

## Certified Reference Materials Cement

**FLX-CRM 105, FLX-CRM 106,  
FLX-CRM 107, FLX-CRM 108,  
FLX-CRM 109, FLX-CRM 110**



## Certificate of Analysis

**FLX-CRM 105, FLX-CRM 106, FLX-CRM 107,  
FLX-CRM 108, FLX-CRM 109, FLX-CRM 110**

**New certificate issued June 2019**

### Reference Material Information

Type:	6 different cements
Form and Size:	Granulate, as-produced, 30g each bottle
Manufactured by:	Dyckerhoff, Germany
Packaged and tested by:	FLUXANA GmbH & Co.KG, Germany
Certified by:	FLUXANA GmbH & Co.KG, Germany

### Description

Together with the cement manufacturer Dyckerhoff, Germany 6 new cements were selected. In January 2010 in total 6 times 30kg were supplied.

The samples were taken by Dyckerhoff directly from the production stream with the goal to guarantee a fresh homogenized material. The complete batch was sealed into 30g bottles in June 2010.

In detail the following cements were taken:

CRM 105	CEM I 42,5 R production site in Deuna, Germany
CRM 106	CEM I 42,5R production site in Lengerich, Germany
CRM 107	CEM II A-LL 42,5R production site in Geseke, Germany
CRM 108	CEM I 42,5R production site in Göllheim, Germany
CRM 109	CEM II A-LL 42,5N production site in Neuwied, Germany
CRM 110	CEM I 42,5R -dw- production site in Amöneburg, Germany

**Certified values and their uncertainties as mass fraction in %**

	FLX-CRM 105		FLX-CRM 106		FLX-CRM 107	
	Value <sup>1</sup>	Uncertainty <sup>2</sup>	Value <sup>1</sup>	Uncertainty <sup>2</sup>	Value <sup>1</sup>	Uncertainty <sup>2</sup>
Al <sub>2</sub> O <sub>3</sub>	4,27	0,06	5,70	0,04	4,23	0,04
CaO	65,24	0,16	66,05	0,17	67,19	0,16
Chloride	0,049	0,019	0,055	0,020	0,043	0,017
Fe <sub>2</sub> O <sub>3</sub>	2,50	0,04	1,98	0,03	1,29	0,02
K <sub>2</sub> O	1,24	0,05	0,86	0,04	0,70	0,03
MgO	1,57	0,03	0,96	0,02	0,70	0,02
Na <sub>2</sub> O	0,21	0,02	0,12	0,02	0,18	0,02
P <sub>2</sub> O <sub>5</sub>	0,053	0,002	0,111	0,003	0,160	0,004
SiO <sub>2</sub>	20,84	0,09	20,29	0,09	21,81	0,06
SO <sub>3</sub>	3,37	0,05	3,01	0,05	3,13	0,07
TiO <sub>2</sub>	0,179	0,003	0,271	0,004	0,194	0,003
Cr <sub>2</sub> O <sub>3</sub>	0,008	0,002	0,008	0,002	0,006	0,002
Mn <sub>2</sub> O <sub>3</sub>	0,040	0,004	0,161	0,007	0,040	0,003
ZnO	0,054	0,004	0,012	0,002	0,013	0,002
SrO	0,146	0,006	0,206	0,005	0,151	0,005
LOI*	(2,61)		(2,06)		(6,59)	
	FLX-CRM 108		FLX-CRM 109		FLX-CRM 110	
	Value <sup>1</sup>	Uncertainty <sup>2</sup>	Value <sup>1</sup>	Uncertainty <sup>2</sup>	Value <sup>1</sup>	Uncertainty <sup>2</sup>
Al <sub>2</sub> O <sub>3</sub>	4,66	0,05	4,25	0,04	4,70	0,04
CaO	65,15	0,11	66,45	0,19	68,13	0,12
Chloride	0,042	0,017	0,049	0,019	(0,008)	(0,006)
Fe <sub>2</sub> O <sub>3</sub>	2,97	0,04	2,32	0,01	0,18	0,01
K <sub>2</sub> O	0,74	0,03	1,06	0,05	0,94	0,03
MgO	2,15	0,02	1,59	0,02	0,65	0,02
Na <sub>2</sub> O	0,09	0,02	0,18	0,02	0,05	0,01
P <sub>2</sub> O <sub>5</sub>	0,169	0,002	0,052	0,003	0,037	0,002
SiO <sub>2</sub>	20,06	0,08	20,39	0,07	22,01	0,08
SO <sub>3</sub>	3,31	0,05	3,11	0,05	2,88	0,08
TiO <sub>2</sub>	0,186	0,003	0,203	0,003	0,170	0,003
Cr <sub>2</sub> O <sub>3</sub>	0,007	0,001	0,008	0,002	0,004	0,002
Mn <sub>2</sub> O <sub>3</sub>	0,219	0,009	0,051	0,006	0,029	0,004
ZnO	0,036	0,002	0,042	0,004	0,003	0,001
SrO	0,083	0,004	0,144	0,006	0,041	0,004
LOI*	(2,68)		(5,96)		(3,46)	

