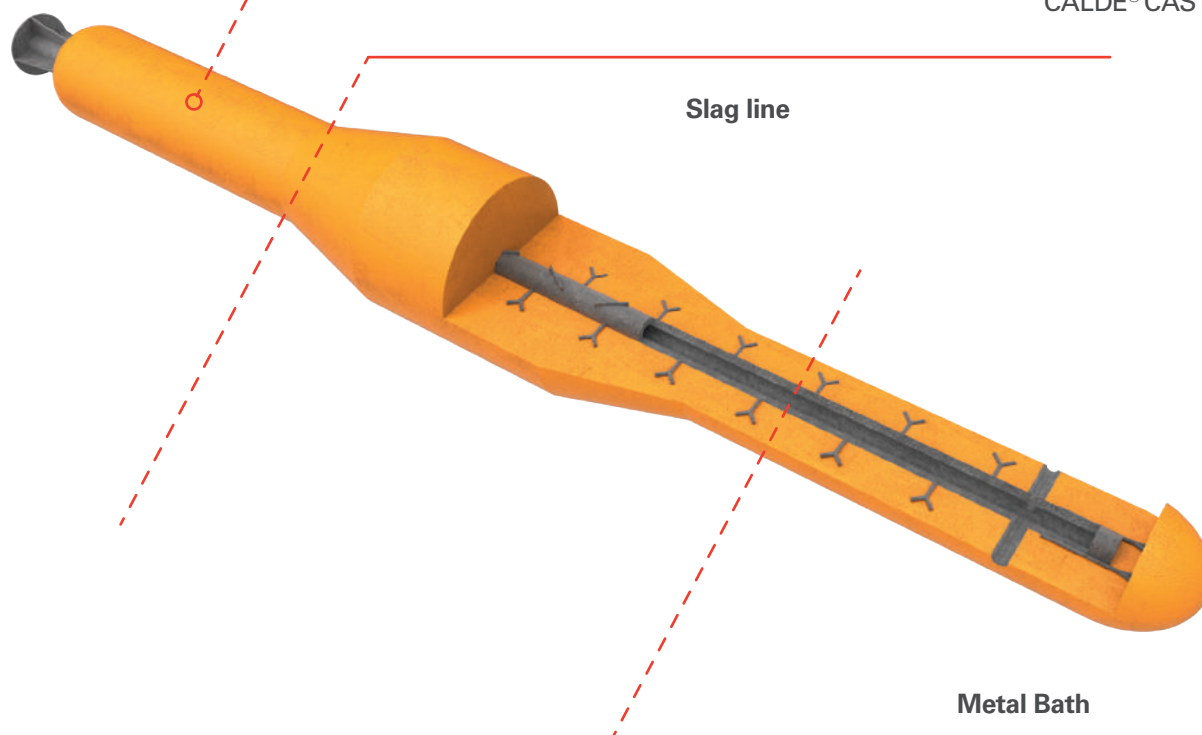
Standard

CALDE® CAST LC 95 SP

Upper Bath

Standard

CALDE® CAST F 50 G 10



Lances for Steel Treatment

Slag line

CALDE® CAST UB 88 G 10 RSH

CALDE® CAST UB 92 G 10 RSH

Lances for Steel Treatment

Metal bath

CALDE® CAST LB 85 G8

CALDE® CAST UB 92 G 10 RSH

CALDE® CAST UB

TECHNICAL DATA

Product name	Usage	Formula design			Chemical analysis (%)		Permanent linear change (%)	CCS (N/mm ²)
		Max. grain size (mm)	Main component	Binding System	Al ₂ O ₃	CaO		
CALDE® CAST MF 50 CFM RSH	DS	10	Chamotte	Hydraulic	50	3.10	+1.50 (1400°C)	100 (1200°C)
CALDE® CAST MF 49 CFM RSH	DS	12	Chamotte	Hydraulic	48	2.80	-0.30 (1200°C)	55 (1200°C)
CALDE® CAST MF 45 CFM RSH	DS	15	Chamotte	Hydraulic	46	2.90	-0.10 (1400°C)	80 (1400°C)
CALDE® CAST FM 50 G12 RSH	DS	12	Chamotte	Hydraulic	49	2.80	-0.35 (1200°C)	55 (1200°C)
CALDE® CAST LB 85 G8 RSH	SB	8	Bauxite	Hydraulic	84	1.30	-0.17 (1400°C)	80 (1400°C)
CALDE® SOL CAST B 84 G10 RSH	SB	10	Bauxite	Mineral reaction	85	-	-0.1 (1200°C)	140 (1200°C)
CALDE® CAST UB	SB	6	Bauxite	Hydraulic	85	0.50	-0.2 (1200°C)	120 (1200°C)
CALDE® CAST UB 90 RSH	SB	6	Bauxite, Corundum	Hydraulic	88	0.80	+1.30 (1600°C)	160 (1600°C)
CALDE® CAST UT 85	SB	6	Tabular Alumina	Hydraulic	85	0.70	+0.20 (1600°C)	120 (1600°C)
CALDE® CAST UC 84	SB	6	Corundum	Hydraulic	84	0.80	+0.40 (1600°C)	115 (1600°C)
CALDE® CAST UB 92 G10 RSH	SB+ST	10	Bauxite	Hydraulic	89	0.30	-1.60 (1600°C)	150 (1600°C)
CALDE® CAST UB 88 G10 RSH	SB+ST	10	Bauxite	Hydraulic	87	0.30	-1.26 (1600°C)	150 (1600°C)
CALDE® CAST F 50 G10	UB	10	Chamotte	Hydraulic	49	6	+0.80 (1400°C)	35 (1400°C)
REPAIRS								
CALDE® CAST LC 95 SP	Casting / vibrating	6	Corundum	Hydraulic	95	2.30	+0.35 (1600°C)	50 (1600°C)
CALDE® PATCH PC 96 U	Patching / coating	0.5	Corundum	Chemical	96	-	-	-

