

GLASS / REFRACTORY MATERIALS

# Feuerfestlösungen für die Glasindustrie

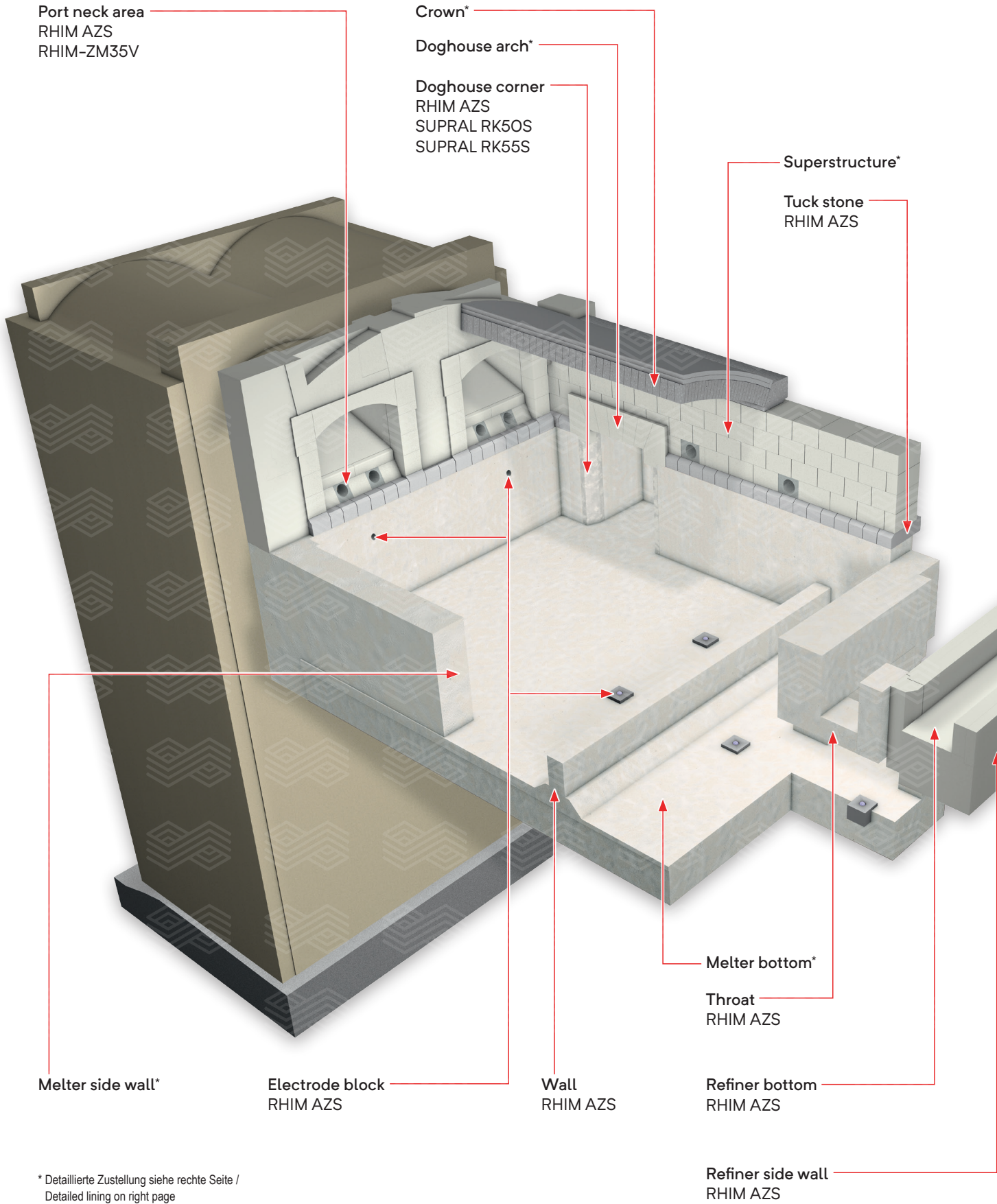
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## Refractory Material Solutions for the Glass Industry

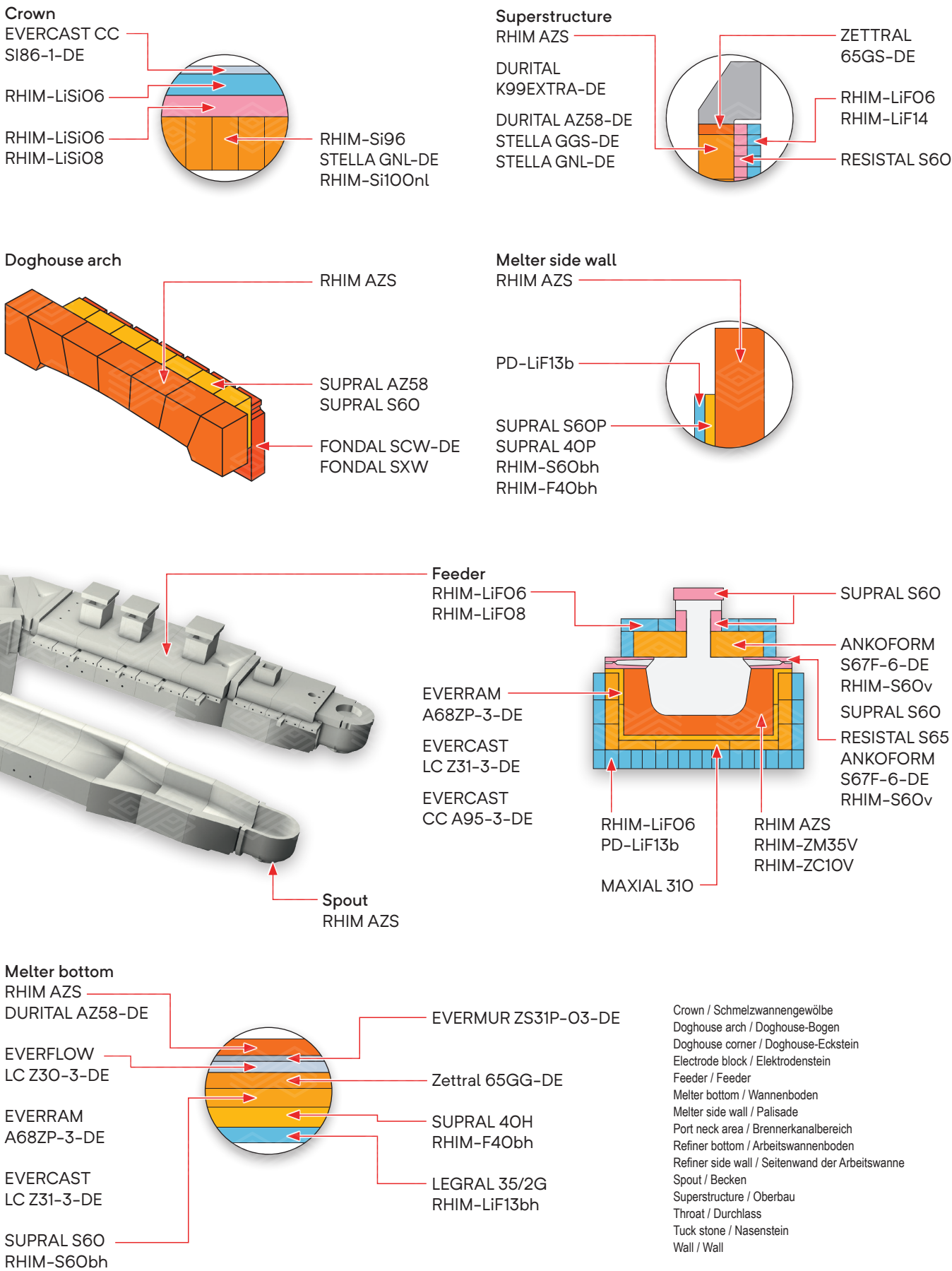


Behälterglaswanne  
für Weißglas

Container Glass Tank  
for Flint Glass



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# Behälterglaswanne für Farbglas

# Container Glass Tank for Colored Glass

Port neck area  
RHIM AZS  
ANKOFORM ZM33F-3-DE  
RHIM-ZM35V

Crown\*  
Doghouse arch\*  
Doghouse corner  
RHIM AZS  
SUPRAL RK50S  
SUPRAL RK55S

Superstructure\*  
Tuck stone  
RHIM AZS  
SUPRAL RK30S

Melter side wall\*

Electrode block  
RHIM AZS  
SUPRAL RK30S

Wall  
RHIM AZS  
SUPRAL RK55S

Melter bottom\*  
Throat  
RHIM AZS  
SUPRAL RK55S

Refiner bottom  
RHIM AZS

Refiner side wall  
RHIM AZS

Crown  
EVERCAST  
CC Si86-1-DE

RHIM-LiSiO6  
RHIM-LiSiO6  
RHIM-LiSi10

RHIM-Si96  
STELLA GNL-DE  
RHIM-Si100nl

Doghouse arch

RHIM AZS

SUPRAL AZ58  
SUPRAL S60

FONDAL SCW-DE  
FONDAL SXW

Superstructure  
RHIM AZS

DURITAL  
K99EXTRA-DE  
DURITAL AZ58-DE  
STELLA GGS-DE  
STELLA GNL-DE  
RHIM-Si96  
RHIM-Si100nl

ZETTRAL  
65GS-DE

RHIM-LiFO6  
RHIM-LiFO8

RESISTAL S60

Melter side wall  
RHIM AZS

PD-LiF13bh

SUPRAL S60P  
SUPRAL 40P  
RHIM-S60bh  
RHIM-F40bh

Feeder  
RHIM-LiFO6  
RHIM-LiFO8

EVERRAM  
A68ZP-3-DE  
EVERCAST  
LC Z31-3-DE  
EVERCAST  
CC A95-3-DE

Spout  
RHIM AZS

SUPRAL S60

ANKOFORM  
S67F-6-DE

SUPRAL S60  
RHIM-S60v

RESISTAL S65

ANKOFORM  
S67F-6-DE

RHIM-LiFO6  
PD-LiF13bh

MAXIAL 310

RHIM AZS  
RHIM-ZM35V  
RHIM-ZC10V

Melter bottom  
RHIM AZS  
DURITAL AZ58-DE  
SUPRAL RK30S

EVERRAM A68ZP-3-DE  
EVERCAST LC Z31-3-DE  
EVERFLOW LC Z30-3-DE  
EVERRAM A67CRP-6-DE

SUPRAL S60  
RHIM-S60bh

EVERMUR ZS31P-O3-DE  
RESITECT SR391 O-O,3-DE

Zettral 65GG-DE  
DURITAL RK10

SUPRAL 40H  
RHIM-F40bh

LEGRAL 35/2G  
RHIM-LiF13bh

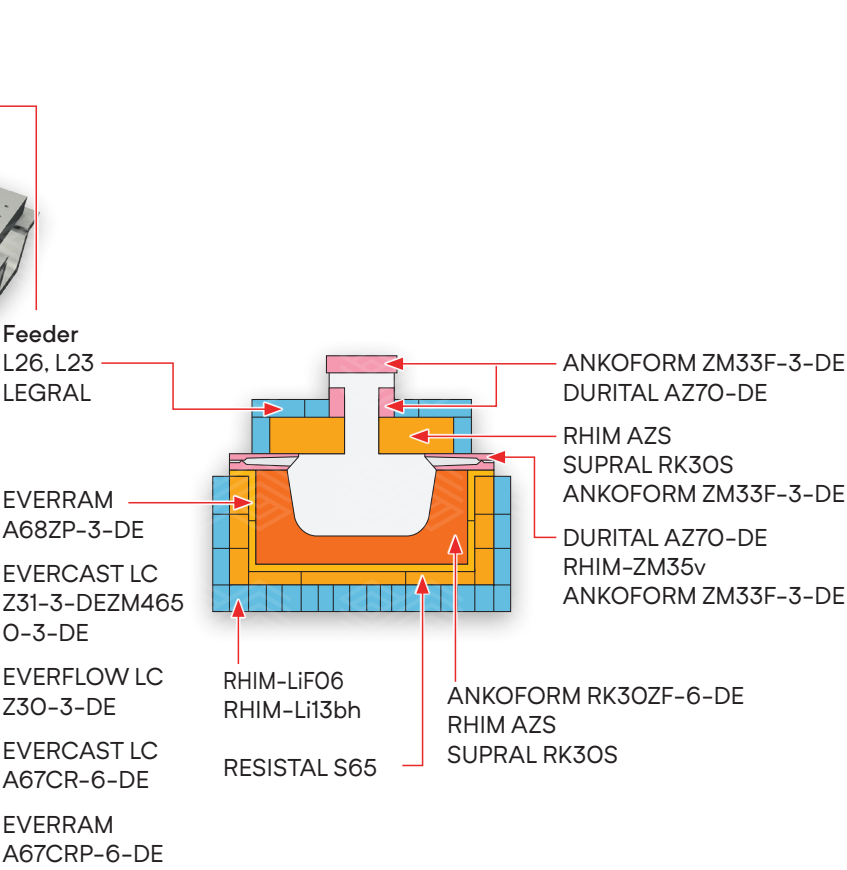
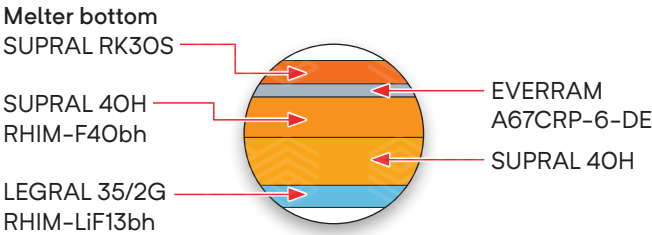
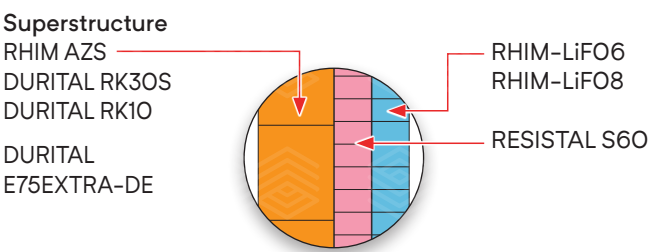
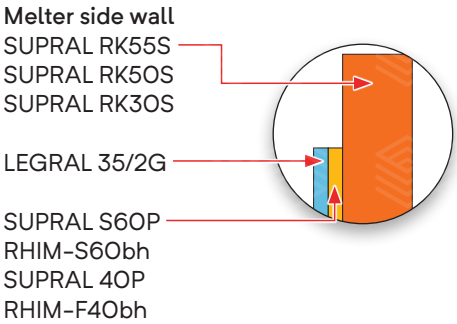
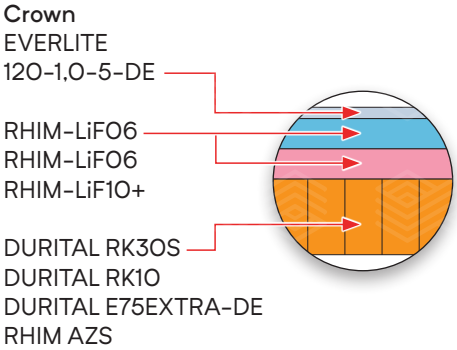
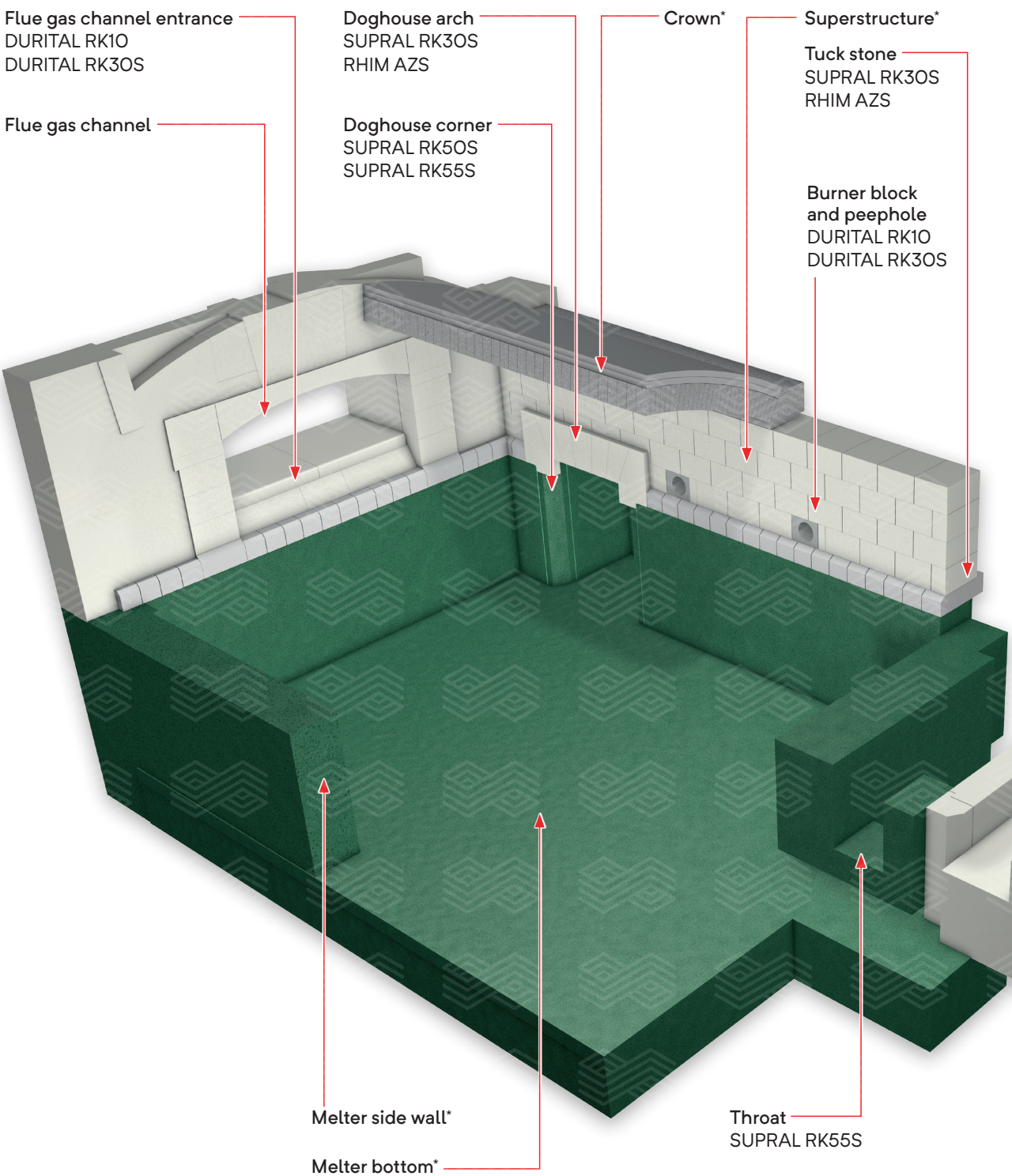
Crown / Schmelzwannengewölbe  
Doghouse arch / Doghouse-Bogen  
Doghouse corner / Doghouse-Eckstein  
Electrode block / Elektrodenstein  
Feeder / Feeder  
Melter bottom / Wannenboden  
Melter side wall / Palisade  
Port neck area / Brennerkanalbereich  
Refiner bottom / Arbeitswannenboden  
Refiner side wall / Seitenwand der Arbeitswanne  
Spout / Becken  
Superstructure / Oberbau  
Throat / Durchlass  
Tuck stone / Nasenstein  
Wall / Wall

