

## REFCON<sup>®</sup> plus

### General information

REFCON<sup>®</sup> plus is an engineered calcium aluminate (CA) cement, designed for medium and low temperature refractory applications. REFCON<sup>®</sup> plus is also chosen for certain applications where reducing conditions may be present.

REFCON<sup>®</sup> plus is the optimal choice for deflocculated castables which contain the following aggregates:

- Bauxite / Andalusite 60-85 % Al<sub>2</sub>O<sub>3</sub>
- Mullitic Fireclay 45-70 % Al<sub>2</sub>O<sub>3</sub>
- Standard Fireclay > 25 % Al<sub>2</sub>O<sub>3</sub>
- Recycled low alumina aggregates

REFCON<sup>®</sup> plus has a shelf life of approximately six months if stored in a dry environment with small temperature variations. Other environments may shorten or extend the shelf life.

### Production

REFCON<sup>®</sup> plus is produced by melting selected raw materials in special kilns. All production parameters are precisely controlled to achieve a high stability of the chemical and mineralogical composition. After melting and cooling, the clinker is ground in ball mills to get its final properties. Every important production step is accompanied by quality tests to ensure high product stability and product quality at a maximum level.

### Quality

REFCON<sup>®</sup> plus is tested according to ASTM and other accepted procedures.

The production plant is certified according to EN ISO 9001 – certificate number CH08/1542 and the Environmental Management System EN ISO 14001 – certificate number CH08/1543.

### Technical data

The following information represents typical ranges for the chemical and physical properties of REFCON<sup>®</sup> plus produced at our plant.

#### Chemical composition (%), ASTM C-114

SiO <sub>2</sub>	≤ 5.5
Al <sub>2</sub> O <sub>3</sub>	≥ 52.0
Fe <sub>2</sub> O <sub>3</sub>	≤ 3.0
CaO	≤ 39.0
MgO	≤ 0.8
SO <sub>3</sub>	≤ 0.4

#### Mineralogical composition

REFCON<sup>®</sup> plus has an optimized monocalcium aluminate (CA) content. This mineral phase is responsible for the high early strength.

When mixed with water, REFCON<sup>®</sup> plus forms calcium aluminate hydrates as its hydration products.

#### Mineral phases of REFCON<sup>®</sup> plus:

Main mineral phase	CA > 60 %
Minor mineral phases	C <sub>2</sub> AS, CT, C <sub>12</sub> A <sub>7</sub>

#### Physical properties:

% retained on 325 mesh	< 30%
Blaine Fineness (ASTM-204)	330 - 380 m <sup>2</sup> /kg
Bulk density	approx. 1.15 g/cm <sup>3</sup>
Specific gravity	3.0-3.1 g/cm <sup>3</sup>
Approximate melting point	1540°C / 2800°F

#### Development of strength

After setting, strength develops very rapidly. REFCON<sup>®</sup> plus is a cement with very high early strength and high compressive strength. After one day, the compressive strength is typically higher than Type I Portland cements after 28 days.

### Typical development of strength versus time

Time	6 hours	1 day
Compressive Strength (MPa)	-	>35

The tests are conducted with 2-inch mortar cubes according modified ASTM C-109.

#### ▶ Refractoriness

REFCON<sup>®</sup> plus can be used in a variety of moderate to severe refractory applications. It is especially designed for use under reducing conditions where carbon monoxide is present at high temperatures. REFCON<sup>®</sup> plus can be used in gunning mixes as well as castables. It can be used as a stand-alone cement, or as part of a more complex hydraulic system.

#### ▶ Mixing advice

As with Portland cement, ambient conditions and temperatures of the ingredients will influence the length of time REFCON<sup>®</sup> plus concretes and mortars will remain plastic and workable. Higher temperatures naturally will reduce this time while lower temperatures will extend it. Many types of mixes using REFCON<sup>®</sup> plus are extremely sensitive to the characteristics of each ingredient in the mix, and may require substantial lab testing to obtain optimum properties.

#### ▶ Safety instructions

In general, CALUCEM calcium aluminate cements are not known to contain hazardous or toxic materials. REFCON<sup>®</sup> plus contains no measurable amounts of crystalline silica (such as Quartz, Tridymite or Cristobalite). In compliance with EN 196-10, the water-soluble chromium VI content is always under 2ppm.

Please refer to our Material Safety Data Sheets for complete information.

#### ▶ Important notice

The information and statements herein are believed to be reliable, but are not to be construed as a warranty or representation for which we assume legal responsibility. No warranty, representation or condition of any kind, expressed or implied (including NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE) shall apply. Having no control over the use of cement, the seller will not guarantee finished work, nor shall the seller be liable for consequential damages.

#### ▶ Note of caution

Dry cement powder is non-hazardous, but will act as an irritant if airborne cement dust is breathed. When mixed with water to make concrete, mortar or grout, skin or eye contact may cause mild to severe irritation. Care should be taken to minimize contact with cement powder or paste, and to avoid breathing any airborne cement dust.

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This supersedes all earlier data sheets.