DS Delsulphurisation pig iron

SB Steel Bubbling

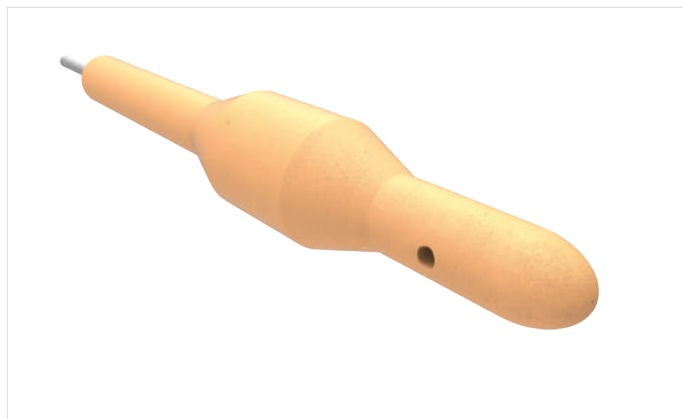
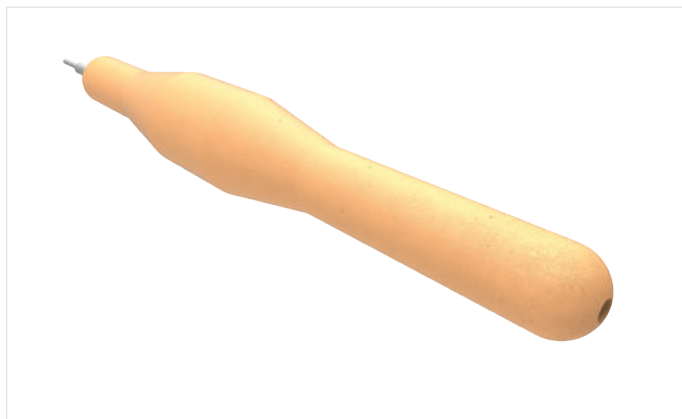
ST Steel Treatment

UB Upper Bath

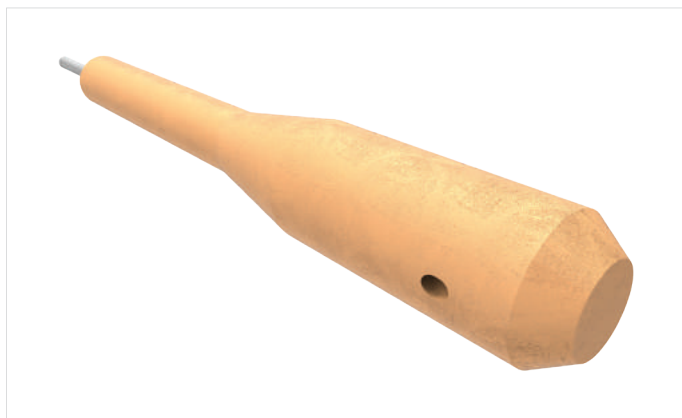
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STIRRING LANCES