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Faserglaswanne

Fiberglass Tank



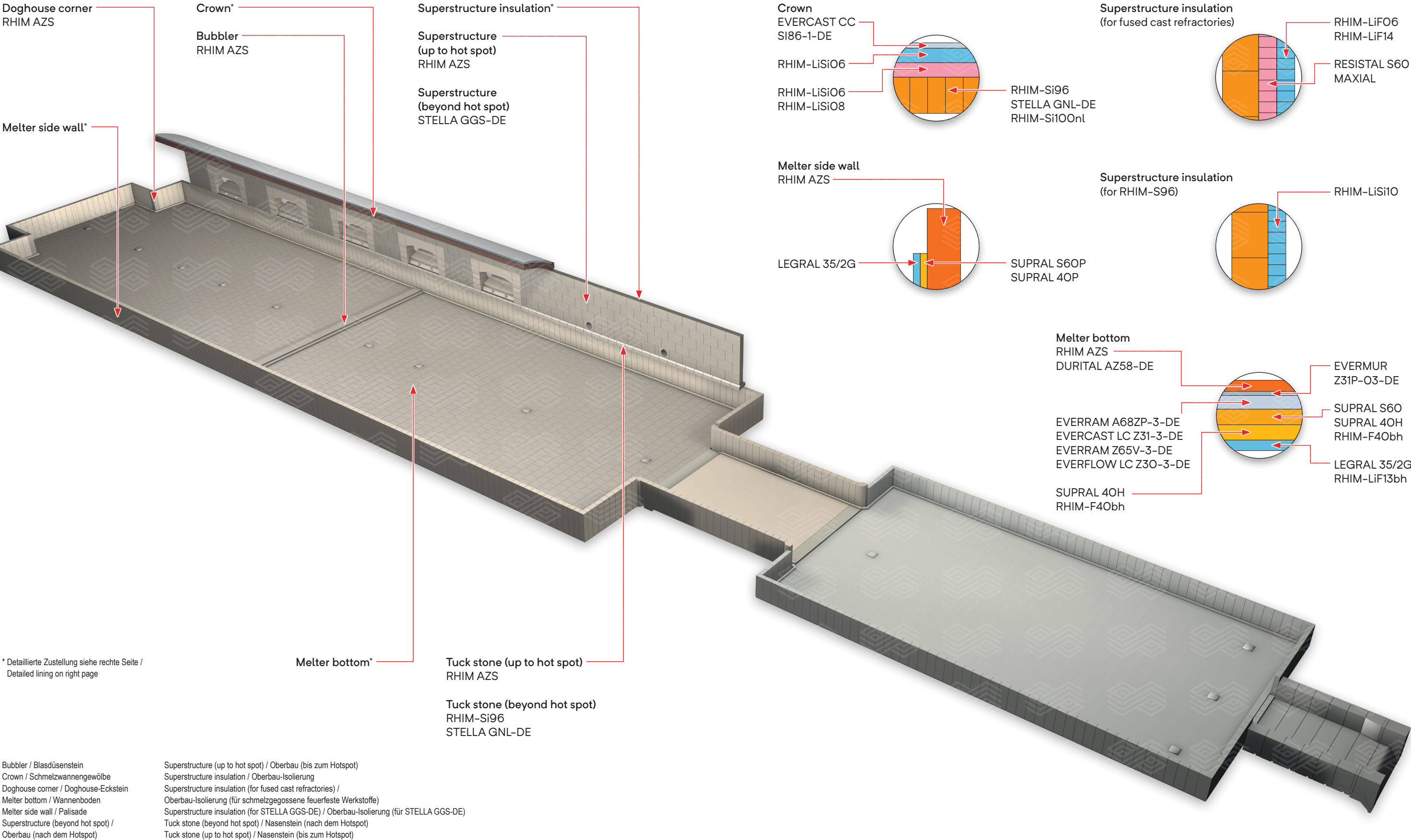
Burner block and peephole / Brennerstein und Schauloch  
Crown / Schmelzwannengewölbe  
Doghouse arch / Doghouse-Bogen  
Doghouse corner / Doghouse-Eckstein  
Feeder / Feeder  
Flue gas channel / Abgaskanal  
Flue gas channel entrance / Eingang Abgaskanal  
Melter bottom / Wannenboden  
Melter side wall / Palisade  
Superstructure / Oberbau  
Throat / Durchlass  
Tuck stone / Nasenstein

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Floatglaswanne

Float Glass Tank

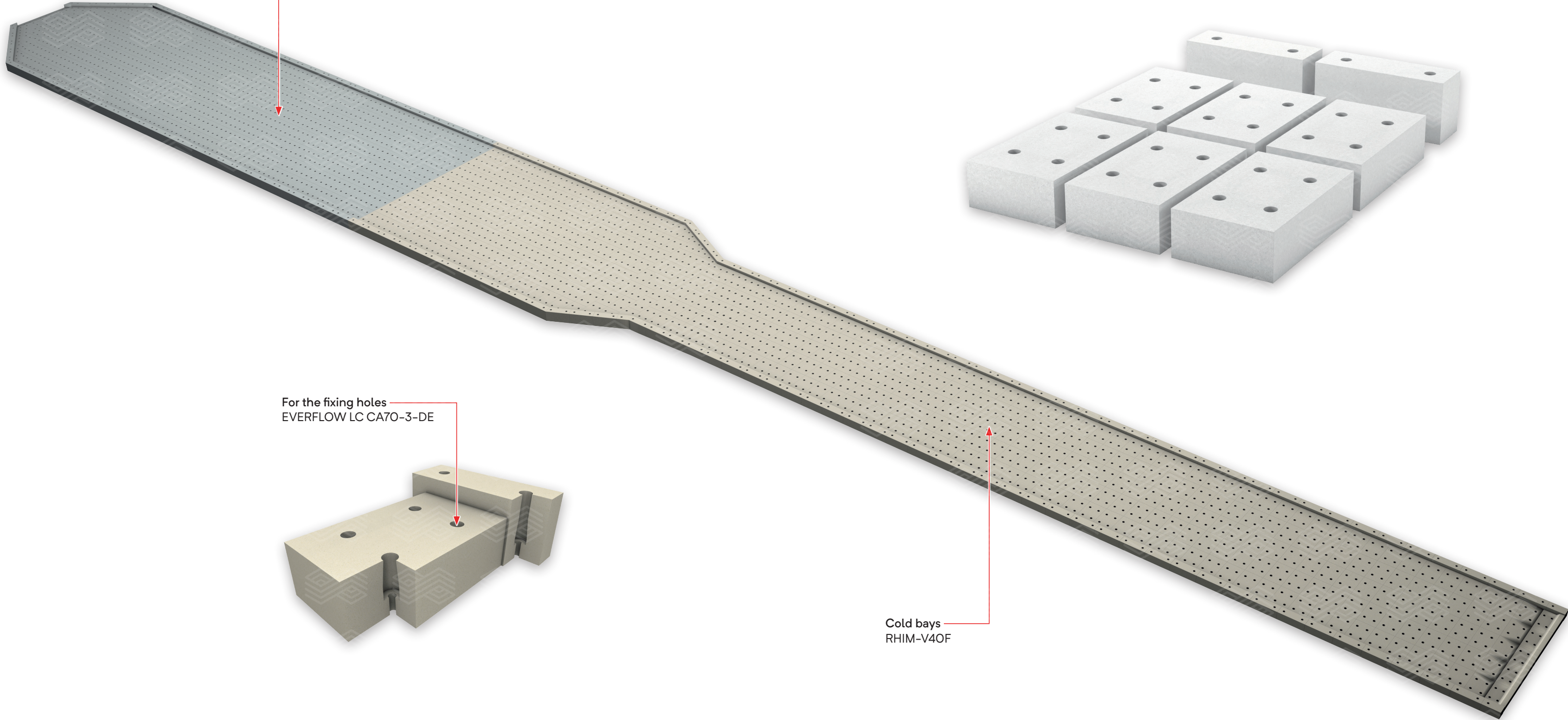




Zinnbadboden

Tin Bath Bottom

Hot bays  
SUPRAL CA  
RHIM-V4OFT



For the fixing holes  
EVERFLOW LC CA70-3-DE

Cold bays  
RHIM-V4OF

Cold bays / Kalter Arbeitsbereich  
For the fixing holes / Für die Befestigungslöcher  
Hot bays / Heißer Arbeitsbereich



# Gehäuse

Die Wahl des Materials für das Regeneratorgehäuse hängt von verschiedenen Faktoren wie Anwendungstemperatur, Gemengestaub und Atmosphäre ab. Die Vorteile und Einschränkungen der unterschiedlichen Feuerfestmaterialien für Regeneratorgehäuse sind im Folgenden zusammengefasst:

## Mullit

- Bei sehr starker Gemengeverstaubung und niedrigerem Alkaligehalt im Abgas, steht eine große Auswahl an Mullit- und Andalusitsteinen zur Verfügung.
- Empfohlen für Regeneratoren in endbefeueften Wannen sowie die erste und zweite Kammer in kreuzbefeueften Wannen.

## Magnesia

- Magnesiateine weisen eine hohe Beständigkeit gegenüber Alkaliangriff auf. Für Hochtemperatur- und Gewölbeanwendungen ist eine Magnesiasorte mit niedrigem Druckfließen (z. B. ANKER DG10) zu empfehlen.
- Bei signifikanter Gemengeverstaubung können Magnesia-Zirkon-Steine (z. B. RUBINAL VZ) verwendet werden, insbesondere für die Prallwand.
- Ein Regeneratorgehäuse mit einem Magnesiegewölbe und -wänden weist das beste Preis-Leistungs-Verhältnis von allen Materialkonzepten auf.

## Silika

- Silika ist im Regeneratorgewölbe kosteneffizient und für Situationen mit signifikanter Gemengeverstaubung und hohen Abgastemperaturen (> 1470 °C) geeignet. Die Bildung von flüssiger Schlacke aufgrund von Alkaliangriffen ist bei niedrigeren Abgastemperaturen kritisch.
- Heutzutage ist Silika nicht die erste Wahl für Regeneratorkammern.

# Casing

The choice of regenerator casing material depends on multiple factors including the application temperature, carry-over, and atmosphere. The advantages and limitations of the various refractory materials for regenerator casings are summarized in the table below:

## Mullite

- In the case of very strong sand carry-over and lower alkali content in the flue gas, a large variety of mullite and andalusite bricks are available.
- Recommended for regenerators in endfired furnaces or the first and second chamber in crossfired furnaces

## Magnesia

- Magnesia bricks have a high resistance against alkali attack. For high-temperature and crown applications a magnesia grade with a low creep value (e.g., ANKER DG10) is recommended.
- In the case of significant sand carry-over, magnesia zircon (e.g., RUBINAL VZ) can be used, especially for the target walls.
- A regenerator casing comprising a magnesia crown and walls has the best cost-performance ratio of all the different material concepts.

## Silica

- Silica in the regenerator crown is cost-efficient and suitable for situations with significant sand carry-over and high flue gas temperatures (> 1470 °C). The formation of liquid slag due to the attack of alkalis is critical in the case of lower flue gas temperatures.
- Nowadays silica is not the first choice for regenerator casings.

Sorten in Grün: Zustellung mit basischen Steinen  
Sorten in blau: Zustellung mit Mullit

Grades in green: Lining with basic bricks  
Grades in blue: Lining with mullite

## Magnesia concept Crown and side walls

**Crown & Upper Walls**  
T: 1250 — 1600 °C  
ANKER DG10  
RUBINAL VZ (Target wall)

**Middle Walls**  
T: 800 — 1250 °C  
ANKER DG3

**Lower Walls & Base**  
T: < 800 °C  
RHIM-F41  
RHIM-F40  
RHIM-F35  
MAXIAL 310

**Rider arches**  
RESISTAL S65  
RHIM-S65

## Mullite Concept Crown and side walls

**Crown & Upper Walls**  
T: 1550 — 1600 °C  
RHIM-S70+  
RHIM-M75f  
DURITAL E75EXTRA  
  
T: 1450 — 1550 °C  
RHIM S72  
DURITAL S70HM  
(1470 — 1550 °C)  
  
T: 1300 — 1450 °C  
RHIM-S65+  
DURITAL S65G

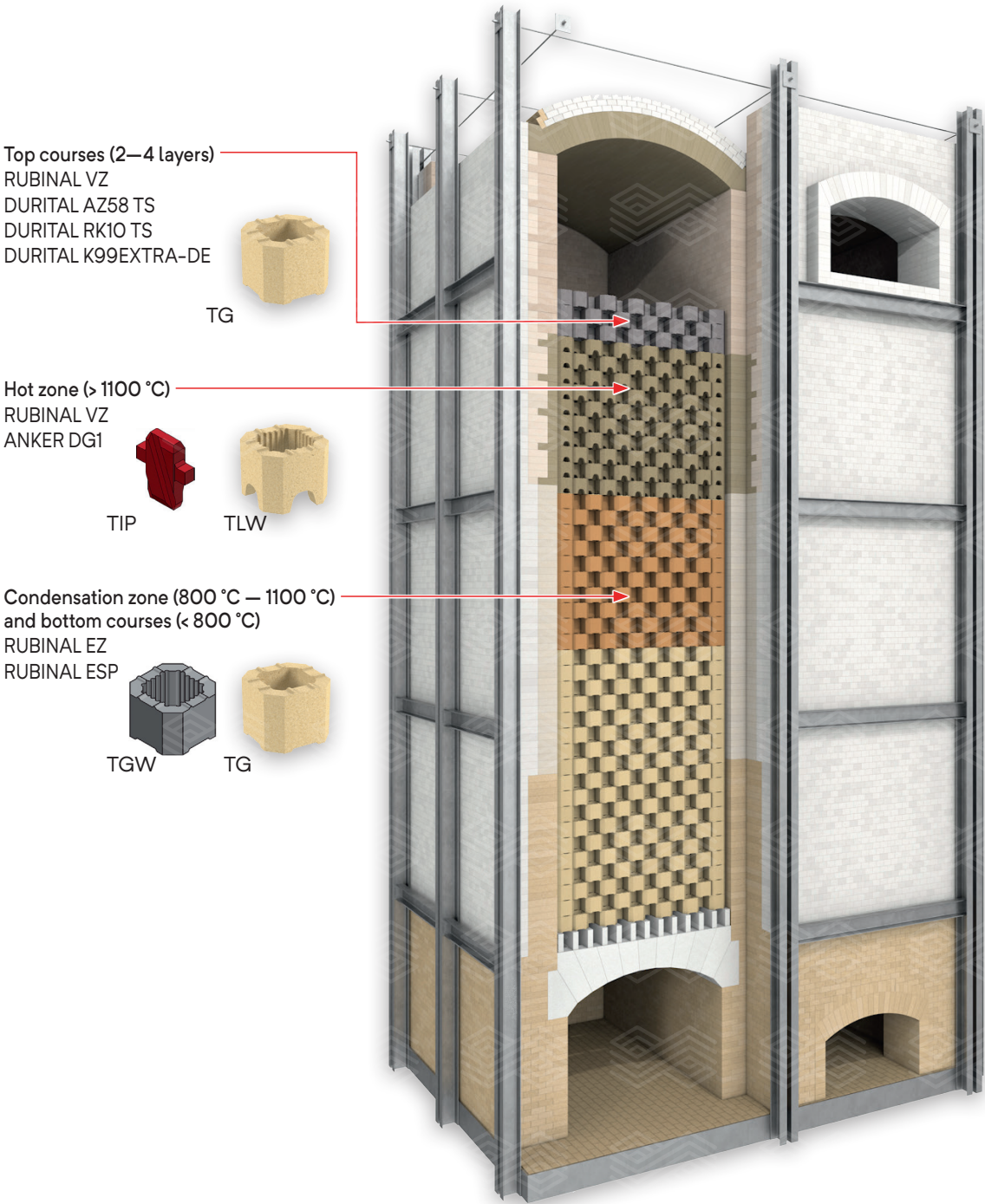
**Middle Walls**  
T: 800 — 1425 °C  
RHIM-S65  
RHIM-S60  
  
T: 800 — 1300 °C  
RESISTAL S65  
RESISTAL S60

**Lower Walls & Base**  
T: < 800 °C  
RHIM-F41  
RHIM-F40  
RHIM-F35  
MAXIAL 310



# INNOREG — Standardkonfiguration

Die Standardkonfiguration des INNOREG beinhaltet Gittersteinformate, die in Bezug auf Raumvolumen, Wandstärke und Wärmeübergangsfläche hin optimiert wurden, um eine maximale Effizienz des Regenerators zu ermöglichen