**Notes:** all values (except LOI) apply after ignition at 950°C for 1 hour.

\*LOI is informal only and is excluded from certification because it might change over time

Values in brackets are informal only.

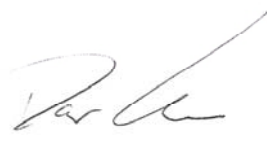
All decimal places of the uncertainties are corrected according to the values precisions.

## Definitions

- <sup>1</sup> The above values are the present best estimates of the true content for each component. Each value is a panel consensus, based on the averaged results of an inter laboratory testing program, detailed in values obtained by individual laboratories or methods.
- <sup>2</sup> The uncertainty values are coming from the half width confidence interval C(95%). It is equal to  $C(95\%) = (t \times s) / \sqrt{n}$  where t is the appropriate Student's value, n the number of acceptable mean values and s the standard deviation.

## Certified by

FLUXANA GmbH & Co.KG



on 06<sup>th</sup> February 2012

Dr. Rainer Schramm

## Certificate reissued by

FLUXANA GmbH & Co.KG



on 21<sup>st</sup> June 2019

Susan Aschenbrenner

### **Description of the CRM**

This reference material is an industrial product and was taken directly from the production stream. The complete batch was sealed into 30g bottles. This material is normally used as cement for constructions.

### **Intended use**

Calibration and control sample for x-ray fluorescence (xrf) analysis.

### **Instructions for the correct use of the CRM**

This material has to be ignited for minimum 1 hour at 950°C prior use. The ignition process must result in a constant weight. The ignited material must be stored in a desiccator not longer than 24h, then re-ignition might be necessary. The minimum sample quantity for analysis should be 0.5g. The material is moisture sensitive.

For XRF use, ignited samples should be prepared as a fused bead, using e.g. 1 part sample + 8 parts Lithium tetraborate, prepared on an automated fusion machine, and otherwise in accordance with ISO 29581-2:2010.

### **Hazardous situation**

Not classified as dangerous according 67/548/EEC, 1999/45/EC and directive 1272/2008/EC (CLP).

### **Level of homogeneity**

The batch was checked for uniformity using a wavelength-dispersive XRF unit, and a test method in conformance with ISO 29581-2:2010.

Using the data from each sample, standard deviation values were derived for each element as an indicator of any non-homogeneity (as determined for the specific sample size taken by the spectrometer).

### **Traceability**

The analytical work performed to assess this material has been carried out by competent, laboratories, from raw material and cement industry. All of the results derived as part of this testing program have traceability to NIST and other national standards, as part of the analytical calibration or process control.

### **Values obtained by individual laboratories or methods**

Please see the detailed report from the proficiency test for this information.

### **Methods used**

The method most used is x-ray fluorescence analysis with fused bead as sample preparation (with ISO 29581-2:2010).