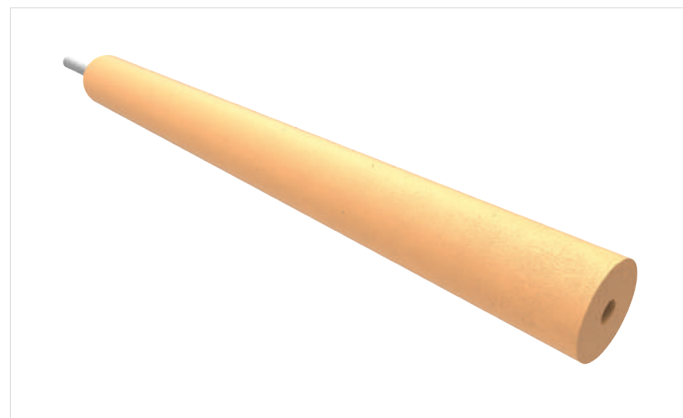
Slag line reinforced system



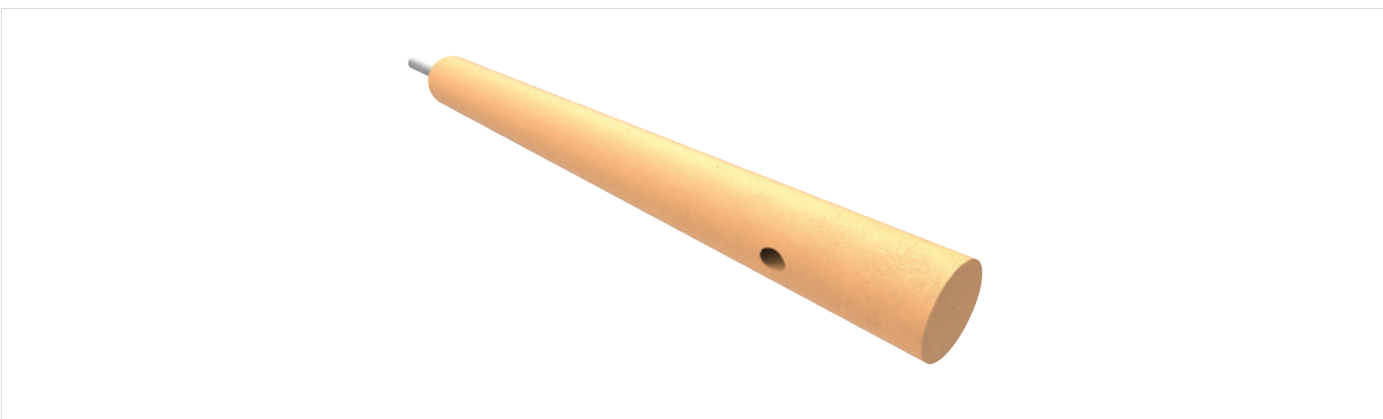
Hammer Head System



Mono outlet System



System with two or more outlets



SOLUTIONS FOR PURGING PLUGS

Within the Secondary Metallurgy Segment, Calderys has provided the highest level of technical solutions for over 50 years.

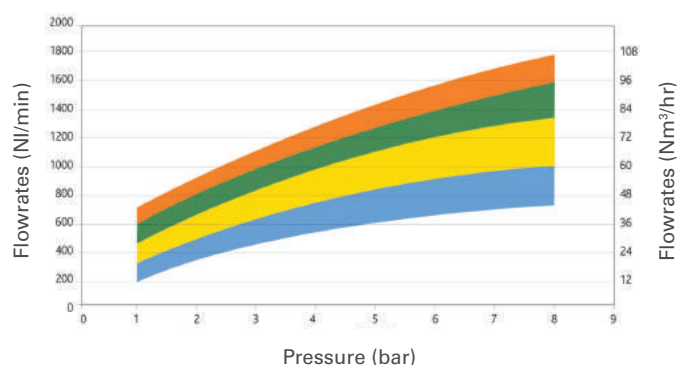
For Purging Systems Technologies, we offer a full range of solutions that meet the ever increasing process demands of our clients.

Within the Global Steel Market, we are regarded as the reference supplier. We have continually kept pace with evolutions in purging system requirements through a dedicated development program for products and accessories. We hold a comprehensive product portfolio for the full spectrum of purging technologies, including hot metal treatment, steel processing and other ferrous foundry applications.

Our worldwide presence allows for dedicated technical support in order to provide the most suitable and cost-effective solutions.

Gas flowrates

Gas flow under different pressures for slot plugs, HP plugs and segment plugs.

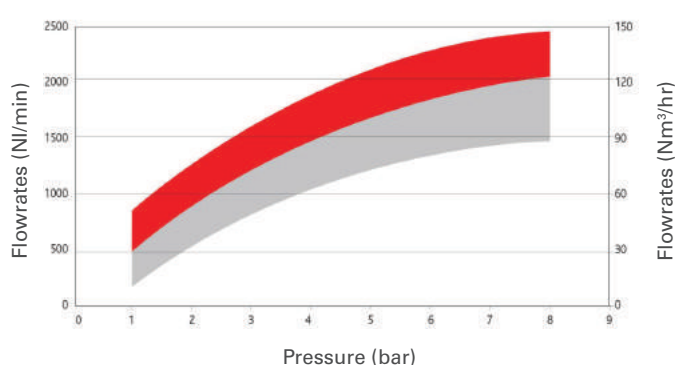


Measured under Air

Corrector factor for Argon: 0.85

Corrector factor for Nitrogen: 1.01

- 16 slots 12x0.19mm or HP Diameter small
- 16 slots 12x0.25mm or HP Diameter medium or 3 segments or 24 slots 12*0.19mm
- 24 slots 12x0.25mm or HP Diameter large or 4 segments
- 30 slots 12x0.25 mm or HP Diameter large



Measured under Air

Corrector factor for Argon: 0.85

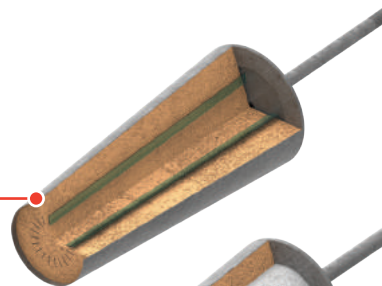
Corrector factor for Nitrogen: 1.01

- Combined
- Porous

SOLUTIONS FOR PURGING PLUG DESIGNS

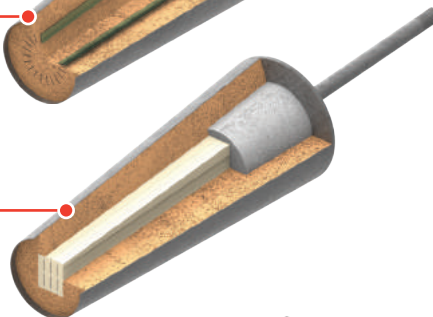
Slot plugs

Directional porosity:
high level of flexibility of gas flow



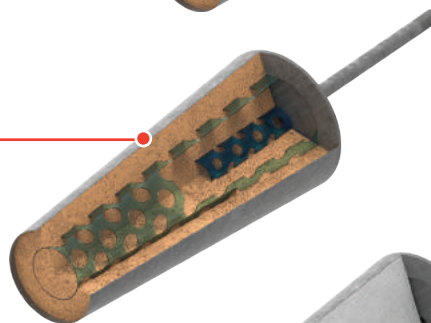
Segment plugs

Directional porosity with burned plates inside



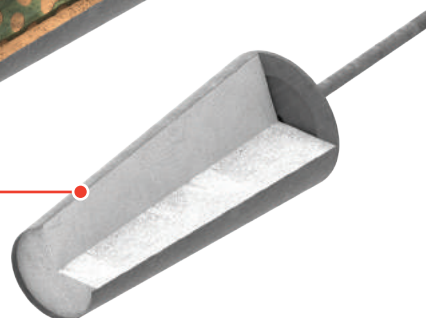
HP plugs

High performance with directional porosity



Porous plugs

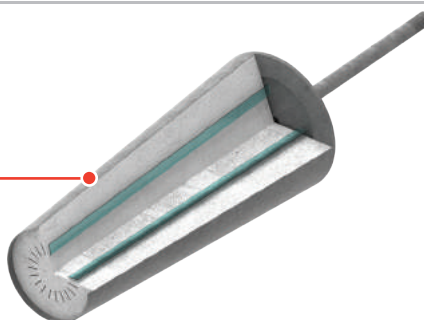
Non directional porosity
particularly devoted for
foundries and special steels