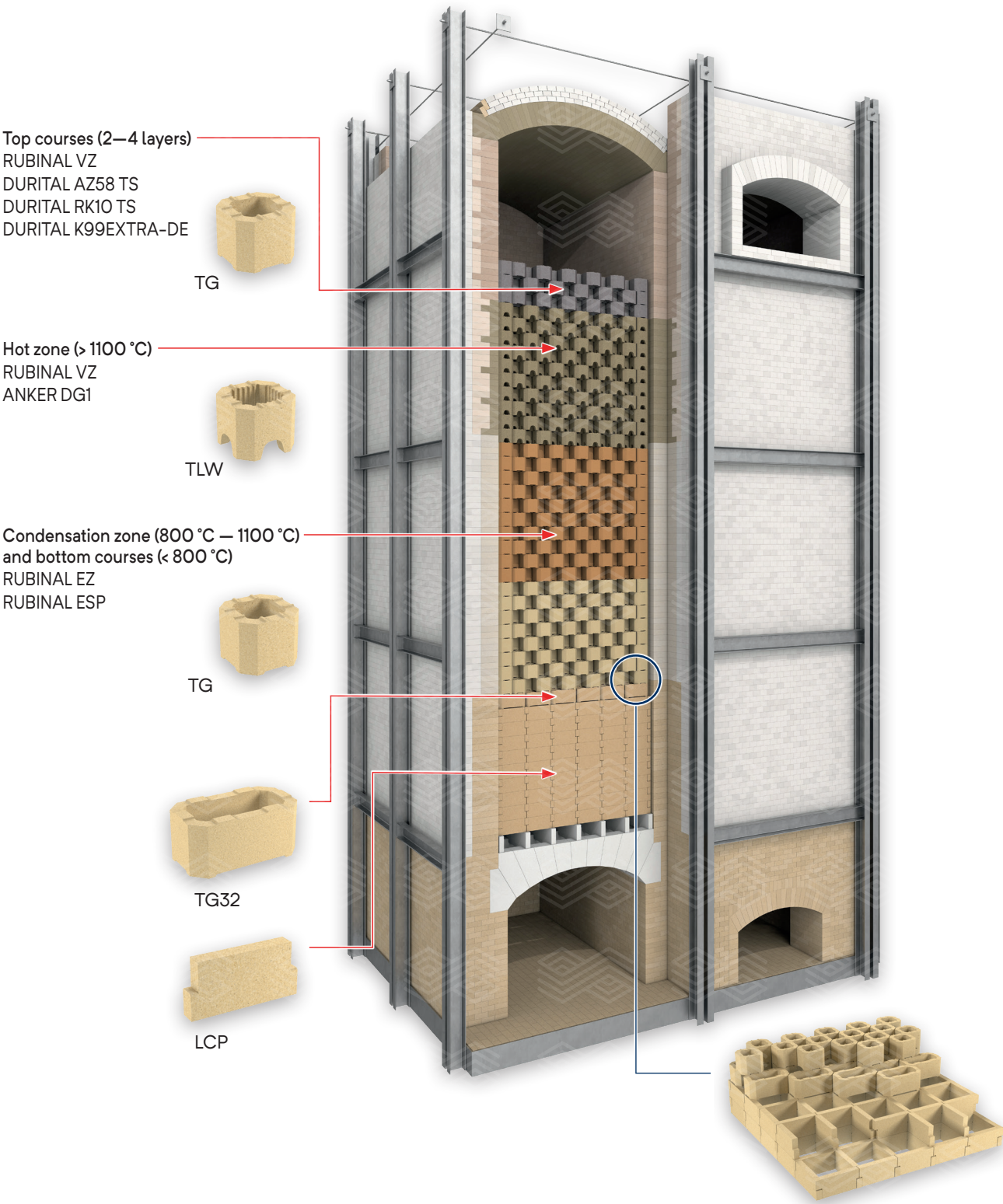


# INNOREG — Standard Configuration

The standard configuration of INNOREG includes checker brick shapes which have been optimized in terms of volume, wall thickness and heat transfer area to enable maximum efficiency of the regenerator.

# INNOREG — Anti-Clogging Konfiguration

In manchen Regeneratoren gibt es, ein erhöhtes Risiko für Verstopfungen. In solchen Regeneratoren können in der Kondensationszone Gittersteine eingesetzt werden, die eine doppelte Kanalweite ermöglichen. Dies verringert deutlich das Verstopfungsrisiko und erleichtert die thermische Reinigung



# INNOREG — Anti-Clogging Configuration

Some regenerators have an increased clogging risk. In these regenerators, checker bricks which enable doubling the flue size can be used in the condensation zone. As a result, the risk of clogging is reduced significantly and thermal cleaning is facilitated.

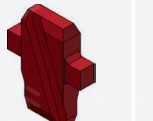
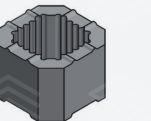


Gittersteinformate

Ein wichtiger Faktor für die Effizienz von Regenerator Gittersteinen ist die spezifische Wärmeübergangsfläche.

Das TLW Format ist diesbezüglich optimiert. Die innere gewellte Oberfläche erhöht die spezifische Wärmeübergangsfläche auf 19 m²/m³.

Durch zwei weitere Formate kann eine größere Kanalweite erzielt werden, die eine Verstopfung in der Kondensationszone verhindern soll. Der lange Topfstein TG 32/175 ermöglicht die doppelte Kanalweite, der LCP („Large Channel Piece“) verfügt sogar über die vierfache Kanalweite im Vergleich zu Standardgittersteinen.

| Shape             | Top Layer                                                                                 | Hot Zone                                                                                   |                                                                                          | Condensation Zone                                                                         |                                                                                                                                                                                                 |
|-------------------|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Normal Conditions | TG<br>   | TLW<br>   | TIP<br> | TG<br>   | TGW<br>                                                                                                      |
| Risk for Clogging | TG<br> | TLW<br> |                                                                                          | TG<br> | TG 32/175<br> LCP<br> |

| Shape                     | Flue size | Brick thickness | Brick height | Brick volume | Pieces | Specific heat transfer area |
|---------------------------|-----------|-----------------|--------------|--------------|--------|-----------------------------|
|                           | mm        | mm              | mm           | dm³          | pcs/m³ | m²/m³                       |
| TG 14/175                 | 142       | 38              | 175          | 4,23         | 88.2   | 15.9                        |
| TG 15/175                 | 150       | 30              | 175          | 3,40         | 88.2   | 17.0                        |
| TL 14/175                 | 142       | 38              | 175          | 3,74         | 88.2   | 16.6                        |
| TL 15/175                 | 150       | 30              | 175          | 3,02         | 88.2   | 17.1                        |
| TLW 14/175                | 142       | 38              | 175          | 3,46         | 88.2   | 18.9                        |
| TLW 14/15                 | 142       | 38              | 150          | 3,05         | 102.9  | 19.7                        |
| TLW 14/15 + TIP           | 62.9*     | 38              | 150          | 4,40         | 90.93* | 24.9                        |
| TGW 14/15                 | 142       | 38              | 150          | 3,33         | 102.9  | 18.5                        |
| TG 32/175                 | 322x142   | 38              | 175          | 6,54         | 44.1   | 13.2                        |
| LCP (Large Channel Piece) | 310       | 50              | 175          | 2,89         | 88.2   | 9.6                         |

\* This is an effective value, as the system consists off two different shapes

|                               |                        |                               |
|-------------------------------|------------------------|-------------------------------|
| Brick height / Steinhöhe      | Flue size / Kanalweite | Specific heat transfer area / |
| Brick thickness / Steinstärke | Pieces / Stück         | Spezifische Heizfläche        |
| Brick volume / Steinvolumen   | Shape / Format         |                               |

Checker Brick Shapes

An important factor for the efficiency of regenerator checker bricks is the specific heat transfer area.

The TLW shape is optimized in this respect. The inner corrugated surface increases the specific heat transfer area to 19 m²/m³.

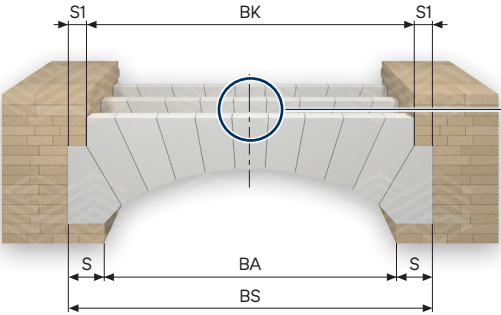
Two other shapes help achieve an increased flue size, which is intended to prevent clogging in the condensation zone. The long chimney block TG 32/175 provides double the flue size, while the flue size of the LCP (“Large Channel Piece“) is even four times that of standard checker bricks.

Schlitzbogen und Tragsteine

Der Schlitzbogen dient als Basis zur Unterstützung der Gitterung. RHI Magnesita bietet hier zwei Konzepte an.

Das bewährte Standardkonzept beinhaltet Standardformate für den Bau von Schlitzbögen. Dies hat folgende Vorteile: Speziell designte Wölber (SB Formate) bilden einen scheitrechten Bogen, der ein solides Fundament für die Gitterung darstellt. Die Zustellung vor Ort wird einfacher.

Einzelbögen

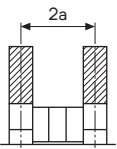


Rider Arch and Transition Tiles

The rider arch serves as a basis to support the checkerwork. RHI Magnesita offers two concepts.

The proven standard concept includes standard shapes for the construction of rider arches. This has the following advantages: Specialty designed wedges (SB shapes) are forming a straight rider arch, acting as a solid foundation for the checkerwork. On-site installation becomes easier.

Single arches



a = d + s  
d = Gitter-Kanalweite  
s = Gitterstein-Dicke  
  
a = d + s  
d = Checker channel width  
s = Checker brick thickness

| Chamber width | Width of waste gas flue | Rider arch width | Wall thickness |     | Pieces per rider arch |      |       |      |       |      |       |      |      |       |      |       |      |  |
|---------------|-------------------------|------------------|----------------|-----|-----------------------|------|-------|------|-------|------|-------|------|------|-------|------|-------|------|--|
| BK            | BA                      | BS               | S              | S1  | SB 1                  | SB 2 | SB 2A | SB 3 | SB 3A | SB 4 | SB 4A | SB 5 | SB 6 | SB 6A | SB 7 | SB 7A | SB 8 |  |
| 1150          | 900                     | 1400             | 250            | 125 | 1                     |      | 2     |      | 2     |      |       |      | 2    |       |      |       |      |  |
| 1250          | 1000                    | 1500             | 250            | 125 | 1                     |      | 2     | 2    |       |      |       |      | 2    |       |      |       |      |  |
| 1350          | 1100                    | 1600             | 250            | 125 | 1                     | 2    |       | 2    |       |      |       |      | 2    |       |      |       |      |  |
| 1450          | 1200                    | 1600             | 200            | 75  | 1                     | 2    |       | 2    |       |      |       |      | 2    |       |      |       |      |  |
| 1550          | 1300                    | 1800             | 250            | 125 | 1                     |      | 2     |      | 2     |      | 2     |      |      |       | 2    |       |      |  |
| 1650          | 1400                    | 1900             | 250            | 125 | 1                     | 2    |       |      | 2     |      | 2     |      |      |       | 2    |       |      |  |
| 1750          | 1500                    | 2000             | 250            | 125 | 1                     | 2    |       | 2    |       |      | 2     |      |      |       | 2    |       |      |  |
| 1850          | 1600                    | 2100             | 250            | 125 | 1                     | 2    |       | 2    |       | 2    |       |      |      |       | 2    |       |      |  |
| 1950          | 1700                    | 2200             | 250            | 125 | 1                     |      | 2     |      | 2     |      | 2     | 2    |      |       |      |       | 2    |  |
| 2050          | 1800                    | 2300             | 250            | 125 | 1                     | 2    |       |      | 2     |      | 2     | 2    |      |       |      |       | 2    |  |
| 2150          | 1900                    | 2400             | 250            | 125 | 1                     | 2    |       | 2    |       |      | 2     | 2    |      |       |      |       | 2    |  |
| 2250          | 2000                    | 2500             | 250            | 125 | 1                     | 2    |       | 2    |       | 2    |       | 2    |      |       |      |       | 2    |  |



Kundenorientierte Systemlösungen — Keramischer Oberbau

Üblicherweise werden im Oberbau von Glasschmelzwannen schmelzgegossene AZS-Blöcke eingesetzt. Diese neigen dazu, bei hohen Temperaturen Glasphase „auszuschwitzen“, was zu Glasfehlern führen kann. Dieser Effekt wird noch ausgeprägter, wenn man neue Feuerungsalternativen wie Oxy-Fuel oder sogar H<sub>2</sub>-Feuerung in Betracht zieht.

RHI Magnesita bietet hier eine keramisch gebundene Alternative an, die kein solches Verhalten zeigt.

Empfohlen wird die Verwendung von Zirkonmullit-Steinen, DURITAL AZ58-DE, in dem vorderen Schmelzwannenbereich, insbesondere dort, wo mit Korrosion durch Verstaubungsprodukte zu rechnen ist. Im hinteren Bereich, wo ein Angriff durch Alkaliverdampfung vorherrscht, wird die Verwendung von DURITAL K99EXTRA-DE auf Edelforundbasis empfohlen.

Feuerfeste Steine / Refractory bricks

| Grade               | Al <sub>2</sub> O <sub>3</sub> | SiO <sub>2</sub> | ZrO <sub>2</sub> | BD                | AP    | CCS               | TSR                     | RUL T <sub>0.5</sub> | TE        | Raw material                                           |
|---------------------|--------------------------------|------------------|------------------|-------------------|-------|-------------------|-------------------------|----------------------|-----------|--------------------------------------------------------|
|                     | %                              | %                | %                | g/cm <sup>3</sup> | vol.% | N/mm <sup>2</sup> | H <sub>2</sub> O Cycles | °C                   | 1500 °C % |                                                        |
| DURITAL K99EXTRA-DE | 99.0                           | 0.2              |                  | 3.26              | 17.0  | 87                | 25                      | > 1700               | 1.20      | Fused alumina                                          |
| DURITAL AZ58-DE     | 59.0                           | 13.5             | 25.0             | 3.20              | 14.5  | 134               | > 30                    | 1670                 | 0.70      | Sintered alumina, zirconia mullite, zirconium silicate |
| SUPRAL AZ58         | 60.0                           | 13.0             | 26.0             | 3.05              | 17.5  | 108               | > 30                    | 1680                 | 0.65      | Sintered alumina, zirconia mullite, zirconium silicate |

AP Offene Porosität / Apparent porosity

BD Rohdichte / Bulk density

CCS Kaltdruckfestigkeit / Cold crushing strength

RUL Druckerweichen / Refractoriness under load

TE Wärmedehnung / Thermal expansion

TSR Temperaturwechselbeständigkeit / Thermal shock resistance

Fused alumina / Schmelzkorund

Grade / Sorte

Raw material / Rohstoffbasis

Sintered alumina / Sinterkorund

Zirconia mullite / Zirkonmullit

Zirconium silicate / Zirkoniumsilikat



DURITAL AZ58-DE Sample after two years field test

Customer-oriented System Solutions — Ceramic Superstructure

Fused cast AZS blocks are normally used in the superstructure of glass tanks. These blocks tend to exude glassy phase at high temperatures, which may lead to glass defects. This effect is getting more pronounced, when considering new firing alternatives like oxy-fuel or even H<sub>2</sub> firing

RHI Magnesita offers a ceramically bonded alternative which does not show such behavior.

The use of zirconia mullite bricks, DURITAL AZ58-DE, is recommended in the front area of the glass tank, especially where corrosion through dust products is to be expected. In the rear area, where attack through alkali evaporation prevails, the use of DURITAL K99EXTRA-DE based on white fused corundum is recommended.



Silica crown is dripping on Superstructure blocks

Komplexe Geometrien für spezielle Anwendungen

In einigen Positionen in der Glaswanne sind größere Blöcke mit komplexen Geometrien die beste technische Lösung. Gängige Beispiele sind Bauteile des Feeders oder größere Brennerblöcke.

Solche Geometrien sind durch Pressen oder Handstampfen nicht herstellbar. Vibrationsgießen kann diese Einschränkung überwinden. Mit dem Vibrationsgießen ist es möglich, –Blöcke mit einem Gewicht von 1 to und mehr zu produzieren. Formen mit einer Länge von mehr als 2 m und einer Höhe bis zu 400 mm sind möglich, ebenso wie die Abformung endkonturnaher komplexer Formate, die nach dem Entformen nur wenig Endbearbeitung benötigen.

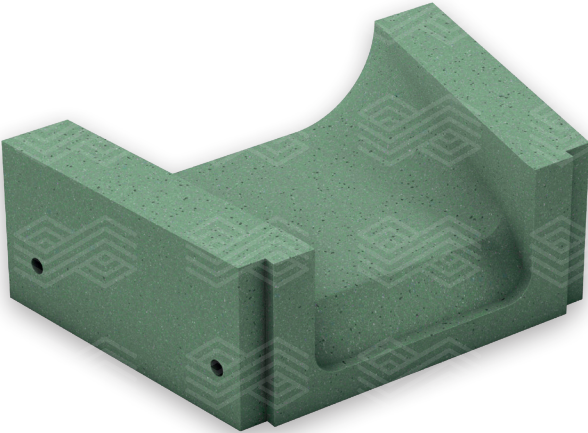
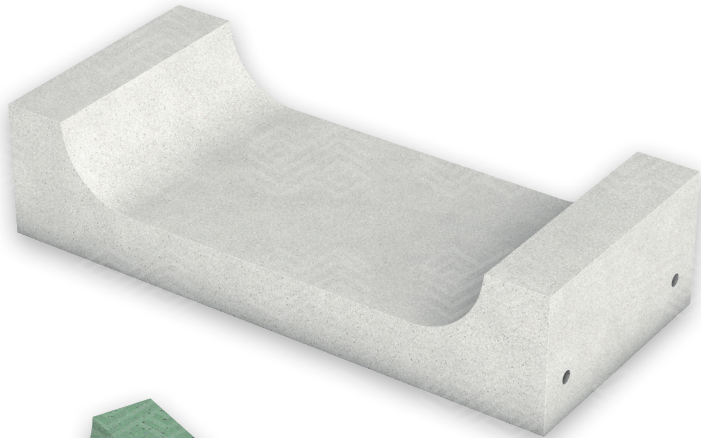
Entsprechend den diversen Anforderungen in Glasöfen bietet RHI Magnesita ein Produktportfolio von mehreren Feuerfestsorten auf Basis von Zirkonmullit, Tonerde, Schmelzmullit, Andalusit, Zirkonsilikat und Chromkorund an.

