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MC-CAL

Cement Calorimeter



Introduction

Determining the heat of hydration of cement is important and traditionally, the heat of hydration has been determined by measuring the heat of solution (ASTM C186). More recently, isothermal calorimetry tests using MC-CAL are increasing because they accurately and reliably measure the heat of hydration (ASTM C1702).

The samples tested in the MC-CAL are usually paste samples, where the cement hydration process can continuously be followed over time.

The shape of the heat flow curve will reflect the cement hydration process and the different phases of the complex process can be determined.

The addition of admixtures will change the shape of the heat flow curve, and the admixture effect can be quantified. The integrated heat flow over time will give the extent of hydration.

Typical Applications

- Research and development of new formulations in the area of additives and admixtures
- Setting time and premature stiffening of cement
- The influence of sulfate carrier content
- Quality control and production control of cement
- Cement research and concrete production control

MC-CAL

Isothermal Multi-Channel-Calorimeter for onlinemonitoring the heat flow during hydration of cement, etc. For determining heat of hydration and to study the influence of additives on the hydration process



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Calorimeter and Measurements

The **MC-CAL 14-Channel Calorimeter** consists of two seven (7) channel calorimeter blocks and a data logging system required for control and data acquisition. The circular design of the individual single calorimeters enables highest flexibility with free combination of sample(s) and reference:

- the maximum capacity to measure 12 samples individually and parallel for highest throughput or
- the highest sensitivity (1:1 combination of sample and reference) to measure 6 samples individually and parallel

MC-CAL Ampoules

The ampoules used in the MC-CAL are designed to handle up to 20, 25 or 30 ml volumes. Either glass, or plastic (HDPE) closed ampoules are available, which enables maximum flexibility for sample management and maximum sensitivity.

MC-CAL Admix Ampoule is an accessory available for initiating reactions inside the calorimeter, can be used for monitoring a reaction from the initial injection. The Admix Ampoule can be configured with or without a motor for stirring and is used with 30 ml disposable glass ampoules.

The **MC-CAL Software** is an easy to handle software package developed for typical cement applications.

Specifications¹

Channels: maximum 12 samples parallel

Sample Volume: variable, max. 30 ml depending on ampoule type

Measuring Range: ± 2 W

Temperature Range: 15–90°C (5–90°C)²

Temperature Stability: $\pm 0.01^\circ\text{C}$

Detection Limit: 20 μW

Accuracy: ± 25 μW

Baseline Stability (over 24 hours):

- Drift: < 40 μW
- Deviation: $< \pm 10$ μW
- Error: $< \pm 24$ μW

Short Term Noise: ± 5 μW

Time Constant (20 ml water): < 2000 s

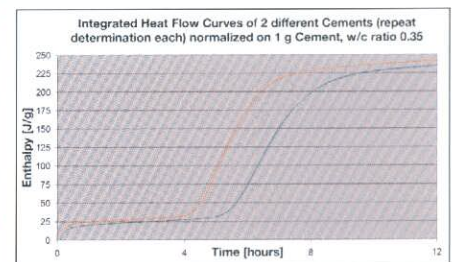
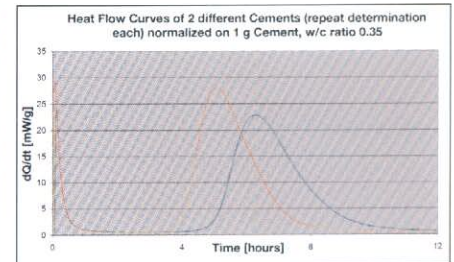
Dimensions: Width 675 mm, Depth 465 mm, Height 927 mm

Weight: ca. 45 kg

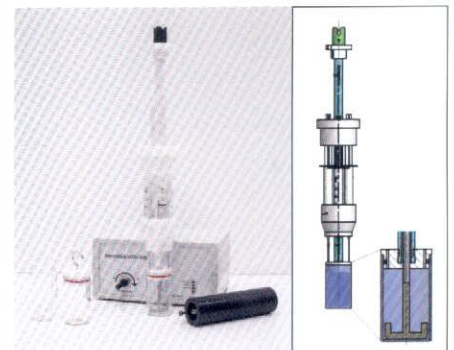
¹ Site of Installation: ambient temperature stability better $\pm 2^\circ\text{C}$ maximum relative humidity 65%

² under dry conditions (avoiding condensation)

Subject to technical changes and misprints.



Application Example – 2 different types of Cement



Admix Cell

MC-CAL Cement Calorimeter