Combined Systems

SL-P plugs

100% porous plus slots



HP-P plugs

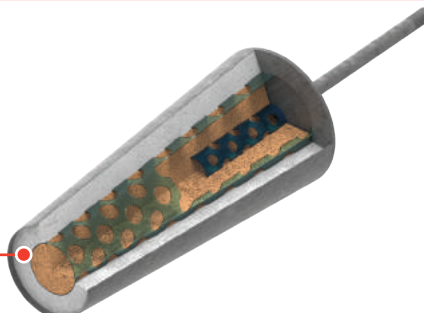
100% porous plus HP-ring channel





HP2^(A) / HP 3 plugs^(B)

^(A) Dense outside and porous inside

^(B) Dense inside and porous outside,
with HP-ring between



Porous 
Dense 

INSTALLATION METHODS OF CHANGEABLE PLUGS

Brick Lined Installation

Pocket block

CALDE® CAST 41
CALDE® CAST LT 90 SP G 8
CALDE® CAST LT 96 SP

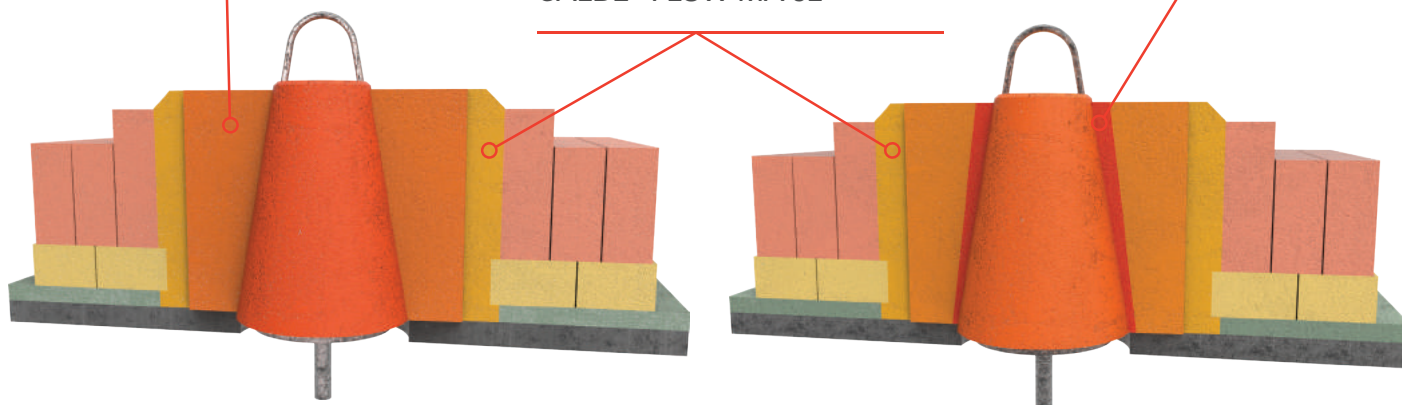
Blocking

Ramming
CALDE® RAM PC 94

Casting