Complex Geometries for Special Applications

Larger blocks with complex geometries are the best technical solution in some locations of a glass tank. Common examples include components of the feeder or larger burner blocks.

These geometries cannot be produced by pressing or manual ramming. Vibration casting can overcome this limitation. Blocks weighing 1 ton or more can be produced using vibration casting. Shapes of a length of more than 2 m and a height of up to 400 mm are possible as well as the molding of near-net-shape complex shapes which require only little finishing after demolding.

In accordance with the diverse requirements in glass furnaces, RHI Magnesita offers a product portfolio of numerous refractory grades based on zirconia mullite, alumina, fused mullite, andalusite, zircon silicate and chrome corundum.





## Kundenorientierte Systemlösungen — Energieeffizienz

Einen entscheidenden Einfluss auf die Wärmeverluste eines Glasofens hat die Isolierung aller Bauteile, z. B. des Wannengewölbes. Stand der Technik sind hier minimalste Wärmeverluste von 1250 W/m<sup>2</sup> und weniger. Wegen der dadurch höheren Wannentemperatur (bis zu 1600 °C oder leicht darüber) ist zu beachten, dass nur Silikasteine mit herausragenden Druckfließeigenschaften eingesetzt werden können.

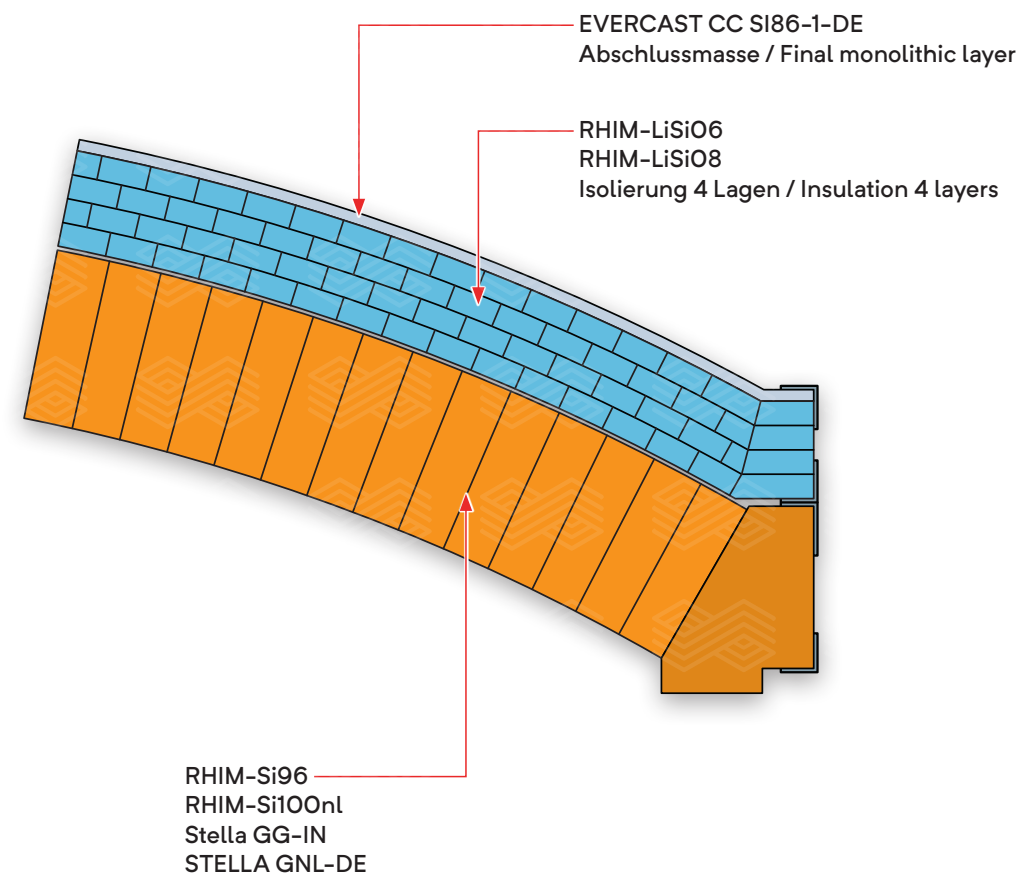
Sehr niedrige Wärmeverluste lassen sich ohne aufwändige Installation erreichen, wenn man qualitativ hochwertige Silika-Isoliersteine verwendet.

## Customer-oriented System Solutions — Energy Efficiency

The insulation of all components, for example of the crown, has a crucial influence on the heat loss of a glass furnace. Minimal heat losses of 1250 W/m<sup>2</sup> or less are the state of the art here. Since the tank temperature is higher as a result (up to 1600 °C or slightly more) it must be noted that only silica bricks with outstanding creep under compression can be used.

Very low heat losses can be achieved without elaborate installation, when using high performance Silica insulation bricks.

Beispiel/Example:  
Gewölbezustellung mit Wärmeverlust < 1250 W/m<sup>2</sup>  
Crown lining concept with heat loss < 1250 W/m<sup>2</sup>



## Monolithisches Konzept

Ein weiteres fortschrittliches Konzept der Gewölbeisolierung verzichtet völlig auf Steinformate. Das monolithische Konzept besteht aus einer dichten Gewölbeversiegelung gefolgt von mehreren Lagen isolierender Leichtmassen.

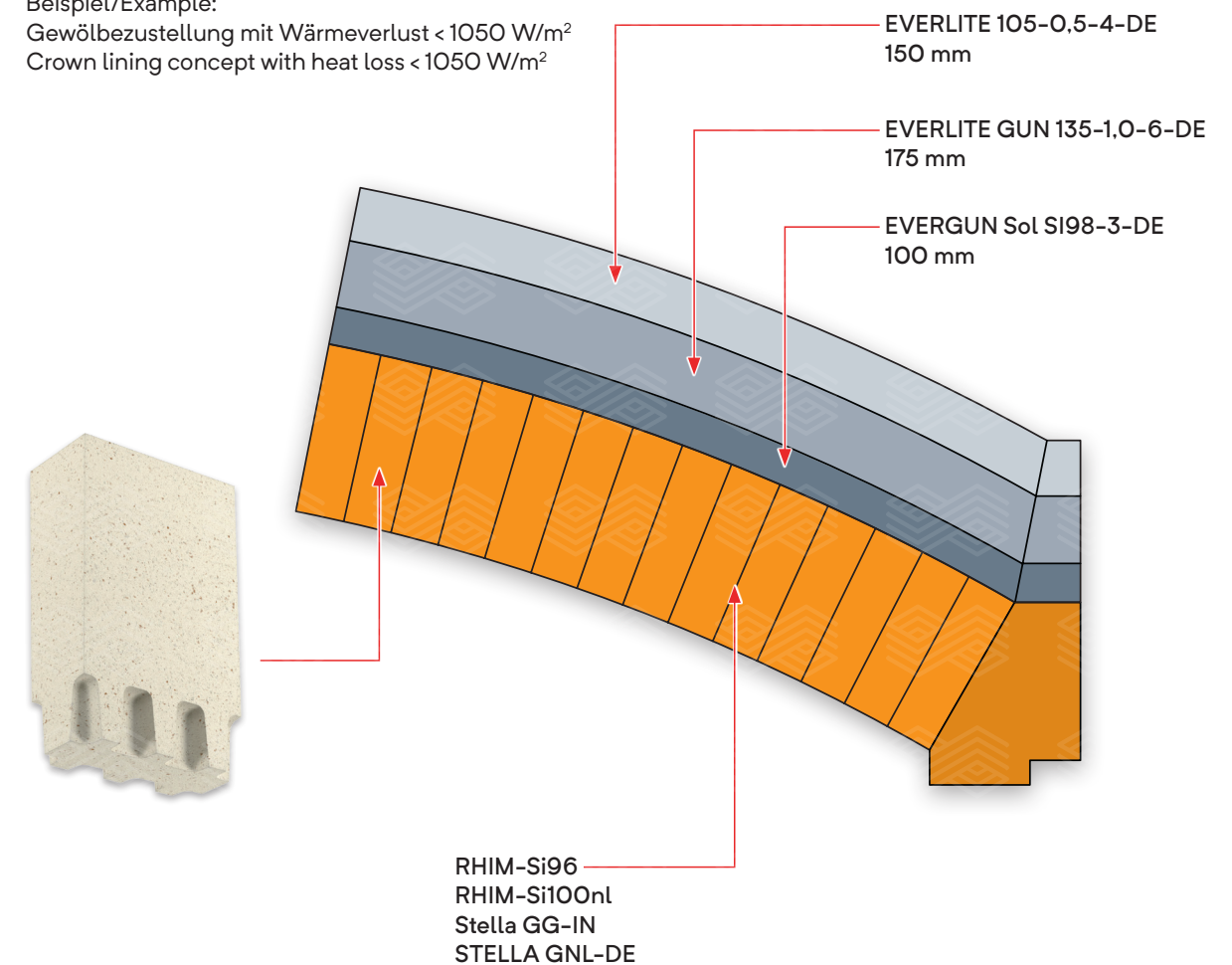
Mit Hilfe von Wärmedurchgangsberechnungen kann die Dicke und Materialauswahl der einzelnen Lagen bestmöglich angepasst werden. Bei der Wahl der Leichtmassen wird jeweils die optimale Lösung im Bezug auf Temperaturbeständigkeit und Isolierfähigkeit bestimmt.

## Monolithic Concept

Another advanced concept of crown insulation completely does without brick shapes. The monolithic concept consists of a dense crown sealing followed by several layers of lightweight insulation mixes.

Using heat flux calculation, the thickness and material selection of the individual layers can be optimally adapted. When choosing the lightweight mixes, the optimum solution with regard to temperature resistance and insulation properties is determined.

Beispiel/Example:  
Gewölbezustellung mit Wärmeverlust < 1050 W/m<sup>2</sup>  
Crown lining concept with heat loss < 1050 W/m<sup>2</sup>





## Honeycomb Design

Die innovative Struktur der Wabensteine bildet eine strukturierte innere Gewölbeoberfläche, die durch einen physikalischen Effekt die Wellenlänge der vom Gewölbe reflektierten Wärmestrahlung moduliert. Infolgedessen ändert sich das Wärmeregime in der Ofenatmosphäre und es gelangt mehr Wärme in das Glasbad. Dies führt zu einem verbesserten Einschmelzen des Gemenges und einem geringeren Energieverlust über das Rauchgas. Es wurden Energieeinsparungen von bis zu 4 % beobachtet.

## Honeycomb Design

The ingenious designed structure of honeycomb wedges are forming a shaped inner crown surface which, by a physical effect, is modulating the wavelength of the heat radiation reflected by the crown. As a consequence the heat regime in the furnace atmosphere is changed and more heat is reaching the glass bath. This leads to improved batch down melting and reduced energy loss with the flue gas. Energy savings up to 4% were reported.



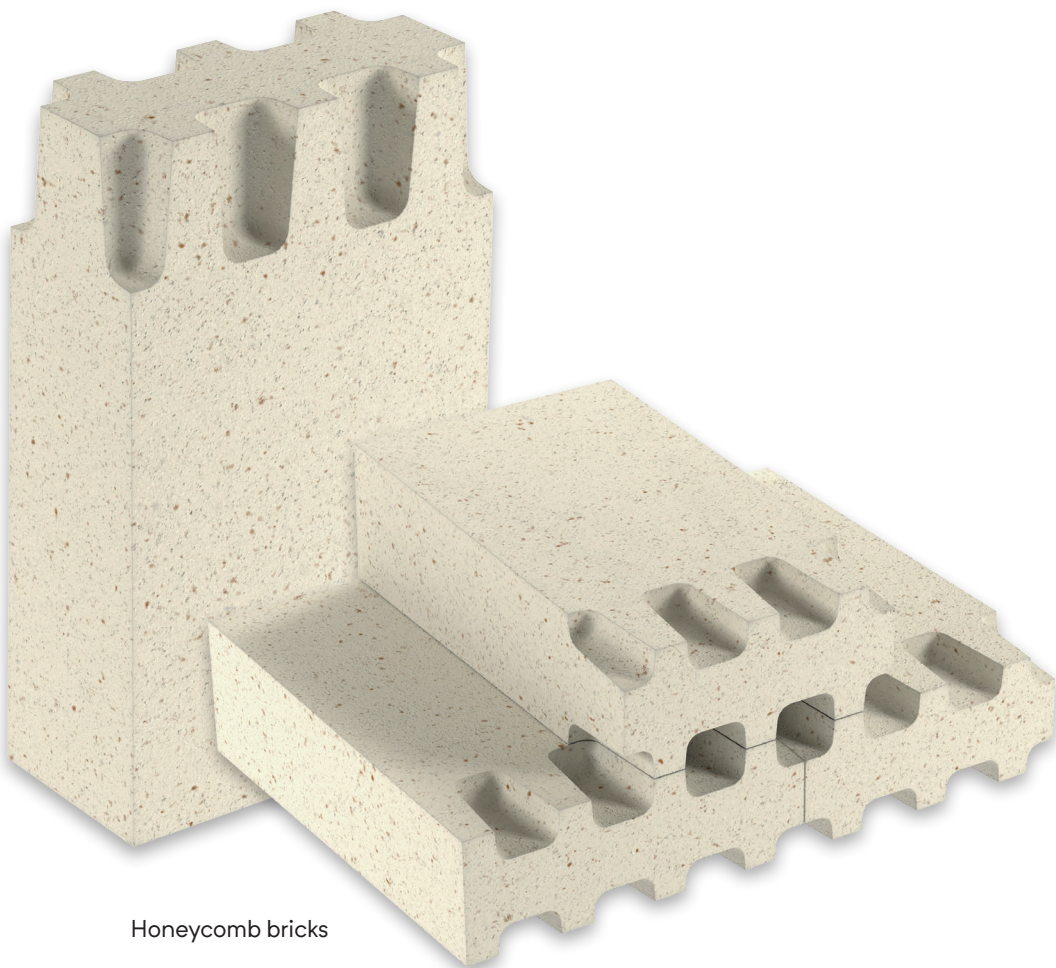
Speziell designte Wabensteine  
Specialy designed honeycomb wedges

## Εpsilon-Konzept

Das Εpsilon-Konzept beinhaltet die Einfärbung des Silika-Materials. Dadurch wird der Emissionskoeffizient des Gewölbes erhöht, was zu einem höheren Wärmestrom vom Gewölbe in die Ofenatmosphäre führt, der mit einer etwas niedrigeren Gewölbetemperatur einhergeht. Mit dieser Technik können zusätzliche Energieeinsparungen in Bezug auf die strukturierte Oberfläche erzielt werden.

## Εpsilon Concept

The Εpsilon concept comprises the coloration of the silica material. As a consequence, the emission coefficient of the crown is increased. This leads to a higher heat flux from the crown to the furnace atmosphere correlated with a slightly lower crown temperature. Additional energy savings with regard to the structured surface can be realized with this technique.



Honeycomb bricks

# Boden Konzept

An den Schmelzboden werden, je nach Lage, unterschiedliche Anforderungen gestellt.

## Die oberen Lagen

**Die Bodenplatten** sind im Glaskontakt und müssen deshalb eine hohe Feuerfestigkeit und Korrosionsbeständigkeit gegen Glas aufweisen

- Schmelzgegossenes AZS; Chromkorund (für Faserglas)

**Die monolithische Lage** verhindert das Eindringen von Glasschmelze unter die Bodenplatten, um Blasenbohren vorzubeugen

- Geringe Schwindung beim Antempfen um Risse zu vermeiden
- EVERMUR Z31P-O3-DE; EVERTECT A66CRV-O3-P3O-DE

**Die Sicherheitslage** verhindert das Metalltropfenbohren. Zirkonsilikat basierte Sorten sind die Standardlösung. Sie schließen die Metalltropfen ein (Verkapselung)

- EVERRAM Z65V-3-DE, EVERRAM Z64P-6-DE und ZETTRAL 65GG

Widerstand gegen Metalltropfenbohren; Chromkorund und Zirkonmullitsorten sind resistent gegen Metalltropfen

- EVERCAST LC Z31-3-DE; EVERCAST LC Z31-3-DE, EVERRAM A68ZP-3-DE; DURITAL AZ58 und SUPRAL RK1OP

Chromkorund Sorten für Faserglaswannen:

- SUPRAL RK3OS, RESISTIT SR885 O-O6

# Bottom Concept

The melter bottom is subject to different requirements according to each layer.

