CIMENT FONDU®

Refractory applications

Product Data Sheet

Reference FC-CF-RE-GB-KFR-032007

Updated 31/03/2008

1 General characteristics

Ciment Fondu® is a hydraulic binder, with an alumina content of approximately 40%.

The principal components of Ciment Fondu® are calcium aluminates which make it an ideal binder for refractory applications. Its high monocalcium aluminate content yields refractory concrete with excellent mechanical properties. Due to the iron oxide content of Ciment Fondu®, it is unsuitable for refractory concretes where iron oxide may not be tolerated, for example in reducing atmospheres.

The rheological properties of Ciment Fondu® are well adapted for all types of placing methods, particularly for casting and gunning. It is recommended for applications where rapid hardening and excellent performance are required.

Ciment Fondu® does not contain any additives, and is suited to the manufacture of refractory premixes.

Ciment Fondu® is produced and controlled within a quality management system that is certified according to ISO 9001.

2 Specification

The properties of Ciment Fondu® produced in Europe conform to the requirements defined in the norm: EN 14647 : “Calcium Aluminate Cement”

The *specification limits* indicated are determined with an acceptable quality level (AQL) of 2.5% defined in the standard ISO 3951.

The *strict specification limits* define the absolute limits of product conformity applicable for individual values.

The EN specification limits are conformed with the requirement defined in the norm EN 14647.

The *usual range* represents typical values of production.

Chemical composition

Main constituents (%)

	Usual range	Specification limit
Al_2O_3	37.5 - 41.0	> 37.0
CaO	35.5 - 39.0	< 41.0
SiO_2	3.5 - 5.5	< 6.0
Fe_2O_3	13.0 - 17.5	< 18.5
MgO	-	< 1.5
TiO_2	-	< 4.0

Other constituents (%)

	Strict specification limit
S (as sulphide ions)	≤ 0.1
Cl (as chloride ions)	≤ 0.1
$Na_2O + 0,659\ K_2O$	≤ 0.4
SO_3	≤ 0.5

The chemical characteristics of Ciment Fondu® have been determined according to the following:

- EN 196-2: Methods of testing cement - Chemical analysis of cement.

Fineness

	Usual range	Specification limit
Blaine Specific surface (cm2/g)	2850 - 3450	> 2700

- Determined in accordance with EN 196-6: Methods of testing cements - Measurement of fineness.

Neat paste setting time

	Usual range	Specification limit
Initial set (min)	180 - 300	> 120
Final set (min)	210 - 330	< 480

- Determined in accordance with EN 196-3: neat cement paste at standard consistency; mechanical mixing ; Vicat test equipment using 300g weight ; temperature 20°C ; relative humidity >90%.

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Mechanical strength

Compressive strength, MPa		
Age	Usual range	Strict specification limit
6 h	35 - 50	> 30
24 h	60 - 80	> 50

- Composition of mortar according to EN 14647: 1350g of sand, 500g of calcium aluminate cement, 200g of water
- Test conditions according to EN 196-1: test prisms 40x40x160mm; temperature 20°C ; prisms cured at >90% relative humidity for 24 hours (NF standard) or 6h (BS standard), followed by immersion in water.

3 Additional data

This information is given for guidance only.

- Principal mineralogical phase*: CA
- Secondary phases*: $C_{12}A_7$, C_2S, C_2AS, C_4AF

* C=CaO, A=Al_2O_3, S= SiO_2, F=Fe_2O_3

- Bulk density: 1100 kg/m^3
- Specific gravity: 3.2 - 3.3 g/cm^3
- Pyrometric cone equivalent (on neat cement paste): 1270 - 1290 °C
- Heat of hydration

6h	340 kJ/kg
24h	445 kJ/kg
5 days	445 kJ/kg

Beyond the minimal requirements of the standard EN 14647, the French production benefits from controls and complementary requirements such as defined in the reference frame NF 002.

Workability - French production

	Specification limit
Spread after 15 min (%)	> 30

The workability of Ciment Fondu® has been determined by measuring the flow properties using the ASTM C230 flow table. The test is carried out using a standard siliceous sand mortar.

- Composition of mortar according to EN 14647: 1350g of sand, 500g of calcium aluminate cement, 200g of water
- Test carried out with 25 shocks after 15 min retained in cone mould, d_1 (diameter of base) = 100mm. % of flow = d_2 (mm) - d_1 (mm)

	Usual range	Specification limit
Initial set (min)	130 - 200	> 120
Final set (min)	140 - 220	< 240

Mortar setting time - French production

- Composition of mortar according to EN 14647: 1350g of sand, 500g of calcium aluminate cement, 200g of water
- Preparation according to EN 196-1.
- Measurement according to NF P15-431: Vicat test equipment as EN 196-3 but using a 1000g test weight ; temperature 20°C ; samples immersed in water or cured at > 90% relative humidity.
- Final setting time measured in accordance with NF P15-330: the Vicat needle no longer penetrates the mortar.

Mechanical strength - French production

Mechanical strength in MPa		
Age	Modulus of rupture strict specification limit	Compressive strength strict specification limit
6 h	> 4	> 30
24 h	> 5	> 50
28 d	> 6.5	> 60

- Composition of mortar according to EN 14647: 1350g of sand, 500g of calcium aluminate cement, 200g of water
- Test conditions according to EN 196-1: test prisms 40x40x160mm; temperature 20°C ; prisms cured at >90% relative humidity for 24 hours (NF standard) or 6h (BS standard), followed by immersion in water.

4 Storage and Shelf Life

As with all hydraulic binders, Ciment Fondu® must be stored in dry conditions, off the ground. In this case, it will retain its properties for at least 6 months. In many instances, properties are retained for more than one year.

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