CALDE® CAST LC 93
CALDE® CAST LC 95 SP
CALDE® FLOW MA 92

Sleeve

CALDE® CAST 41
CALDE® CAST LT 96 SP

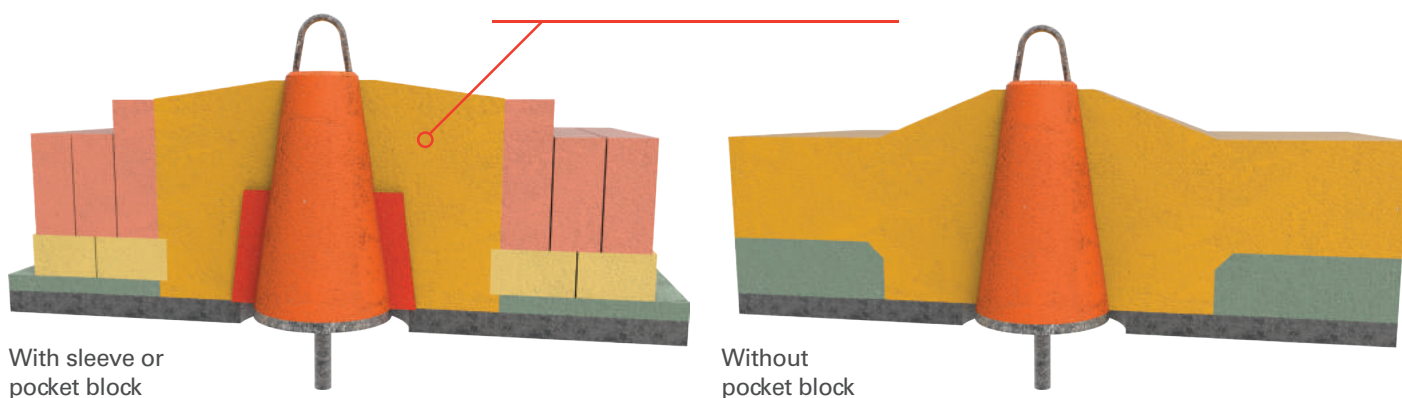


Monolithic Installation

Blocking

Ramming
CALDE® RAM PC 94

Casting
CALDE® CAST LC 93
CALDE® CAST LC 95 SP
CALDE® FLOW MA 92



With sleeve or
pocket block

Without
pocket block

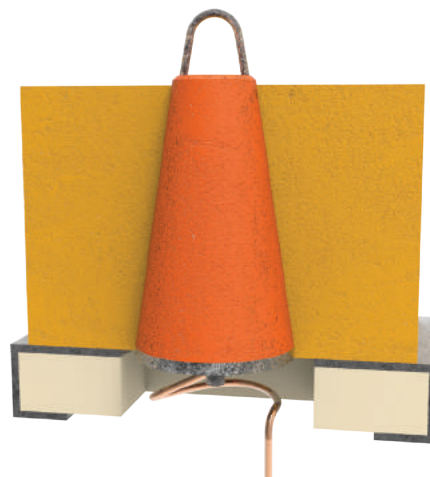
SAFETY SYSTEMS AND WEAR INDICATORS

Safety Systems

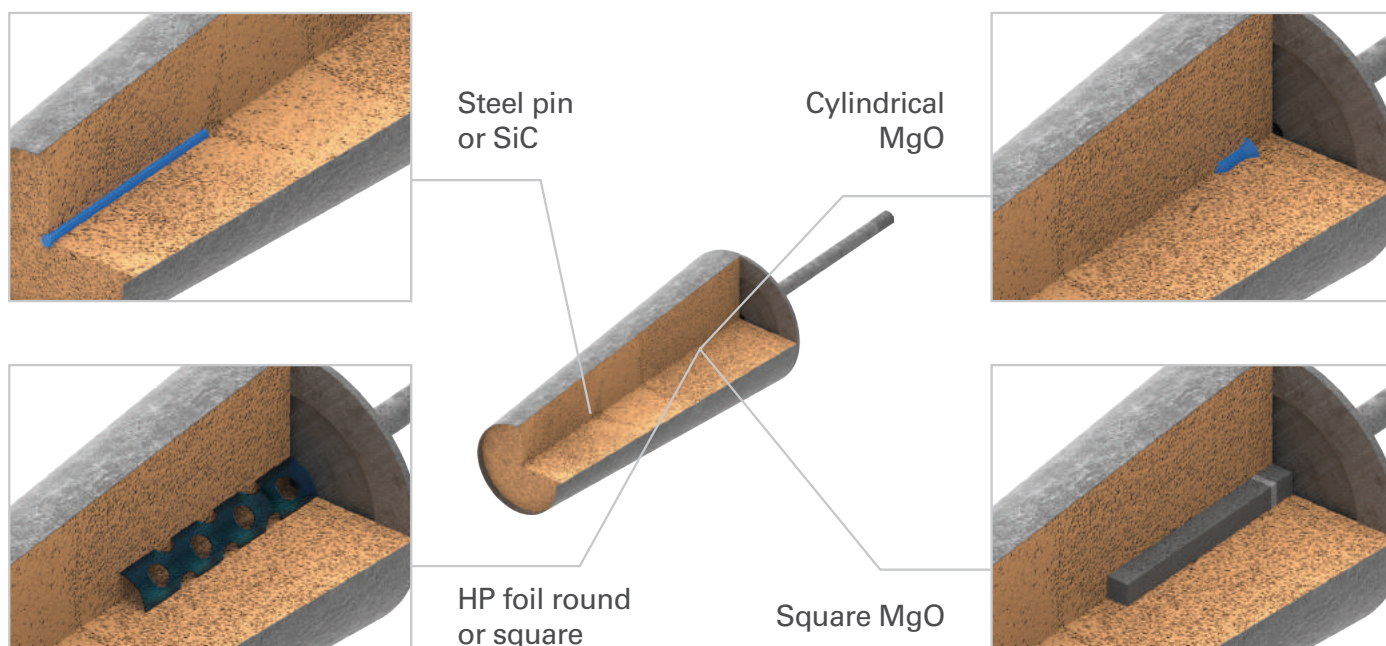
- Breakout security with spiral gas delivery for changeable plugs