## The upper layers

**The bottom plates** are in contact with glass and therefore must have high fire resistance and corrosion resistance to glass

- Fused cast AZS; chrome corundum (for fiber glass)

**A monolithic layer** stops glass penetration through the paving joints and avoids upward drilling.

- Low shrinkage during heatup to obtain a sealed surface area
- EVERMUR Z31P-O3-DE; EVERTECT A66CRV-O3-P3O-DE

**Safety Layer** prevents metal drop drilling. Zirconium silicate-based grades are the standard solution. They enclose the metal drops (encapsulation)

- EVERRAM Z65V-3-DE, EVERRAM Z64P-6-DE and ZETTRAL 65GG,

Zircon mullite or chrome corundum grades are resisting to metal drop drilling

- EVERCAST LC Z31-3-DE; EVERCAST LC Z31-3-DE, EVERRAM A68ZP-3-DE; DURITAL AZ58 and SUPRAL RK1OP

Chrome corundum grades for the fiberglass melters:

- SUPRAL RK3OS, RESISTIT SR885 O-O6

## Die unteren Lagen

- Hitzebeständige, stützende und isolierende Lagen
- Feuerfestigkeit entsprechend den Schichttemperaturen
- Kriechwiderstand
- Einfache und schnelle Verlegung

## Temperatur-Profil

Die Sorte der unteren Schichten sollte entsprechend der zu erwartenden Temperatur festgelegt werden. RHI Magnesita kann den Kunden bei solchen Berechnungen unterstützen.

## Energie & Umwelt

Ungebrannte Bodenplatten mit hervorragendem CO<sub>2</sub>-Fußabdruck sind für jede Lage erhältlich

## The lower layers

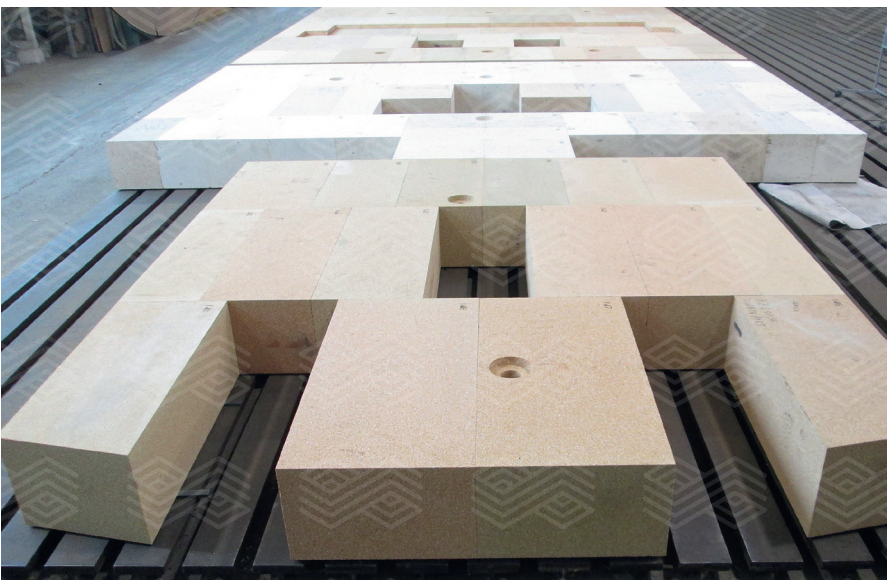
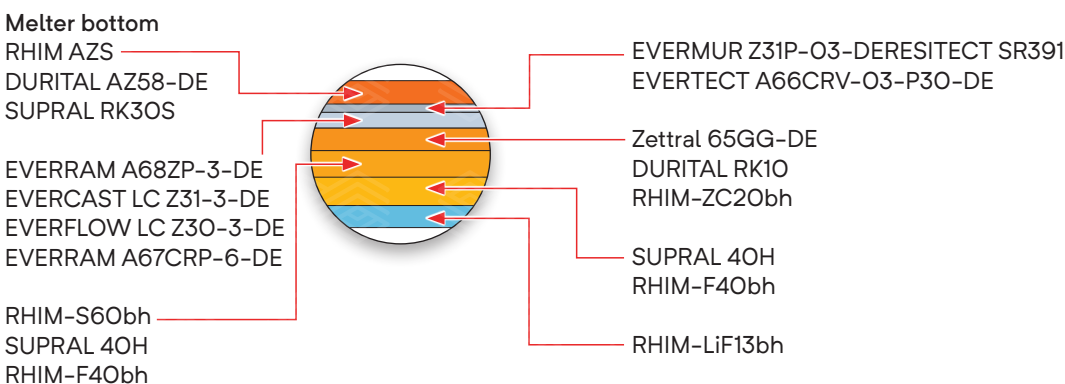
- Heat resistant, supporting and insulating layers
- Refractoriness according to layer temperatures
- Creep resistance
- Easy and fast instalation

## Temperature profile

The grade of the lower layers should be defined according to the expected temperatura. RHI Magnesita can support the customer with such calculations.

## Energy & environment

Unfired bottom blocks with excelent CO<sub>2</sub> footprint are available for each layer.



Komplizierte Formen, wie z.B. Thermoelement-, Abfluss- und Elektrodenblöcke, sind in den entsprechenden Qualitäten erhältlich.

Complicated shapes e.g. thermocouple, drain and electrode blocks are available on the respective grades.

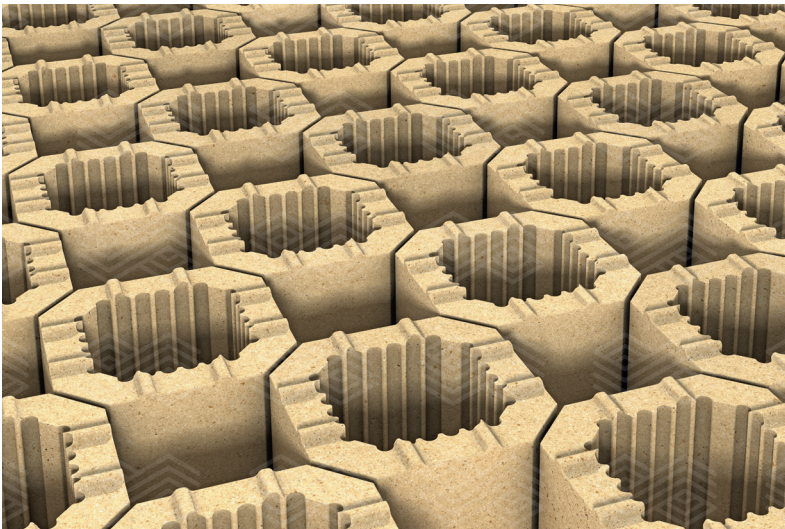
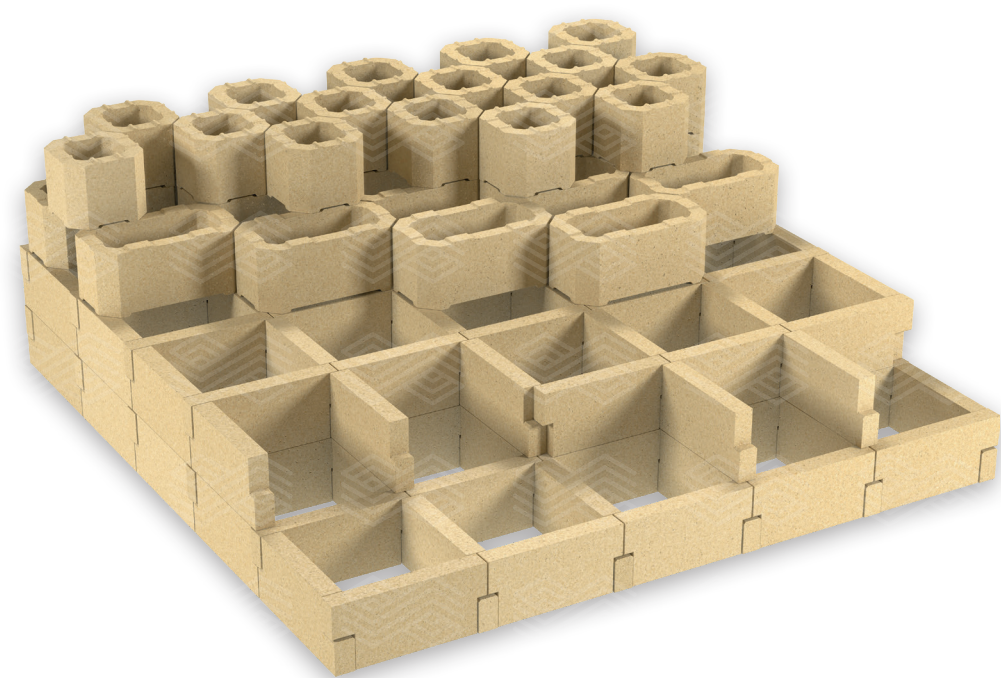


Feuerfeste Steine / Refractory bricks

| Grade         | Al <sub>2</sub> O <sub>3</sub> | SiO <sub>2</sub> | Fe <sub>2</sub> O <sub>3</sub> | Cr <sub>2</sub> O <sub>3</sub> | CaO | MgO | ZrO <sub>2</sub> | BD                | AP    | CCS               | TSR                        |  | RUL T <sub>0.5</sub> | TE             | TC              |                 |                  | Raw material                                      | Mortars                      |
|---------------|--------------------------------|------------------|--------------------------------|--------------------------------|-----|-----|------------------|-------------------|-------|-------------------|----------------------------|--|----------------------|----------------|-----------------|-----------------|------------------|---------------------------------------------------|------------------------------|
|               | %                              | %                | %                              | %                              | %   | %   | %                | g/cm <sup>3</sup> | vol.% | N/mm <sup>2</sup> | H <sub>2</sub> O<br>Cycles |  | °C                   | 1400 °C<br>%   | 500 °C<br>W/m-K | 750 °C<br>W/m-K | 1000 °C<br>W/m-K |                                                   |                              |
| ANKER DG1     | 2,28                           |                  | 0.8                            | 0.5                            |     | 2.0 | 97.0             |                   | 2.96  | 15.9              | 70                         |  | > 1700               | 1.95           | 7.7             | 5.9             | 4.6              | High-grade sintered magnesia                      | ANKERFIX RP10                |
| ANKER DG3     | 2,25                           |                  | 4.0                            | 0.5                            |     | 1.6 | 93.9             |                   | 3.02  | 15.0              | 80                         |  | 1600                 | 1.95           | 7.7             | 5.9             | 4.6              | Sintered magnesia                                 | ANKERFIX RP10                |
| ANKER DG10    | 2,11                           |                  | 0.6                            | 0.1                            |     | 1.9 | 97.0             |                   | 3.03  | 14.5              | 90                         |  | > 1700               | 1.95           | 7.7             | 5.9             | 4.6              | High-grade sintered magnesia                      | ANKERFIX RP10                |
| RUBINAL EZ    | 1,93                           |                  | 10.5                           | 0.5                            |     | 1.2 | 73.7             | 14.0              | 3.10  | 14.5              | 90                         |  | 1570                 | 1.80           | 2.7             | 2.6             | 2.7              | Sintered magnesia, zirconium silicate             | ANKERFIX RP10                |
| RUBINAL VZ    | 2,20                           |                  | 8.5                            | 0.4                            |     | 0.6 | 76.5             | 14.0              | 3.19  | 11.0              | 110                        |  | 1670                 | 1.80           | 2.7             | 2.6             | 2.7              | High-purity sintered magnesia, zirconium silicate | ANKERFIX RP10                |
| RUBINAL ESP   | 2,18                           | 26.5             | 1.7                            | 0.3                            |     | 1.5 | 70.0             |                   | 3.00  | 15.0              | 60                         |  | 1590                 | 1.40           | 5.0             | 4.8             | 4.6              | High-purity sintered magnesia, MA-spinel          | ANKERFIX RP10                |
| ANKER DG1-CN  | 2,29                           |                  | 0.6                            | 0.6                            |     | 1.5 | 97.0             |                   | 2.90  | 16.0              | 80                         |  | > 1700               | 1.95           | 7.7             | 5.9             | 4.6              | High-grade sintered magnesia                      | ANKERFIX RP10 / ANKERFIX CRP |
| ANKER DG3-CN  | 2,34                           |                  | 4.0                            | 1.0                            |     | 1.5 | 93.0             |                   | 2.94  | 16.0              | 100                        |  | 1600                 | 1.95           | 7.7             | 5.9             | 4.6              | Sintered magnesia                                 | ANKERFIX RP10 / ANKERFIX CRP |
| ANKER DG10-CN | 2,99                           |                  | 0.6                            | 0.6                            |     | 1.3 | 97.0             |                   | 3.02  | 14.5              | 75                         |  | > 1700               | 1.95           | 7.7             | 5.9             | 4.6              | High-purity sintered magnesia                     | ANKERFIX RP10 / ANKERFIX CRP |
| RUBINAL EZ-CN | 2,00                           |                  | 9.6                            | 0.8                            |     | 1.1 | 74.0             | 13.0              | 3.04  | 16.5              | 105                        |  | 1570                 | 1.80           | 2.7             | 2.6             | 2.7              | Sintered magnesia, zirconium silicate             | ANKERFIX RP10 / ANKERFIX CRP |
| RUBINAL VZ-CN | 3,09                           |                  | 9.5                            | 0.3                            |     | 0.7 | 76.0             | 13.5              | 3.22  | 12.5              | 120                        |  | 1680                 | 1.80           | 2.7             | 2.6             | 2.7              | Fused magnesia, zirconium silicate                | ANKERFIX RP10 / ANKERFIX CRP |
| RUBINAL EF-CN | 2,03                           | 0.5              | 10.0                           | 2.1                            |     | 1.5 | 85.9             |                   | 2.85  | 16.5              | 50                         |  | 1570                 | 1.40 (1200 °C) |                 | 5.9             | 4.6              | Sintered magnesia                                 | ANKERFIX RP10 / ANKERFIX CRP |
| ANKER DG1-BR  | 2,41                           |                  | 0.4                            | 0.5                            |     | 0.9 | 97.7             |                   | 2.98  | 15.0              | 140                        |  | > 1700               | 1.95           | 7.7             | 5.9             | 4.6              | High-grade sintered magnesia                      | ANKERFIX RP10-BR             |
| ANKER DG3-BR  | 2,20                           |                  | 3.5                            | 0.6                            |     | 0.9 | 94.4             |                   | 3.02  | 14.0              | 80                         |  | 1680                 | 1.95           | 7.7             | 5.9             | 4.6              | Sintered magnesia                                 | ANKERFIX RP10-BR             |
| ANKER DG10-BR | 3,09                           | 0.3              | 0.4                            | 0.6                            |     | 1.2 | 97.3             |                   | 3.07  | 14.0              | 170                        |  | > 1700               | 1.95           | 7.7             | 5.9             | 4.6              | High-grade sintered magnesia                      | ANKERFIX RP10-BR             |
| RUBINAL EZ-BR | 1,79                           |                  | 9.5                            | 0.5                            |     | 0.8 | 75.0             | 13.0              | 3.12  | 13.0              | 90                         |  | 1650                 | 1.80           | 2.6             | 2.7             | 2.6              | Sintered magnesia, zirconium silicate             | ANKERFIX RP10-BR             |

Grade / Sorte  
High-grade sintered magnesia /  
Sintermagnesia hochwert  
High-purity sintered magnesia, MA-spinel /  
Sintermagnesia hochwert, MA-Spinell  
Mortars / Mörtel  
Raw material / Rohstoffbasis  
Sintered magnesia / Sintermagnesia  
Zirconium silicate / Zirkoniumsilikat

AP Offene Porosität / Apparent porosity  
BD Rohdichte / Bulk density  
CCS Kaltdruckfestigkeit / Cold crushing strength  
RUL Druckerweichen / Refractoriness under load  
TC Wärmeleitfähigkeit / Thermal conductivity  
TE Wärmedehnung / Thermal expansion  
TSR Temperaturwechselbeständigkeit /  
Thermal shock resistance



Die o.a. Werte stellen Richtwerte dar, die nach den geltenden Prüfnormen bzw. unternehmensinternen Methoden über einen längeren Zeitraum ermittelt wurden. Sie gelten jedoch nicht als verbindliche Spezifikationen und sind daher keinesfalls als ausdrückliche Zusicherung von bestimmten Eigenschaften zu verstehen. Technische Weiterentwicklungen und die Neuauflage von Datenblättern behalten wir uns vor.

The indicated values are standard values, i.e. values taken over a longer representative period of time according to either valid test standards or internal test methods. They may not be regarded as binding specifications and therefore not as guaranteed properties. We reserve the right to further technical developments and new editions of technical product information.