A few laboratories used:

x-ray fluorescence analysis with pressed pellet as sample preparation,

wet chemical methods with digestion and ICP-OES for the determination of Al<sub>2</sub>O<sub>3</sub>, CaO, Fe<sub>2</sub>O<sub>3</sub>, K<sub>2</sub>O, MgO, Na<sub>2</sub>O, P<sub>2</sub>O<sub>5</sub>, SiO<sub>2</sub>, SO<sub>3</sub>, TiO<sub>2</sub>, Cr<sub>2</sub>O<sub>3</sub>, Mn<sub>2</sub>O<sub>3</sub>, ZnO, SrO,

combustion technique to detect total sulfur

wet chemistry with titration or ion chromatography to detect chlorine.

Loss on ignition (L.O.I) was determined by gravimetry 1h at 950°C (EN 196-2).

### **Further information**

This Reference Material has been produced and certified, wherever possible, in accordance with the requirements of ISO 17043, ISO Guide 34-2009, ISO Guide 31-2000 and ISO Guide 35-2006.

This certification is applicable to the whole of the sample.

As-supplied, this material will not remain stable indefinitely. The matrix will be affected by contact with the atmosphere, and in particular it will absorb moisture and carbon dioxide. However, it continues to be fit for use for an indeterminate period, on the understanding that the sample will be ignited prior to weighing, bead preparation and measurement.

All production records will be retained for a period of 10 years from the date of this certificate. This certification will therefore expire in 31.01.2022, although we reserve the right to make changes as issue revisions, in the intervening period.

The certification, packaging, analysis and storage of this product were supervised by Dr. Rainer Schramm, General Manager, FLUXANA GmbH & Co. KG, Bedburg-Hau, Germany.

## Participating Laboratories

BACHEMA AG	Schlieren	Switzerland
Bildungs- und Wissenschaftszentrum der Bundesfinanzverwaltung	Köln	Germany
Bruker AXS GmbH	Karlsruhe	Germany
Cimpor Turkey - Çorum Plant	Çorum	Turkey
Cimpor Turkey - Hasanoglan-Ankara Plant	Elmadag-Ankara	Turkey
Cimpor Turkey - Samsun Plant	Samsun	Turkey
Cimpor Turkey - Sivas Plant	Yapı/Sivas	Turkey
Cimpor Turkey - Yozgat Plant	Yozgat	Turkey
CRB Analyse Service GmbH	Hardeggen	Germany
Deutsches Institut für Feuerfest und Keramik	Bonn	Germany
Dorfner Anzplan	Hirschau	Germany
Dyckerhoff AG	Wiesbaden	Germany
ESAB AB	Gothenburg	Sweden
FLUXANA	Bedburg-Hau	Germany
VDZ Forschungsinstitut	Düsseldorf	Germany
Forschungsinstitut für Anorganische Werkstoffe-	Höhr-Grenzhausen	Germany
FUNDACION ITMA	Llanera Asturia	Spain
Georg-Simon-Ohm Hochschule Nürnberg	Nürnberg	Germany
Grothe Rohstoffe GmbH & Co. KG	Bückeberg	Germany
Holcim AG	Würenlingen	Switzerland
Holcim AG	Sehnde	Germany
HuK Umweltlabor GmbH	Wenden-Hünsborng	Germany
Instituto Nacional del Carbón (INCAR-CSIC)	Oviedo-Asturias	Spain
Johnson Matthey Catalysts GmbH	Redwitz	Germany
Jung Instruments GmbH	Viersen	Germany
Lafarge Quality Department	Johannesburg	South Africa
LSI	Rotterdam	Nederland
Ohorongo Cement (PTY) LTD	Windhoek	Namibia
Pretoria Portland Cement Company Ltd.	Heriotdale	South Africa
Rockwool BV	Johannesburg	South Africa
terrachem GmbH	Roermond	Nederland
Uni Freiburg, Institut für Geowissenschaften	Mannheim	Germany
University of Kentucky	Freiburg	Germany
	Lexington, KY	USA