- Breakout security with spiral gas delivery for non-changeable plugs



Wear indicators



CALDERYS ACCESSORIES

Adaptors for hydraulic extraction device



Hydraulic extraction device

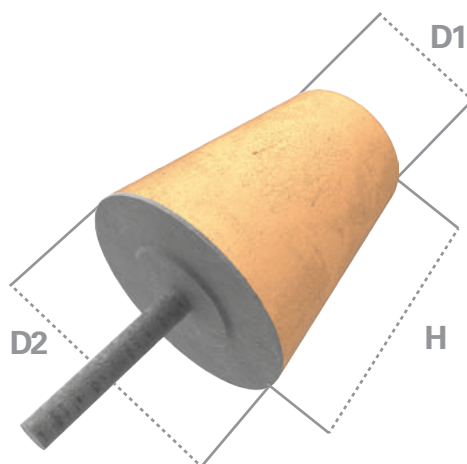


Code number for full traceability



CALDERYS PURGING PLUGS

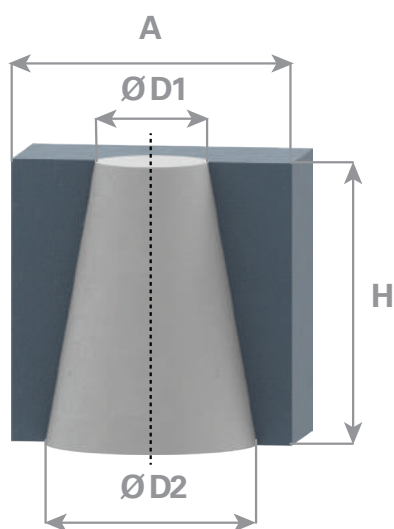
Type	H (mm)	Ø D1 (mm)	Ø D2 (mm)	Vol (dm³)
5° series				
SP 6700	575	88	189	9.05
SP 6600	525	96	189	8.67
SP 6500	470	106	189	8.24
SP 6000	450	109	189	8.03
SP 6000/420	420	114	189	7.73
SP 6000/380	380	121	189	7.29
SP 7000	355	126	189	7.01
SP 3000	325	131	189	6.61
SP 3000/270	270	139	189	5.75
7° series				
SP 8000	480	106	224	10.70
SP 8000/450	450	115	224	10.16
SP 1500	380	129	224	9.52
SP 2000	320	144	224	8.64
SP 4000	270	154	224	7.66
8° series				
SP 5700	355	76	182	4.90
SP 5600	320	85	182	4.68
SP 5500	270	100	182	4.33
12° series				
SP 5000	278	59	182	3.45
SP 9000	165	59	128	1.18
SP 9000/130	130	72	128	1.05



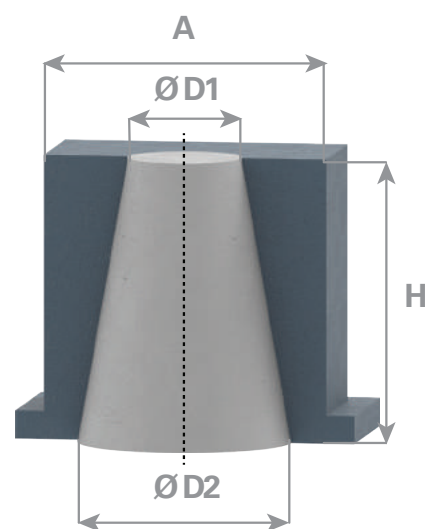
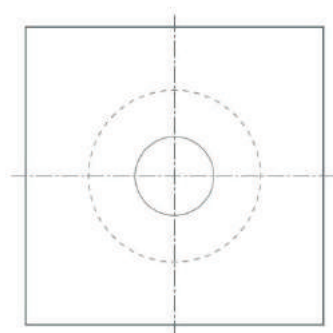
SQUARE POCKET BLOCKS FOR PURGING PLUGS WITHOUT SLEEVE

Type	H (mm)	A (mm)	Ø D1 (mm)	Ø D2 (mm)	Vol (dm ³)
5° series					
LQ 67	575	360	96	195	64.50
LQ 66	525	360	103	195	58.59
LQ 65	470	360	113	195	51.95
LQ 60	450	360	117	195	49.54
LQ 60/420	420	360	122	195	46.00
LQ 60/380	380	360	129	195	41.31
LQ 70	355	360	134	195	38.38
LQ 30	320	360	139	195	34.40
LQ 30/270	270	360	147	195	28.75
7° series					
LQ 80	480	360	113	230	50.69
LQ 15	380	360	138	230	38.93
LQ 20	320	360	152	230	32.18
LQ 40	270	360	164	230	26.69
8° series					
LQ 57	355	360	84	187	40.64
LQ 56	320	360	94	187	36.33
LQ 55	270	360	108	187	30.27
12° series					
LQ 50	270	360	74	187	31.15
LQ 90	157	320	68	134	14.77

All pocket blocks are also available with flange.



Without flange

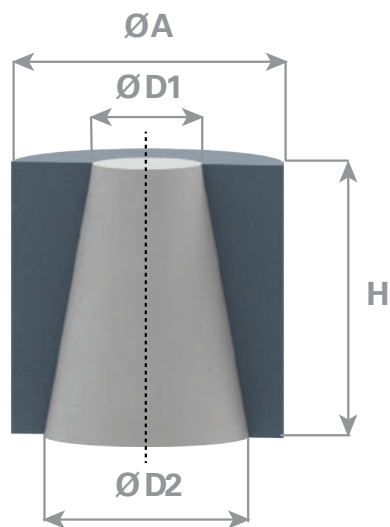


With flange

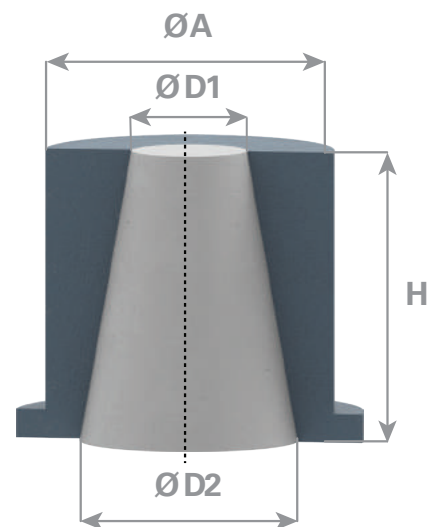
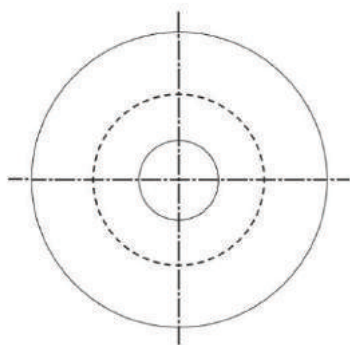
CYLINDRICAL POCKET BLOCKS FOR PURGING PLUGS WITHOUT SLEEVE