Feuerfeste Steine / Refractory bricks

| Grade                | CO <sub>2</sub>             | Al <sub>2</sub> O <sub>3</sub> | SiO <sub>2</sub> | Fe <sub>2</sub> O <sub>3</sub> | Cr <sub>2</sub> O <sub>3</sub> | CaO | MgO  | ZrO <sub>2</sub> | BD                | AP    | CCS               | TSR    | RUL T <sub>0.5</sub> | TE            | TC              |                 |                  | Raw material                                           | Mortars                         |
|----------------------|-----------------------------|--------------------------------|------------------|--------------------------------|--------------------------------|-----|------|------------------|-------------------|-------|-------------------|--------|----------------------|---------------|-----------------|-----------------|------------------|--------------------------------------------------------|---------------------------------|
|                      | Footprint<br>t CO2e/t prod. | %                              | %                | %                              | %                              | %   | %    | %                | g/cm <sup>3</sup> | vol.% | N/mm <sup>2</sup> | Cycles |                      | 1500 °C<br>%  | 400 °C<br>W/m·K | 800 °C<br>W/m·K | 1200 °C<br>W/m·K |                                                        |                                 |
| FONDAL SCW-DE        | 1,99                        | 0,5                            | 98               | 0,2                            |                                |     |      |                  | 1,87              | 18    | 35                | > 30   |                      | 0.1 (1000°C)  | 1,2             | 1,4             | 1,7              | Fused silica                                           | EVERMUR SI96-03-DE              |
| RHIM-SI97If          | 0,871                       |                                | 97               | 0,5                            |                                | 2,7 |      |                  | 1,82              | 21    | 35                |        | 1675                 | 1,4           |                 |                 | 2,1              | Quartzite                                              | EVERMUR SI96-03-DE              |
| RHIM-SI96            | 0,871                       | 0,5                            | 96.0             | 0,5                            |                                | 2,7 |      |                  | 1.82              | 21    | 40                |        | 1675                 | 1.35 (1000°C) |                 |                 | 2,1              | Quartzite                                              | EVERMUR SI96-03-DE              |
| Stella GG-IN         |                             | 0,4                            | 96.5             | 0,6                            |                                | 2,6 | 0,3  |                  | 1.8               | 20.5  | 40                |        | 1650                 | 1.5           |                 |                 |                  | Quartzite                                              | EVERMUR SI96-03-DE              |
| STELLA GNL-DE        | 1,969                       |                                | 98,5             |                                |                                |     |      |                  | 1,9               | 16    | 45                |        | 1690                 | 0.85 (600°C)  | 1,31            | 1,56            | 1.79 (1000°C)    | Fused silica                                           | Evermur Si100nl-05-DE           |
| RHIM-Si100nl         | 0,742                       |                                | 99.5             |                                |                                |     |      |                  | 1.9               | 17    | 40                |        | 1690                 | 1.3           |                 |                 | 2.1 (1400°C)     | Quartzite                                              | Evermur Si100nl-05-DE           |
| MAXIAL 310           | 0,875                       | 42.0                           | 54.0             | 1.2                            |                                |     |      |                  | 2.23              | 17.0  | 50                | 25     | 1300                 | 0.65 (1000°C) | 1,5             | 1,5             | 1.4              | Fireclay                                               | EVERMUR F45-05-DE               |
| MAXIAL 310-IN        |                             | 42.0                           | 43               | 52                             | 1,5                            |     |      |                  | 2,28              | 17    | 50                | 30     | 1430                 | 0,65          | 1,6             | 1,65            | 1,8              | Fireclay                                               | DIDOMUR S45-05-IN               |
| MAXIAL 300           | 0,903                       | 50                             | 45               | 1,2                            |                                |     |      |                  | 2,3               | 18    | 50                | 20     | 1450                 | 0.58 (1000°C) | 1.50 (500°C)    | 1.80 (750°C)    | 2.00 (1000°C)    | Fireclay                                               | EVERMUR F45-05-DE               |
| RESISTAL S60         | 1,071                       | 63                             | 34               | 0,8                            |                                |     |      |                  | 2,52              | 16    | 90                | > 50   | 1650 °C              | 0.52 (1000°C) | 2,1             | 2,05            | 2                | Andalusite                                             | EVERMUR B64-05-DE               |
| RESISTAL S65         | 1.029                       | 63.5                           | 34.5             | 0.7                            |                                |     |      |                  | 2.56              | 15.2  | 60                | > 30   | 1650                 | 0.80          | 1.9 (400 °C)    | 1.8 (800 °C)    | 1.8              | Andalusite                                             | EVERMUR B64-05-DE <sup>1)</sup> |
| DURITAL S65G         | 1,045                       | 66                             | 33,5             | 0,8                            |                                |     |      |                  | 2,58              | 14    | 85                | > 30   | 1680                 | 0.80          | 2,24            | 2,16            | 2,36             | Andalusite                                             | EVERMUR B64-05-DE               |
| DURITAL S70          | 1,516                       | 77                             | 21,8             | 0,5                            |                                |     |      |                  | 2,75              | 16    | 90                | > 30   | 1700                 | 0.80          | 2,5             | 2,4             | 2                | Andalusite, fused alumina                              | EVERMUR M70-03-DE               |
| DURITAL S70HM        | 1,308                       | 69.2                           | 29.3             | 0,5                            |                                |     |      |                  | 2.64              | 15.0  | 75                |        | 1700                 | 0,8           | 2,5             | 2,4             | 2,3              | Andalusite, fused alumina                              | EVERMUR M70-03-DE               |
| DURITAL E75EXTRA-DE  | 1,862                       | 76                             | 23               | 0,1                            |                                |     |      |                  | 2,6               | 16    | 106               | 30     | 1700                 | 0,75          | 2,1             | 2               | 2,35             | Fused mullite                                          | EVERMUR M70-03-DE               |
| DURITAL K99EXTRA-DE  | 2,266                       | 99                             | 0,2              | 0,1                            |                                |     |      |                  | 3,26              | 17    | 87                | 25     | > 1700 °C            | 1.20          | 4,8             | 3,85            | 3,15             | Fused alumina                                          | EVERMUR A98-05-DE               |
| DURITAL RK10         | 2,547                       | 85                             | 0,8              | 0,6                            | 10,5                           |     |      |                  | 3,33              | 15,5  | 150               | 20     | > 1700 °C            | 1.30          | 5,5             | 4,1             | 3,5              | Chromium oxide. fused alumina                          | EVERTECT A66CRV-03-P30-DE       |
| DURITAL RK10TS       | 2,606                       | 86                             | 1                |                                | 10,5                           |     |      |                  | 3,22              | 16    | 130               | 15     | > 1700               | 1.30          | 5,5             | 4,1             | 3,5              | Chromium oxide, fused alumina                          |                                 |
| DURITAL RK30NP       | 3,298                       | 64                             | 2,5              |                                | 29                             |     |      | 2                | 3,5               | 15,7  | 190               | > 30   | > 1700               | 1.20          | 4,05            | 3,24            | 3.11 (1000°C)    | Chromium oxide, fused alumina                          | EVERTECT A66CRV-03-P30-DE       |
| DURITAL RK30NP Extra | 2,956                       | 64.0                           | 2.5              |                                | 29.0                           |     |      | 2.0              | 3.47              | 12.2  | 120               | >30    | > 1701               | 1,2           | 4,2             | 3,5             | 3,2              | Chromium oxide, fused alumina                          | EVERTECT A66CRV-03-P30-DE       |
| DURITAL RK30S        | 2,548                       | 61                             | 2,5              | 0,5                            | 30                             |     |      | 2,8              | 3,5               | 13,5  | 200               | 25     | > 1700               | 1.20          | 3,75            | 3,05            | 2,95             | Chrome corundum fused grain, chromium oxide            | EVERTECT A66CRV-03-P30-DE       |
| DURITAL RK50NP       | 3,307                       | 39                             | 2                | 0,6                            | 52                             |     |      | 3,2              | 3,8               | 15,2  | 115               | 30     | > 1700 °C            | 1.20          | 3,68            | 3,36            | 3.27 (1000°C)    | Chrome corundum fused grain, chromium oxide            | EVERTECT CR63P-03-P27-DE        |
| DURITAL RK50S        | 2,955                       | 38,5                           | 2,2              |                                | 51,5                           |     |      | 3,8              | 3,78              | 13,8  | 162               | 15     | > 1700               | 1.20          | 3,6             | 3,2             | 3                | Chrome corundum fused grain, chromium oxide            | EVERTECT CR63P-03-P27-DE        |
| DURITAL RK70         | 4.170                       | 16                             | 3,8              |                                | 72                             |     |      | 4                | 3,9               | 15    | 150               | 15     | 1650                 | 1.10          | 2,61            | 2,41            | 2,34             | Chrome corundum fused grain, chromium oxide            | EVERTECT CR63P-03-P27-DE        |
| DURITAL AZ50-DE      | 0,993                       | 46                             | 15,5             |                                |                                |     |      | 35               | 3,3               | 15    | 230               | 10     | 1650                 | 0.7 (1000°C)  | 3.50 (500°C)    | 3.05 (750°C)    | 2.80 (1000°C)    | AZS fused grain                                        | EVERMUR Z31P-03-DE              |
| DURITAL AZ58         | 1,761                       | 59                             | 13,5             | 0,1                            |                                |     |      | 25               | 3,2               | 14,5  | 134               | > 30   | 1670                 | 0.70          | 2,37            | 2,1             | 2,28             | Sintered alumina, zirconia mullite, zirconium silicate | EVERMUR Z31P-03-DE              |
| DURITAL AZ70-DE      | 1,893                       | 70                             | 10,5             |                                |                                |     |      | 17,5             | 3,33              | 14,5  | 140               | 20     | 1700                 | 0.90          | 2,7             | 2,4             | 2,6              | Fused alumina, zirconium silicate                      | EVERMUR Z31P-03-DE              |
| ZETTRAL 65-DE        | 0,742                       | 1,8                            | 33,5             | 0,2                            |                                |     |      | 63               | 3,53              | 20    | 200               | > 30   | 1590                 | 0.45 (1400°C) | 2.80 (500°C)    | 2.55 (750°C)    | 2.35 (1000°C)    | Zirconium silicate                                     | EVERMUR Z60V-03-DE              |
| ZETTRAL 65GG-DE      | 0,746                       | 1,2                            | 33               | 0,1                            |                                | 0,2 | 0,1  |                  | 3,67              | 19    | 130               | 30     | 1640                 | 0.60 (1400°C) | 2,9             | 2,25            | 2                | Zirconium silicate                                     | EVERMUR Z60V-03-DE              |
| ZETTRAL 65GS-DE      | 1,345                       |                                | 32,5             |                                |                                |     |      | 65               | 3,67              | 19    | 144               | 20     | 1640                 | 0.65          | 2,5             | 1,95            | 1,85             | Zirconium silicate                                     | EVERMUR Z60V-03-DE              |
| ZETTRAL 95GR         | 4.506                       | 1.9                            |                  |                                |                                | 4.0 | 92.0 | 4.50             | 17.5              | 186   | 20                |        | 1650                 | 0.80 (1600°C) | 1,3             | 1,2             | 1.1              | Zirconia                                               | EVERMUR Z60V-03-DE              |

<sup>1)</sup> EVERTECT B60CV-05-P30-DE für Schlitzbögen  
EVERTECT B60CV-05-P30-DE for rider arches

Andalusite / Andalusit  
AZS fused grain / AZS Schmelzkorn  
Chrome corundum fused grain, chromium oxide /  
Chrom-Korund-Schmelzkorn, Chromoxid  
Cycles / Zyklen  
Fireclay / Schamotte  
Fused alumina / Schmelzkorund  
Fused mullite / Schmelzmullit  
Fused silica / Quarzgut

Grade / Sorte  
Mortars / Mörtel  
New name / Neuer Name  
Quartzite / Quarzit  
Raw material / Rohstoffbasis  
Sintered alumina, zirconia mullite, zirconium silicate /  
Sinterkorund, Zirkonmullit, Zirkoniumsilikat  
Sintered magnesia / Sintermagnesia  
Zirconia / Zirkonoxid

AP Offene Porosität / Apparent porosity  
BD Rohdichte / Bulk density  
CCS Kaldruckfestigkeit / Cold crushing strength  
RUL Druckerweichen / Refractoriness under load  
TC Wärmeleitfähigkeit / Thermal conductivity  
TE Wärmedehnung / Thermal expansion  
TSR Temperaturwechselbeständigkeit /  
Thermal shock resistance

Die o.a. Werte stellen Richtwerte dar, die nach den geltenden Prüfnormen bzw. unternehmensinternen Methoden über einen längeren Zeitraum ermittelt wurden. Sie gelten jedoch nicht als verbindliche Spezifikationen und sind daher keinesfalls als ausdrückliche Zusicherung von bestimmten Eigenschaften zu verstehen. Technische Weiterentwicklungen und die Neuauflage von Datenblättern behalten wir uns vor.

The indicated values are standard values, i.e. values taken over a longer representative period of time according to either valid test standards or internal test methods. They may not be regarded as binding specifications and therefore not as guaranteed properties. We reserve the right to further technical developments and new editions of technical product information.



Großformatige Blöcke / Large-shaped blocks

| Grade        |       | Al <sub>2</sub> O <sub>3</sub> | SiO <sub>2</sub> | Fe <sub>2</sub> O <sub>3</sub> | Cr <sub>2</sub> O <sub>3</sub> | CaO | MgO | ZrO <sub>2</sub> | BD                | AP    | CCS               | TSR<br>H <sub>2</sub> O |  | RUL T <sub>0.5</sub> | TE<br>1500 °C | TC              |                 |                  | Raw material                                           | Mortars                   |
|--------------|-------|--------------------------------|------------------|--------------------------------|--------------------------------|-----|-----|------------------|-------------------|-------|-------------------|-------------------------|--|----------------------|---------------|-----------------|-----------------|------------------|--------------------------------------------------------|---------------------------|
|              |       | %                              | %                | %                              | %                              | %   | %   | %                | g/cm <sup>3</sup> | vol.% | N/mm <sup>2</sup> | Cycles                  |  |                      | %             | 500 °C<br>W/m-K | 750 °C<br>W/m-K | 1000 °C<br>W/m-K |                                                        |                           |
| SUPRAL 40H   | 1,015 | 44.0                           | 46.6             | 1.5                            |                                | 5.0 |     |                  | 2.20              | 16.0  | 76.5              |                         |  | 1250                 | 0.40          | 1.3 (400°C)     | 1.4 (800°C)     | 1.4              | Fireclay                                               | EVERMUR F45-05-DE         |
| RHIM-F40bh   | 0,846 | 42                             | 51               | 1.8                            | <3                             |     |     |                  | 2.1               | 22    | 30                |                         |  | 1360                 | 0.5 (1000°C)  |                 | 1.4 (800°C)     | 1.5 (1100°C)     | Fireclay                                               | EVERMUR F45-05-DE         |
| RHIM-LIF13bh | 1,359 | 36                             | 57               | 2.0                            | <3                             |     |     |                  | 1.35              | 40    | 10                |                         |  | 1350*                | 0.3 (1000°C)  | 0.6 (400°C)     | 0.8 (800°C)     | 0.9 (1100°C)     | Fireclay                                               | DIDOTECT Q21VC-05-DE      |
| SUPRAL S60   | 1,06  | 62.0                           | 35.0             | 0.9                            |                                |     |     |                  | 2.48              | 16.0  | 80                | 30                      |  | 1650                 | 0.80 (1400°C) | 2.0 (400°C)     | 1.9 (800°C)     | 1.9              | Andalusite                                             | EVERMUR B64-05-DE         |
| RHIM-S60bh   | 0,861 | 61                             | 33               | 0.8                            | 2.3                            |     |     |                  | 2.5               | 17    | 65                |                         |  | 1550                 | 0.4 (1000°C)  |                 | 1.9 (800°C)     | 1.9 (1200°C)     | Andalusite                                             | EVERMUR B64-05-DE         |
| SUPRAL S70   | 1,539 | 77.0                           | 21.0             | 0.4                            |                                |     |     |                  | 2.66              | 19.0  | 85                | > 30                    |  | 1700                 | 0.85          | 2.0 (400°C)     | 1.9 (800°C)     | 2.1              | Andalusite, fused alumina                              | EVERMUR M70-03-DE         |
| SUPRAL E75   | 1,727 | 75.0                           | 24.0             | 0.2                            |                                |     |     |                  | 2.54              | 19.0  | 90                | 30                      |  | > 1700               | 0.70 (1400°C) | 1.9 (400°C)     | 1.7 (800°C)     | 1.6              | Fused mullite                                          | EVERMUR M70-03-DE         |
| SUPRAL K99   | 2,237 | 98.0                           | 0.5              |                                |                                |     |     |                  | 3.20              | 18.5  | 110               | 15                      |  | 1650                 | 1.2           | 5.4 (400°C)     | 3.8 (800°C)     | 3.4              | Fused alumina                                          | EVERMUR A98-05-DE         |
| SUPRAL AZ50  | 1,836 | 46.0                           | 15.5             |                                |                                |     |     | 35.0             | 3.24              | 16.0  | 226               | 10                      |  | 1660                 | 0.65          | 2.5             | 2.4             | 2.3              | AZS fused grain                                        | EVERMUR Z31P-03-DE        |
| SUPRAL AZ58  | 1,836 | 60.0                           | 13.0             |                                |                                |     |     | 26.0             | 3.05              | 17.5  | 108               | > 30                    |  | 1680                 | 0.65          | 1.8 (400°C)     | 1.7 (800°C)     | 1.6              | Sintered alumina, zirconia mullite, zirconium silicate | EVERMUR Z31P-03-DE        |
| SUPRAL AZ70  | 1,817 | 66.5                           | 12.0             |                                |                                |     |     | 20.0             | 3.36              | 15.5  | 116               | 20                      |  | 1650                 | 0.9           | 2.9 (400°C)     | 2.5 (800°C)     | 2.4              | Fused alumina, zirconium silicate                      | EVERMUR Z31P-03-DE        |
| RHIM-ZC20bh  | 0,815 | 59                             | 18               | 0.2                            | 2.7                            |     |     | 19               | 2.9               | 19    | 45                |                         |  | 1600                 | 0.6 (1000°C)  |                 | 2.2 (800°C)     | 2.2 (1100°C)     | Sintered alumina, zirconia mullite, zirconium silicate | EVERMUR Z31P-03-DE        |
| SUPRAL RK30N | 3,302 | 63.5                           | 2.4              |                                | 29.2                           |     |     | 2.2              | 3.45              | 16.5  | 170               | > 30                    |  | > 1700               | 1.1           | 2.9 (400°C)     | 2.5 (800°C)     | 2.5              | Chromium oxide, fused alumina                          | EVERTECT A66CRV-03-P30-DE |
| SUPRAL RK30S | 2,679 | 61.5                           | 1.7              |                                | 30.8                           |     |     | 2.7              | 3.45              | 16.0  | 200               | 25                      |  | > 1700               | 1.2           | 4.1 (400°C)     | 3.3 (800°C)     | 3.1              | Chrome corundum fused grain, chromium oxide            | EVERTECT A66CRV-03-P30-DE |
| SUPRAL RK50S | 2,196 | 37.0                           | 2.2              |                                | 53.0                           |     |     | 4.4              | 3.77              | 14.2  | 140               | 25                      |  | > 1700               | 1.2           | 2.7 (400°C)     | 2.4 (800°C)     | 2.4              | Chrome corundum fused grain, chromium oxide            | EVERTECT CR63P-03-P27-DE  |
| SUPRAL RK55S | 4,111 | 42.0                           | 0.8              |                                | 52.0                           |     |     | 2.6              | 3.80              | 15.3  | 140               | 25                      |  | 1700                 | 1.2           | 4.1             | 4.0             | 3.9              | Chrome corundum fused grain, chromium oxide            | EVERTECT CR63P-03-P27-DE  |
| SUPRAL RK70  | 3,589 | 14.5                           | 3.6              |                                | 73.7                           |     |     | 3.8              | 3.80              | 18.0  | 103               | 15                      |  | 1700                 | 1.1           | 3.0 (400°C)     | 2.6 (800°C)     | 2.5              | Chrome corundum fused grain, chromium oxide            | EVERTECT CR63P-03-P27-DE  |

Zinnbadboden Blöcke / Tin bath bottom blocks

| Grade      |       | Al <sub>2</sub> O <sub>3</sub> | SiO <sub>2</sub> | Fe <sub>2</sub> O <sub>3</sub> | Cr <sub>2</sub> O <sub>3</sub> | CaO  | MgO | ZrO <sub>2</sub> | BD                | AP    | CCS               | TSR<br>H <sub>2</sub> O |  | RUL T <sub>0.5</sub> | TE<br>1000 °C | 500 °C | 750 °C | 1000 °C | Raw material      | Mortars |
|------------|-------|--------------------------------|------------------|--------------------------------|--------------------------------|------|-----|------------------|-------------------|-------|-------------------|-------------------------|--|----------------------|---------------|--------|--------|---------|-------------------|---------|
|            |       | %                              | %                | %                              | %                              | %    | %   | %                | g/cm <sup>3</sup> | vol.% | N/mm <sup>2</sup> | Cycles                  |  |                      | %             | W/m-K  | W/m-K  | W/m-K   |                   |         |
| SUPRAL CA  | 1.933 | 68.0                           | 5.0              | 0.1                            |                                | 24.4 | 1.3 |                  | 2.36              | 18.0  | 80                |                         |  | 1350                 | 0.6           | 1.7    | 1.6    | 1.5     | Calcium aluminate |         |
| RHIM-V40F  | 1.332 | 43.0                           | 52.0             | 1.2                            |                                |      |     |                  | 2.20              | 20.0  | 30                |                         |  | 1350                 | 0.6           |        |        |         |                   |         |
| RHIM-V40FT | 1.332 | 40.0                           | 56.0             | 1.4                            |                                |      |     |                  | 2.15              | 21.0  | 40                |                         |  | 1270                 | 0.65          |        |        |         |                   |         |

Vibrationsgegossene Blöcke / Vibrocast blocks

| Grade                |       | Al <sub>2</sub> O <sub>3</sub> | SiO <sub>2</sub> | Fe <sub>2</sub> O <sub>3</sub> | Cr <sub>2</sub> O <sub>3</sub> | CaO | MgO | ZrO <sub>2</sub> | BD                | AP    | CCS               | TSR<br>H <sub>2</sub> O |  | RUL T <sub>0.5</sub> | TE<br>1000 °C  | 500 °C       | 750 °C       | 1000 °C       | Raw material                                | Mortars                   |
|----------------------|-------|--------------------------------|------------------|--------------------------------|--------------------------------|-----|-----|------------------|-------------------|-------|-------------------|-------------------------|--|----------------------|----------------|--------------|--------------|---------------|---------------------------------------------|---------------------------|
|                      |       | %                              | %                | %                              | %                              | %   | %   | %                | g/cm <sup>3</sup> | vol.% | N/mm <sup>2</sup> | Cycles                  |  |                      | %              | W/m-K        | W/m-K        | W/m-K         |                                             |                           |
| FONDAL SXW           | 1.589 | 0.9                            | 98.5             |                                |                                |     |     |                  | 1.85              | 17.5  | 35                | > 30                    |  | 1600                 | 0.10           | 1.3 (800 °C) | 1.0 (400 °C) | 1.5           | Silica glass                                | EVERMUR SI96-03-DE        |
| ANKOFORM F55F-6-DE   | 1.332 | 55.5                           | 34.0             | 0.6                            |                                | 7.0 |     |                  | 2.30              | 21.0  | 30                |                         |  | 1380                 | 0.55           | 1.8          | 1.8          | 1.8           | Porcelain                                   |                           |
| ANKOFORM S67F-6-DE   | 1.243 | 67.0                           | 29.0             | 0.6                            |                                | 1.8 |     |                  | 2.65              | 17.0  | 110               | > 30                    |  | 1700                 | 0.60           | 2.3          | 2.2          | 2.2           | Andalusite                                  | EVERMUR B64-05-DE         |
| ANKOFORM M78F-6-DE   | 1.808 | 78.0                           | 21.5             | 0.1                            |                                | 0.3 |     |                  | 2.63              | 17.0  | 110               | > 30                    |  | 1700                 | 0.50           | 2.3          | 2.2          | 2.2           | Fused mullite                               | EVERMUR M70-03-DE         |
| ANKOFORM RK30ZF-6-DE | 2.126 | 62.0                           | 3.4              |                                | 30.5                           | 0.8 |     | 1.9              | 3.32              | 19.0  | 160               | 13                      |  | > 1700               | 0.77           | 2.6 (400 °C) | 2.6 (700 °C) | 2.5           | Chrome corundum fused grain, chromium oxide | EVERTECT A66CRV-03-P30-DE |
| ANKOFORM RK55ZF-6-DE | 3.171 | 31.0                           | 4.5              |                                | 55.0                           | 1.1 |     | 5.0              | 3.44              | 21.0  | 150               | 7                       |  | 1700                 | 0.77 (1100 °C) | 3.2 (400 °C) | 3.1 (700 °C) | 3.0           | Chrome corundum fused grain, chromium oxide | EVERTECT CR63P-03-P27-DE  |
| ANKOFORM ZM33F-3-DE  | 1.897 | 51.0                           | 15.0             | 0.1                            | 0.5                            |     |     | 33.0             | 3.10              | 18.0  | 100               | > 30                    |  | 1650                 | 0.60           | 2.1          | 2.1          | 1.9           | Zirconia mullite                            | EVERMUR Z31P-03-DE        |
| RHIM-ZM35V           | 1.897 | 50                             | 15               | 0.2                            |                                |     |     | 35               | 3.20              | 17.0  | 100               | 20                      |  | 1560                 | 0.65           |              | 1.8 (800°C)  | 1.95 (1100°C) | Zirconia mullite                            | EVERMUR Z31P-03-DE        |
| RHIM-ZC10V           | 1.949 | 78                             | 9.5              |                                |                                |     |     | 11               | 3.30              | 15.0  | 130               | 30                      |  | 1690                 | 1.1 (1500°C)   | 3.0 (400°C)  | 2.4 (800°C)  | 2.3           | Fused alumina, Zirconium silicate           | EVERMUR A98-05-DE         |

Andalusite / Andalusit

AZS fused grain / AZS Schmelzkorn

Calcium aluminate / Kalziumaluminat

Chrome corundum fused grain, chromium oxide / Chrom-Korund-Schmelzkorn, Chromoxid

Chromium oxide / Chromoxid

Cycles / Zyklen

Fireclay / Schamotte

Fused alumina / Schmelzkorund

Fused mullite / Schmelzmullit

Grade / Sorte

Mortars / Mörtel

Porcelain / Porzellan

Raw material / Rohstoffbasis

Silica glass / Quarzglas

Sintered alumina, zirconia mullite, zirconium silicate / Sinterkorund, Zirkonmullit, Zirkoniumsilikat

Zirconium silicate / Zirkoniumsilikat

AP    Offene Porosität / Apparent porosity

BD    Rohdichte / Bulk density

CCS    Kaltdruckfestigkeit / Cold crushing strength

RUL    Druckerweichen / Refractoriness under load

TC    Wärmeleitfähigkeit / Thermal conductivity

TE    Wärmedehnung / Thermal expansion

TSR    Temperaturwechselbeständigkeit / Thermal shock resistance

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30 GLASS / REFRACTORY MATERIALS



RHI MAGNESITA

Hochtemperatur-Wärmedämmung / High-temperature heat insulation

| Grade                    | ISO 2245  | CT   | Al <sub>2</sub> O <sub>3</sub><br>[MgO] | SiO <sub>2</sub> | Fe <sub>2</sub> O <sub>3</sub><br>[ZrO <sub>2</sub> ] | CaO  | PLC             | BD    | CCS   |  | TE            |        |        |        | TC      |         |                           | Mortars |
|--------------------------|-----------|------|-----------------------------------------|------------------|-------------------------------------------------------|------|-----------------|-------|-------|--|---------------|--------|--------|--------|---------|---------|---------------------------|---------|
|                          |           | °C   | %                                       | %                | %                                                     | %    | %               | g/cm³ | N/mm² |  | 1000 °C       | 400 °C | 600 °C | 800 °C | 1000 °C | 1200 °C |                           |         |
|                          |           |      |                                         |                  |                                                       |      |                 |       |       |  | %             | W/m·K  | W/m·K  | W/m·K  | W/m·K   | W/m·K   |                           |         |
| RHIM-LiSi06              | 150-0.6-L | 1500 | 2.3                                     | 91               |                                                       | 4.0  |                 | 0.65  | 1     |  | 1.4           | 0.22   | 0.27   | 0.34   | 0.44    |         | EVERMUR SI96-03-DE        |         |
| RHIM-LiSi08              | 155-0.8-L | 1550 | 2.0                                     | 93               |                                                       | 4.0  |                 | 0.85  | 3     |  | 1.4           | 0.29   | 0.34   | 0.41   | 0.47    |         | EVERMUR SI96-03-DE        |         |
| RHIM-LiSi10              | 160-1.0-L | 1600 | 2.0                                     | 93               |                                                       | 4.0  |                 | 1.00  | 5     |  | 1.4           | 0.58   | 0.69   | 0.86   | 1.4     |         | EVERMUR SI96-03-DE        |         |
| RHIM-LiSi12              | 155-1.2   | 1550 | 1.5                                     | 91               |                                                       | <6.5 |                 | 1.25  | 4.5   |  | 1.4           | 0.66   |        | 0.83   |         | 1.13    | EVERMUR SI96-03-DE        |         |
| RHIM-LiF06               | 125-0.6-L | 1250 | 40                                      | 53               | 2                                                     |      |                 | 0.6   | 1.6   |  | 0.55          | 0.24   | 0.27   | 0.32   | 0.40    | 0.47    | EVERTECT SI72CV-05-P31-DE |         |
| RHIM-LiF08               | 140-0.8-L | 1400 | 54                                      | 41               | 1.4                                                   |      |                 | 0.8   | 3.5   |  | 0.6           | 0.33   | 0.36   | 0.39   | 0.43    | 0.47    | EVERTECT SI72CV-05-P31-DE |         |
| RHIM-LiF10               | 150-1.0-L | 1500 | 37                                      | 56               | 2.8                                                   |      |                 | 1.0   | 7     |  | 0.55          | 0.46   | 0.49   | 0.52   | 0.56    |         | EVERTECT B50CV-05-P31-DE  |         |
| RHIM-LiF12               | 140-1.2   | 1400 | 37                                      | 55               | 2.9                                                   |      |                 | 1.18  | 12    |  | 0.55          | 0.54   | 0.56   | 0.58   | 0.60    |         | EVERTECT B50CV-05-P31-DE  |         |
| RHIM-LiF13               | 135-1.3   | 1350 | 37                                      | 57               | 3.6                                                   |      |                 | 1.3   | 10    |  | 0.55          | 0.63   | 0.69   | 0.77   | 0.82    |         | EVERTECT SI72CV-05-P31-DE |         |
| RHIM-LiF13bh             | 135-1.7   | 1350 | 36                                      | 57               | 2.0                                                   | 2.8  |                 | 1.35  | 10    |  | 0.55          | 0.65   | 0.72   | 0.79   | 0.85    |         | EVERTECT SI72CV-05-P31-DE |         |
| PYROSTOP ISOL 450        | 90-0.4-L  | 900  | 15.0                                    | 65.0             | 3.5                                                   | 7.5  | -1.00 (850 °C)  | 0.43  | 1.3   |  | 0.40 (900 °C) | 0.12   | 0.14   |        |         |         | EVERTECT SI72CV-05-P31-DE |         |
| PYROSTOP ISOL 600        | 90-0.5-L  | 900  | 15.0                                    | 65.0             | 3.5                                                   | 7.5  | -0.80 (850 °C)  | 0.50  | 2.5   |  | 0.40 (900 °C) | 0.14   | 0.15   |        |         |         | EVERTECT SI72CV-05-P31-DE |         |
| PYROSTOP BLANKET 96/1430 |           | 1430 | 35.0                                    | 50.0             | [14.0]                                                |      | -2.80 (1400 °C) | 0.10  |       |  |               | 0.11   | 0.16   | 0.23   | 0.32    |         |                           |         |
| PYROSTOP BOARD 1260      |           | 1250 | 46.1                                    | 53.9             |                                                       |      | -3.29 (1200 °C) | 0.33  |       |  |               |        | 0.13   | 0.16   | 0.19    |         |                           |         |
| PYROSTOP BOARD 1500      |           | 1500 | 60.0                                    | 39.0             |                                                       |      | -2.00 (1400 °C) | 0.30  |       |  |               | 0.09   | 0.14   | 0.18   | 0.23    | 0.30    |                           |         |
| PYROSTOP BOARD 1600      |           | 1600 | 65.0                                    | 34.0             |                                                       |      | -2.00 (1500 °C) | 0.35  |       |  |               | 0.09   | 0.11   | 0.13   | 0.26    | 0.34    |                           |         |
| PYROSTOP SUPERFELT 1400  |           | 1400 | 30.0                                    | 54.0             | [16.0]                                                |      | -2.00 (1400 °C) | 0.25  |       |  |               |        |        | 0.15   | 0.21    | 0.29    |                           |         |
| PYROSTOP SUPERFELT 1500  |           | 1500 | 59.0                                    | 40.0             |                                                       |      | -3.40 (1500 °C) | 0.12  |       |  |               |        |        |        | 0.21    | 0.28    |                           |         |
| PYROSTOP SUPERFELT 1600  |           | 1600 | 62.0                                    | 37.0             |                                                       |      | -3.00 (1600 °C) | 0.17  |       |  |               | 0.09   | 0.12   | 0.17   | 0.21    | 0.23    |                           |         |

Grade / Sorte  
Mortars / Mörtel

BD Rohdichte / Bulk density  
CCS Kaltdruckfestigkeit / Cold crushing strength  
CT Klassifikationstemperatur / Classification temperature  
PLC Bleibende Längenänderung / Permanent linear change  
TC Wärmeleitfähigkeit / Thermal conductivity  
TE Wärmedehnung / Thermal expansion



PYROSTOP BLANKET

PYROSTOP BOARD

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Feuerfeste Massen / Refractory mixes