Type	H (mm)	A (mm)	Ø D1 (mm)	Ø D2 (mm)	Vol (dm³)
5° series					
LRZ 67	575	360	96	195	48.60
LRZ 66	525	360	103	195	43.99
LRZ 65	470	360	113	195	38.88
LRZ 60	450	360	117	195	37.02
LRZ 60/420	420	360	122	195	34.32
LRZ 60/380	380	360	129	195	30.74
LRZ 70	355	360	134	195	28.50
LRZ 30	320	360	139	195	25.50
LRZ 30/270	270	360	147	195	21.24
7° series					
LRZ 80	480	360	113	230	37.34
LRZ 15	380	360	138	230	28.36
LRZ 20	320	360	152	230	23.28
LRZ 40	270	360	164	230	19.18
8° series					
LRZ 57	355	360	84	187	30.77
LRZ 56	320	360	94	187	27.43
LRZ 55	270	360	108	187	22.76
12° series					
LRZ 50	270	360	74	187	23.65
LRZ 90	157	320	68	134	11.32

All pocket blocks are also available with flange.



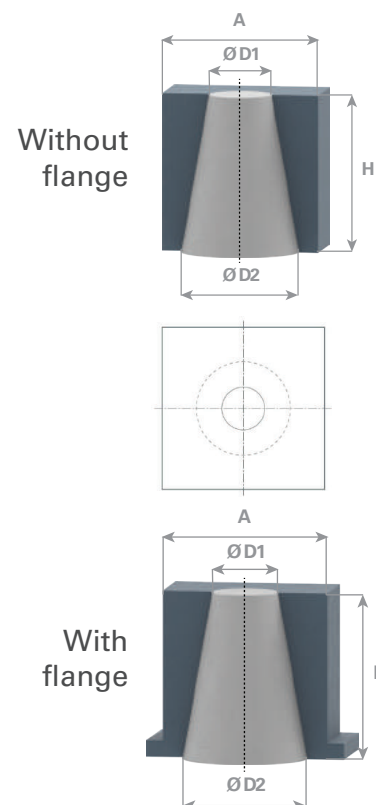
Without flange



With flange

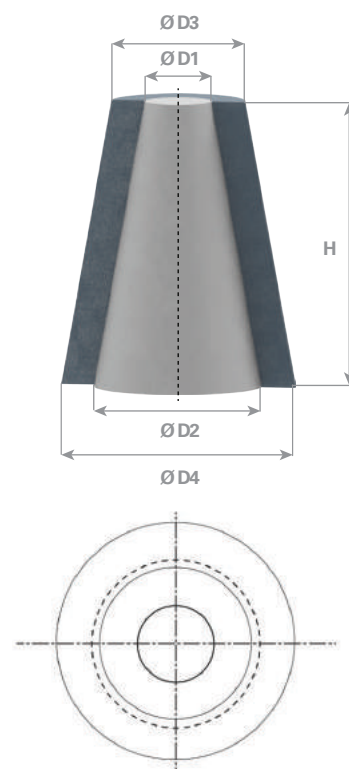
SQUARE POCKET BLOCKS FOR PURGING PLUGS WITH SLEEVE

Type	H (mm)	A (mm)	Ø D1 (mm)	Ø D2 (mm)	Vol (dm ³)
5 ° series					
LQH 60	450	360	210	286	36.41
LQH 70	355	360	193	238	33.01
LQH 30	320	360	198	238	29.49
LQH 30/270	270	360	204	238	24.61
8 ° series					
LQH 57	355	360	143	230	36.13
LQH 56	320	360	152	230	32.18
LQH 55	270	360	164	230	26.69
12 ° series					
LQH 50	270	360	164	230	26.69
LQH 90	157	320	164	202	11.93



SLEEVES

Type	H (mm)	Ø D3 (mm)	Ø D4 (mm)	Ø D1 (mm)	Ø D2 (mm)	Vol (dm ³)
5° series						
H 6000	450	204	280	117	195	12.09
H 7000	355	187	233	134	195	4.71
H 3000	320	192	233	139	195	4.31
H 3000/270	270	198	233	147	195	3.63
8° series						
H 5700	355	137	224	84	187	3.89
H 5600	320	146	224	94	187	3.59
H 5500	270	158	224	108	187	3.09
12° series						
H 5000	270	158	224	74	187	3.97
H 9000	157	158	196	68	134	2.58