| Grade                     | Old name                 | Al <sub>2</sub> O <sub>3</sub> | SiO <sub>2</sub> | Fe <sub>2</sub> O <sub>3</sub> | CaO  | ZrO <sub>2</sub> | MgO  | P <sub>2</sub> O <sub>5</sub> | Cr <sub>2</sub> O <sub>3</sub> | TL   | MR                 |  | CCS               |                   | PLC             | TE             | SL     | TC     |              |               | ML            |
|---------------------------|--------------------------|--------------------------------|------------------|--------------------------------|------|------------------|------|-------------------------------|--------------------------------|------|--------------------|--|-------------------|-------------------|-----------------|----------------|--------|--------|--------------|---------------|---------------|
|                           |                          |                                |                  |                                |      |                  |      |                               |                                |      |                    |  | 110 °C            | 1000 °C           | 1000 °C         | 1400 °C        |        | 400 °C | 600 °C       | 1000 °C       |               |
|                           |                          | %                              | %                | %                              | %    | %                | %    | %                             | %                              | °C   | kg/dm <sup>3</sup> |  | N/mm <sup>2</sup> | N/mm <sup>2</sup> | %               | %              | Months | W/m-K  | W/m-K        | W/m-K         |               |
| EVERSHOT SOL SI99-3-DE    | COMPAC SHOT SB FS99-3-DE | 0.2                            | 99.5             | 0.1                            |      |                  |      |                               |                                | 1650 | 1.80               |  | 12                | 25                | -0.40           | 0.00 (1000 °C) | 18     | 1.1    | 1.3 (800 °C) | 1.4           | DIVASIL FP    |
| EVERRAM D SI95-6-DE       | FONDIT H 0-6-DE          | 0.4                            | 94.0             | 0.1                            | 4.9  |                  | 0.3  |                               |                                | 1650 | 1.80               |  | 30                | 10                | -0.50 (1500 °C) | 0.10           | 8      | 1.6    | 1.9          | 2.0           | Water         |
| EVERRAM SI99V-6-DE        | FONDIT K 0-6-DE          | 0.4                            | 99.0             | 0.1                            | 0.1  |                  |      |                               |                                | 1650 | 1.70               |  | 12                | 25                | 0.25            | 0.05           | 12     | 1.4    | 1.6          | 1.7           | DIKASIL 2:1   |
| EVERCAST CC SI86-1-DE     | STELLIT GH 0-1-DE        | 1.7                            | 84.0             | 0.6                            | 13.0 |                  |      |                               |                                | 1400 | 1.85               |  | 6                 | 3                 | 0.80            | 0.40 (1200 °C) | 12     | 0.3    | 0.4 (800 °C) | 0.6 (1200 °C) | Water         |
| EVERGUN SOL SI99-3-DE     | COMPAC SOL FS99G-3-DE    | 2.0                            | 97.0             | 0.2                            | 0.6  |                  |      |                               |                                | 1550 | 1.75               |  | 25                | 30 (815 °C)       | -0.10 (800 °C)  | 0.00 (1000 °C) | 18     | 1.1    | 1.3 (800 °C) | 1.4           | DIVASIL FP    |
| EVERLITE 105-0.5-2-GS     | LEGRIT 105-0.5E 0-2      | 7.0                            | 31.0             | 3.5                            | 51.0 |                  | 2.0  |                               |                                | 1050 | 0.55               |  | 3                 | 0.5               | -2.00           | 0.40 (800 °C)  | 12     | 0.2    | 0.2          | 0.2           | Water         |
| EVERLITE 120-0.9-5-DE     | LEGRIT 120-0.9 0-5-DE    | 37.0                           | 37.0             | 3.0                            | 19.0 |                  | 0.5  |                               |                                | 1200 | 0.95               |  | 6                 | 3.5               | -0.6 (815°C)    | 0.60 (1200 °C) | 12     | 0.2    | 0.3          | 0.3           | Water         |
| EVERCAST MC F41-6-DE      | SUPER COMPRIT F41-6-DE   | 41.0                           | 51.0             | 0.7                            | 3.4  |                  |      |                               |                                | 1400 | 2.20               |  | 85                | 95                | -0.25           | 0.60           | 8      | 0.9    | 1.0          | 1.1           | Water         |
| EVERCAST CC F44-6-D+5:31E | COMPRIT F44-6-DE         | 44.0                           | 47.0             | 0.6                            | 3.5  |                  | 0.4  |                               |                                | 1350 | 2.15               |  | 55                | 45                | -0.10           | 0.40 (1000 °C) | 12     | 0.9    | 0.9          | 1.0           | Water         |
| EVERCAST CC F47-6-DE      | COMPRIT F47-6-DE         | 47.0                           | 41.0             | 1.5                            | 7.4  |                  |      |                               |                                | 1400 | 2.10               |  | 60                | 40                | -0.15           | 0.35 (1000 °C) | 12     | 0.7    | 0.7 (800 °C) | 0.8 (1200 °C) | Water         |
| EVERCAST LC F50-6-DE      | DIDURIT F50-6-DE         | 51.0                           | 44.0             | 1.0                            | 1.6  |                  |      |                               |                                | 1500 | 2.30               |  | 65                | 110               | -0.30 (1400 °C) | 0.55 (1000 °C) | 8      | 0.5    | 1.6 (800 °C) | 1.8           | Water         |
| EVERCAST CC B75-6-DE      | COMPRIT B75-6-DE         | 73.5                           | 19.0             | 1.3                            | 3.6  |                  | 0.2  |                               |                                | 1600 | 2.45               |  | 90                | 75                | -1.50 (1500 °C) | 0.60 (1000 °C) | 12     | 1.3    | 1.2          | 1.3           | Water         |
| EVERCAST CC A95-3-DE      | COMPRIT A95-3-DE         | 95.0                           | 0.2              | 0.1                            | 4.1  |                  | 0.2  |                               |                                | 1800 | 2.70               |  | 75                | 75                | -0.10           | 0.75 (1000 °C) | 12     | 2.6    | 2.1 (800 °C) | 2.1           | Water         |
| EVERRAM A87CRP-6-DE       | RESISTIT SR888 0-6-DE    | 86.5                           | 1.0              | 0.3                            |      |                  |      | 3.4                           | 8.5                            | 1800 | 3.15               |  | 50 (350 °C)       | 40                | -0.20           | 1.20           | 8      | 2.5    | 2.2 (800 °C) | 2.2 (1200 °C) | Ready for use |
| EVERRAM A67CRP-6-DE       | RESISTIT SR885 0-6-DE    | 67.0                           | 0.5              | 0.1                            |      |                  |      | 3.0                           | 29.0                           | 1850 | 3.40               |  | 20 (300 °C)       | 40                | -0.20 (1400 °C) | 1.14           | 6      | 3.7    | 3.3 (800 °C) | 2.8           | Ready for use |
| EVERCAST LC A67CR-6-DE    | DIDURIT SR485 0-6-DE     | 67.0                           | 2.0              |                                | 1.2  |                  | 0.2  |                               | 27.0                           | 1850 | 3.10               |  | 18.5 (350 °C)     | 32.5              | -0.10           | 1.14           | 8      | 3.9    | 3.4 (800 °C) | 3.0           | Water         |
| EVERGUN SOL CR61A-3-DE    | COMPAC SOL RK61G-3-DE    | 28.0                           | 5.0              | 0.7                            | 1.1  |                  |      |                               | 61.0                           | 1650 | 3.10               |  | 30                | 25                | -0.30           | 1.25           | 18     | 3.1    | 2.9          | 2.8           | DIVASIL FP    |
| EVERSHOT CR64A-3-DE       | COMPAC SHOT RK64-3-DE    | 25.0                           | 4.8              | 0.5                            |      |                  |      |                               | 64.0                           | 1800 | 3.40               |  | 55                | 80                | -0.50 (1500 °C) | 1.25           | 8      | 2.9    | 2.7          | 2.6           | Water         |
| EVERRAM A59ZP-1-DE        | RESISTIT ZM160P 0-1-DE   | 58.5                           | 13.0             | 0.1                            |      | 23.0             |      | 5.0                           |                                | 1600 | 3.30               |  | 100 (300 °C)      | 100               | 0.40            | 1.00           | 12     | 1.8    | 1.6          | 1.4           | Ready for use |
| EVERRAM A68ZP-3-DE        | RESISTIT ZM260 0-3-DE    | 68.0                           | 10.0             | 0.1                            |      | 18.0             |      | 2.4                           |                                | 1650 | 3.00               |  | 65 (300 °C)       | 65                | 0.20            | 1.00           | 12     | 1.9    | 1.7          | 1.5           | Ready for use |
| EVERCAST LC Z31-3-DE      | DIDURIT ZM465 0-3-DE     | 56.5                           | 12.5             | 0.2                            | 1.2  | 28.0             |      |                               |                                | 1600 | 3.05               |  | 55                | 40                | -0.80 (1500 °C) | 1.10           | 12     | 1.6    | 1.5          | 1.4           | Water         |
| EVERFLOW LC Z30-3-DE      | DIDOFLO ZM30-3-DE        | 53.0                           | 14.0             | 0.2                            | 1.2  | 30.5             |      |                               |                                | 1600 | 3.05               |  | 55                | 40                | -0.80 (1500 °C) | 1.1            | 12     | 1.6    | 1.5          | 1.4           | Water         |
| EVERRAM Z63P-3-DE         | RESISTIT ZS150P 0-3-DE   | 0.8                            | 32.0             | 0.1                            |      | 63.0             |      | 3.7                           |                                | 1650 | 3.75               |  | 80 (300 °C)       | 90                | -0.40 (1400 °C) | 0.65           | 12     | 1.4    | 1.2          | 1.0           | Ready for use |
| EVERRAM Z64P-6-DE         | RESISTIT ZS748 0-3-DE    | 0.3                            | 32.1             | 0.2                            |      | 64.1             |      | 2.6                           |                                | 1800 | 3.83               |  | 40 (300 °C)       | 54                | -0.50 (1400 °C) | 0.70           | 12     | 1.4    | 1.2          | 1.0           | Ready for use |
| EVERRAM Z65V-3-DE         | RESISTIT ZS717 W 0-3-DE  | 1.3                            | 31.0             |                                |      | 65.0             |      | 0.1                           |                                | 1700 | 3.23               |  | 6.5 (300 °C)      | 11.5              | -0.01           | 0.70           | 8      | 1.4    | 1.2          | 1.0           | Ready for use |
| EVERFLOW LC CA70-3-DE     | DIDOFLO CA70-3-DE        | 70.0                           | 5.0              | 0.1                            | 14.0 | 9.2              | 1.2  |                               |                                | 1350 | 2.65               |  | 60 (300 °C)       | 40                | 0.10            | 0.60 (1000 °C) | 8      | 1.7    | 1.6          | 1.5           | Water         |
| ANKERJET GW15-AT          | ANKERJET GW15-AT         | 1.9                            | 5.3              | 0.8                            | 2.8  |                  | 88.6 |                               |                                | 1750 |                    |  |                   |                   |                 |                | 12     |        |              |               | Water         |

|                                     |     |                                                              |
|-------------------------------------|-----|--------------------------------------------------------------|
| Grade / Sorte                       | CCS | Kaltdruckfestigkeit / Cold crushing strength                 |
| Months / Monate                     | ML  | Anmachflüssigkeit / Mixing liquid                            |
| Ready for use / Verarbeitungsfertig | MR  | Materialbedarf / Material requirement                        |
| Water / Wasser                      | PLC | Bleibende Längenänderung / Permanent linear change           |
|                                     | SL  | Lagerfähigkeit / Storage life                                |
|                                     | TC  | Wärmeleitfähigkeit / Thermal conductivity                    |
|                                     | TE  | Wärmedehnung / Thermal expansion                             |
|                                     | TL  | Anwendungsgrenztemperatur / Temperature limit of application |

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Sorten

Grades

Toleranzen

Tolerances

Feuerfeste Mörtel & Kitte / Refractory mortars & mastics

| Grade                     | Old name                | Al <sub>2</sub> O <sub>3</sub> | SiO <sub>2</sub> | Fe <sub>2</sub> O <sub>3</sub> | ZrO <sub>2</sub> | Cr <sub>2</sub> O <sub>3</sub> | MgO  | TL   | MR                 | SL     | ML            |
|---------------------------|-------------------------|--------------------------------|------------------|--------------------------------|------------------|--------------------------------|------|------|--------------------|--------|---------------|
|                           |                         | %                              | %                | %                              | %                | %                              | %    | °C   | kg/dm <sup>3</sup> | Months |               |
| EVERMUR SI96-03-DE        | STELLAMUR GLS 0-0.3-DE  | 0.9                            | 94.8             | 0.1                            |                  |                                |      | 1680 | 1.30               | 24     | Water         |
| EVERMUR SI100SB-05-DE     | RHIM-Mt SI100nl         | 0.1                            | 99.8             | 0.1                            |                  |                                |      | 1680 | 1.2                | 24     | Divasil       |
| EVERTECT SI72CV-05-P31-DE | DIDOTECT Q21VC-05-DE    | 21.5                           | 72.0             | 1.2                            |                  |                                |      | 1350 | 1.85               | 12     | Ready for use |
| EVERMUR SI73V-05-DE       | DIDOMUR Q23VC-05-DE     | 23.0                           | 73.0             | 0.9                            |                  |                                |      | 1350 | 1.40               | 12     | DIKASIL 3:1   |
| EVERMUR F45-05-DE         | DIDOMUR F45-05-DE       | 45                             | 50               | 1.5                            |                  |                                | 0.3  | 1450 | 1.35               | 24     | Water         |
| DIDOMUR S45-05-IN         | DIDOMUR S45-05-IN       | 46.0                           | 49.0             | 1.2                            |                  |                                |      | 1400 | 1.50               | 24     | Water         |
| EVERTECT B50CV-05-P31-DE  | DIDOTECT B50VC-05-DE    | 49.5                           | 42.0             | 1.8                            |                  |                                | 0.2  | 1500 | 1.95               | 12     | Ready for use |
| DIDOMUR S60-05-IN         | DIDOMUR S60-05-IN       | 60.0                           | 35.0             | 1.9                            |                  |                                |      | 1400 | 1.60               | 24     | Water         |
| EVERTECT B60CV-05-P30-DE  | DIDOTECT B60VC-05-DE    | 60.0                           | 32.5             | 1.5                            |                  |                                |      | 1650 | 2.10               | 12     | Ready for use |
| EVERMUR B64-05-DE         | RESIMUR B64-05-DE       | 64.0                           | 31.5             | 1.9                            |                  |                                |      | 1550 | 1.65               | 24     | Water         |
| RESIMUR S70-05-IN         | RESIMUR S70-05-IN       | 70.0                           | 29.0             | 0.5                            |                  |                                |      | 1650 | 1.60               | 12     | Water         |
| EVERMUR M70-03-DE         | RESIMUR M70-03-DE       | 71.0                           | 25.5             | 1.0                            |                  |                                |      | 1650 | 1.55               | 12     | Water         |
| EVERTECT A77V-05-P30-DE   | RESITECT K77V-05-DE     | 77.0                           | 19.0             | 0.5                            |                  |                                |      | 1800 | 2.25               | 12     | Ready for use |
| EVERMUR A86V-03-DE        | RESIMUR TC320 0-0.3-DE  | 86.0                           | 11.0             | 0.2                            |                  |                                |      | 1800 | 2.70               | 12     | Water         |
| EVERMUR A98-05-DE         | RESIMUR A98-05-DE       | 97.5                           | 1.5              | 0.1                            |                  |                                |      | 1800 | 2.15               | 24     | Water         |
| EVERTECT A66CRV-03-P30-DE | RESITECT SR391 0-0.3-DE | 66.5                           | 1.7              | 1.0                            |                  | 29.0                           |      | 1750 | 2.90               | 12     | Ready for use |
| EVERTECT CR63P-03-P27-DE  | DIDOTECT K23PCR-03-DE   | 23.0                           | 4.2              |                                |                  | 65.0                           |      | 1870 | 3.45               | 9      | Water         |
| EVERMUR Z60V-03-DE        | RESIMUR ZS716 0-0.3-DE  |                                | 37.5             | 0.3                            | 60.0             |                                |      | 1800 | 2.85               | 12     | Water         |
| EVERMUR Z31P-03-DE        | RESIMUR ZM362 0-0.3-DE  | 49.0                           | 16.5             |                                | 31.0             |                                |      | 1650 | 2.50               | 12     | Water         |
| ANKERFIX RP10-AT          | ANKERFIX RP10-AT        | 0.1                            | 1.0              | 0.2                            |                  |                                | 95.6 | 1750 | 2.10               | 9      | Water         |
| ANKERFIX RP10-BR          | ANKERFIX RP10-BR        | 0.4                            | 1.6              | 0.6                            |                  |                                | 94.4 | 1750 | 2.10               | 6      | Water         |
| ANKERFIX CRP-CN           | ANKERFIX CRP-CN         | 0.2                            | 0.8              | 0.8                            |                  |                                | 94.5 | 1750 | 2.10               | 9      | Water         |

Grade / Sorte  
Months / Monate  
Ready for use / Verarbeitungsfertig  
Water / Wasser

ML  
MR  
SL  
TL

Anmachflüssigkeit / Mixing liquid  
Materialbedarf / Material requirement  
Lagerfähigkeit / Storage life  
Anwendungsgrenztemperatur /  
Temperature limit of application



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Die Prüfungen erfolgen grundsätzlich am Einzelstein. Für Vormontagen müssen alle Angaben in gesonderten Zeichnungen festgehalten werden. Spezielle Toleranzen müssen abgestimmt und in den Zeichnungen vermerkt werden.

The tests are always carried out on individual bricks. For the purposes of preassembly, all the specifications must be provided in separate drawings. Special tolerances must be agreed upon and indicated in the drawings.



## Serviceangebote

RHI Magnesita bietet, zusammen mit einem professionellen Partnernetzwerk, Serviceaktivitäten rund um die Glaswanne an, die zum sicheren und fehlerfreien Ofenbetrieb sowie der Verlängerung der Lebenszeit beitragen.

### Analysen

Um einen Fehler erfolgreich beheben und in Zukunft zuverlässig verhindern zu können, ist zunächst seine Identifizierung unter Einsatz geeigneter Analyseverfahren nötig. RHI Magnesita verfügt über umfassendes Know-how in Umgang und Anwendung von zwei Analysethemen, die für Glashersteller und Ofenbetreiber entscheidend sind: Glasfehleranalyse und Feuerfestanalyse.

### Inspektionen

RHI Magnesita bietet weltweit mit seinem Partner spezialisierte Inspektionsservices für Behälter-, Flach- und Spezialglaswannen an: Visuelle Inspektion, Endoskopie, hochauflösende Thermografie (außen und innen) sowie videobasierte Langzeitüberwachung.

## Service Offers

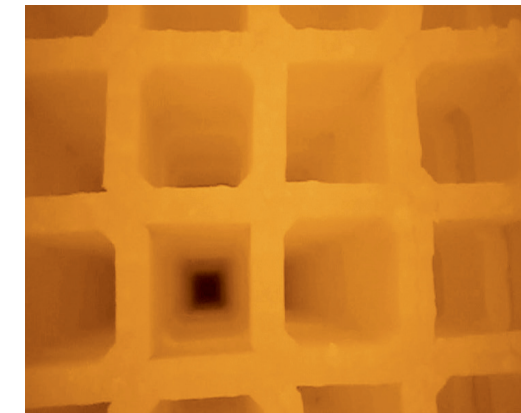
In cooperation with a network of professional partners, RHI Magnesita offers service activities for glass tanks which contribute to safe and error-free furnace operation and to an extended service life.

### Analyses

In order to successfully eliminate defects and reliably prevent them in the future, such defects first have to be identified by using the appropriate analytical procedures. RHI Magnesita has comprehensive know-how in the application of two types of analysis which are crucial to glass producers and furnace operators: glass defect analysis and refractory analysis.

### Inspections

In cooperation with its partner, RHI Magnesita offers specialized inspection services for container glass, flat glass and special glass furnaces worldwide: visual inspection, endoscopy, high-resolution thermography (internal and external) and video-based long-term monitoring.



Darüber hinaus bietet RHI Magnesita seinen Kunden Unterstützung bei

- Technischen Fragestellungen
  - > Empfehlungen für Materialzustellungen mit optimiertem Preis-Leistungs-Verhältnis
  - > Wärmedurchgangsberechnungen
  - > Regeneratorberechnungen
  - > Feuerfestdesign
  - > Feuerfestbezogenen Glasfehleranalysen sowie Post-mortem-Analyse von Feuerfestmaterial
  - > After Sale Service
- Finanzierungsfragen
- Projektlogistik
- Notfällen
  - > Kurzfristiger Lieferung von Reparaturmaterialien durch Notfalllager
- Werkstoffrecycling

In addition, RHI Magnesita offers customers support in various areas:

- Technical questions
  - > Recommendations for a refractory lining with optimum price/performance ratio
  - > Heat flux calculations
  - > Regenerator calculations
  - > Refractory design
  - > Analysis of glass defects and post-mortem analysis of refractory material
  - > After sale service
- Financing questions
- Project logistics
- Emergencies
  - > Short-term delivery of repair material from emergency stocks
- Material recycling

**Imprint:**

Media owner and publisher: RHI Magnesita N.V., Branch Vienna, Kranichberggasse 6, 1120 Vienna, Austria

Produced by: RHI Magnesita — 10 / 2024-10-DE/EN

Place of publication and production: Vienna, Austria

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