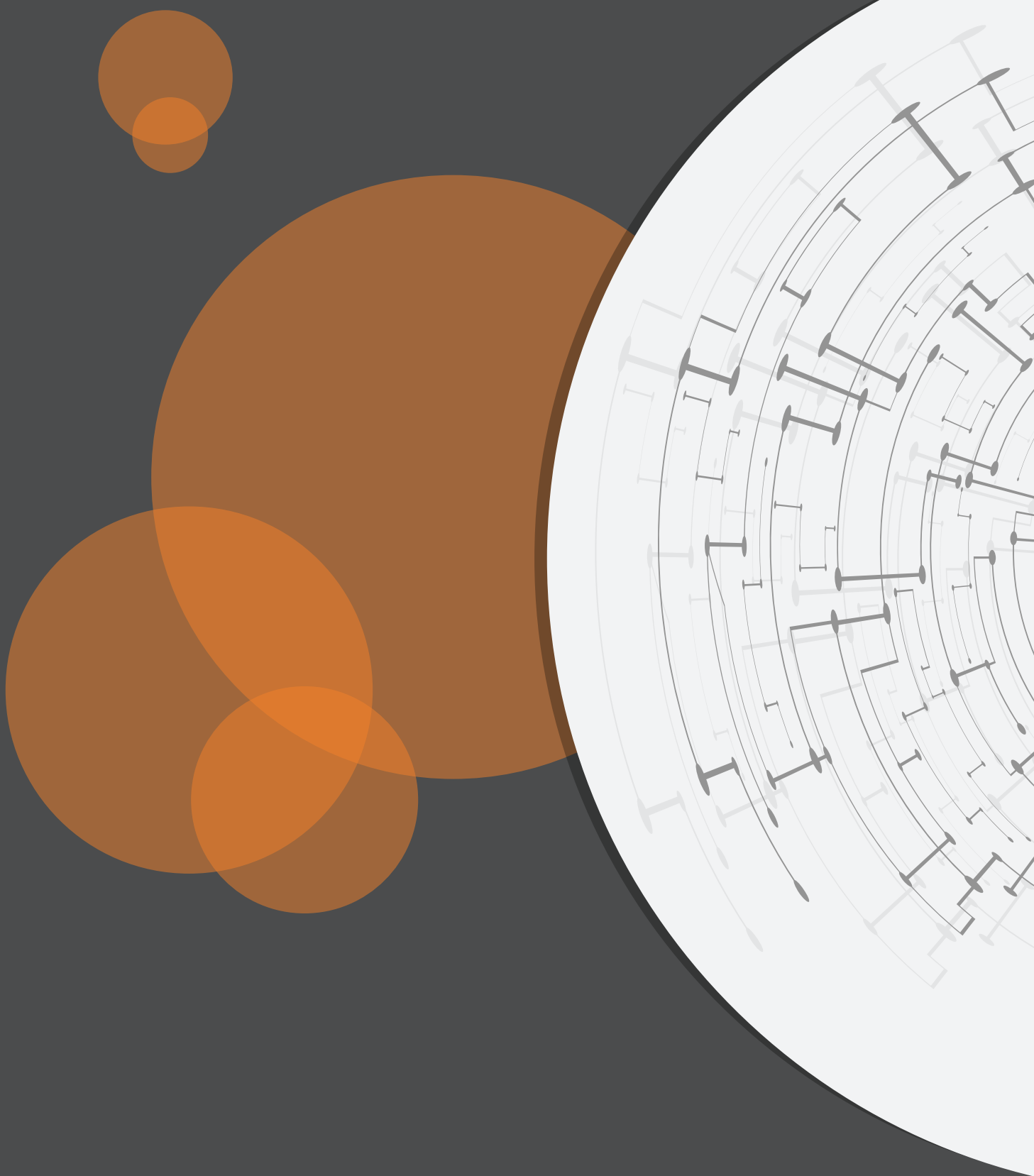


TECHNICAL DATA

Product Name	Usage	Formula design			Chemical analysis (Averages %)					Material required (t/m ³)	Porosity (%)	Permanent linear change (%)		CCS (N/mm ²)	
		Max grain size (mm)	Main Component	Binding System	Al ₂ O ₃	SiO ₂	Fe ₂ O ₃	CaO	MgO						
CALDE® CAST LT 90 SP G 8	Plugs, Pocket Blocks	10	Tabular Alumina Spinel	Hydraulic	92	0.10	0.10	1.30	5	3.2	16	+0.10 (1200°C)	-0.15 (1600°C)	140 (1200°C)	200 (1600°C)
CALDE® CAST LT 96 SP	Plugs, Pocket Blocks, Sleeves	6	Tabular Alumina Spinel	Hydraulic	96	0.10	0.10	1.40	2.2	3.25	-	+0 (1200°C)	-0.25 (1600°C)	140 (1200°C)	200 (1600°C)
CALDE® RAM LT 98 RSH	Porous Plugs & Combined Plugs	1	Tabular Alumina	Hydraulic	97	0.20	0.10	1.90	-	2.65	30	+0.05 (1300°C)	+0.10 (1600°C)	40 (1300°C)	75 (1600°C)
CALDE® CAST LC 93	Plugs Installation & Repair Castable	6	Corundum	Hydraulic	93	4.50	0.10	1.80	-	2.97	19	+0.05 (1300°C)	-0.55 (1600°C)	60 (1300°C)	130 (1600°C)
CALDE® CAST 41	Plugs, Pocket Blocks, Sleeves	6	Tabular Alumina	Hydraulic	96	0.10	0.02	3.60	-	2.82	27	-0.10 (1200°C)	+0.20 (1600°C)	60 (1200°C)	65 (1600°C)
CALDE® FLOW MA 92	Installation and Repair	6	Tabular Alumina Spinel	Hydraulic	92	0.60	0.10	1.70	5.4	2.9	21	-0.10 (1200°C)	+0.50 (1600°C)	60 (1200°C)	70 (1600°C)
CALDE® CAST LC 95 SP	Installation and Repair Castable	6	Corundum Spinel	Hydraulic	95	0.10	0.10	2.30	2.3	2.9	21	-0.05 (1200°C)	+0.35 (1600°C)	35 (1200°C)	50 (1600°C)
CALDE® RAM PC 94	Installation	4	Corundum	Chemical	96	1.30	0.10	1.50 (P ₂ O ₅)	-	3.14	-	-0.30 (1200°C)	-1 (1600°C)	85 (1200°C)	110 (1600°C)

Porosity is measured at 800 °C

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