

calmetrix

I-CAL 8000



CALMETRIX I-CAL 8000 EQUIPMENT & SOFTWARE

Background: Isothermal Calorimetry in cement and concrete testing.

Isothermal calorimetry measures the heat generated by a cementitious binder as an indicator for the rate of reaction. Since the rate of reaction is very important for engineering properties such as workability, set and early strength development, calorimetry is widely used to develop new binders and mixes, for quality control and to study the effect of different chemical admixtures and binder compositions on performance.

The curing temperature is also known to greatly affect the reaction rate and thus the engineering properties of cementitious materials. Isothermal calorimeters, as opposed to semi-adiabatic calorimeters, allow for testing at controlled temperature, thus enabling excellent repeatability and accurate studies of temperature effects on the rate of reaction.

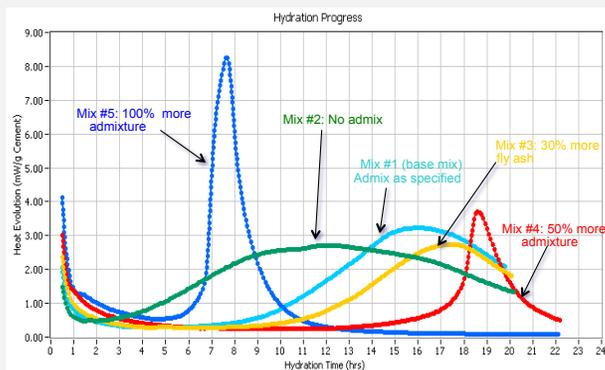
I-Cal 8000 Isothermal Calorimeter for Cement / Concrete Professionals.



The I-Cal 8000 is an 8-channel Isothermal Calorimeter that can be used to test cement paste, mortar or **even real concrete**. Testing on real concrete is particularly important to detect unwanted interactions between complex admixture molecules and aggregates. A thermal hydration curve is plotted as the ambient temperature around the sample is kept constant. The temperature is easily set via software interface with a feedback loop to ensure optimal control, while precision sensors measure the heat flow generated by the cementitious binders reacting in concrete during the first days. Embedded reference cells eliminate the need for duplicate test samples. I-Cal 8000 complies with ASTM C1679.

Data generated by I-Cal is retrieved and analyzed with Calmetrix' state-of-the art CalCommander software, which combines ease of use and a suite of analytical tools.

Example of use: admixture dosing sensitivity (Applicable Instruments: any F-Cal or I-Cal instrument)



This example shows the sensitivity of a standard mix (light blue) to changes in admixture dosage. A 50% admixture overdose shows both severe retardation and altered shape of the main hydration peak. At 100% admixture overdose (blue curve), the steep rise and high peak are indicators of an uncontrolled aluminate reaction, with poor ensuing strength gain. A 30% overdose of fly ash (yellow curve) does not show any performance issues, other than a two-hour retardation in set.

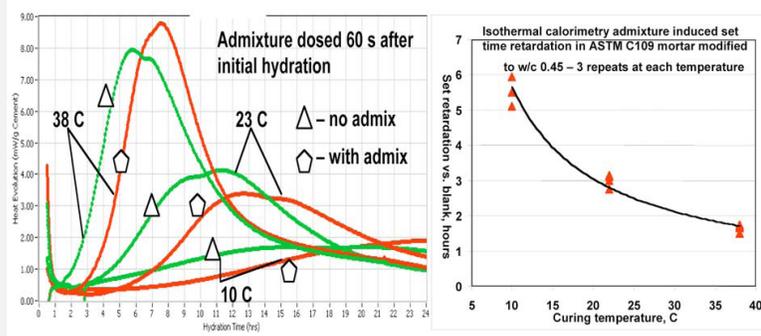
Applications and uses.

I-Cal 8000 is cost effective, yet precise enough for applications in multiple fields, including R&D and Investigative work on concrete properties, and daily QC needs in Cement and Concrete production.

I-Cal 8000 is typically used to perform the following tasks:

- determination of activation energy for maturity, strength and thermal crack prediction
- studies of hydration patterns and correlation to shrinkage or other parameters
- sensitivity tests on temperature variations
- testing and resolution of sulfate imbalance issues
- Mix design optimization, selecting type and dosage of admixture, SCM
- troubleshooting complex mixes, detect potential material – admixture incompatibility
- sensitivity tests on small variations in admixture or other material content
- prediction of setting times through thermal set indicators or maturity

Example of use: temperature sensitivity and activation energy (Applicable Instruments: any I-Cal instrument)



This example shows a normal case, where chemical admixtures (or SCM's) retard less at higher temperatures.

Any abnormal retardation at high temperatures as is sometimes seen with very reactive class C fly ashes would cause a larger retardation of the high temperature curve (red)

Users of I-Cal 8000 can be found among Universities, Cement Producers, Concrete Producers, Fly Ash Distributors, Admixture Producers and Testing Laboratories.

Specifications.

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Operating Voltage	110 - 240 VAC - 50/60Hz	Sample size	up to 125ml/~340g (12oz.)
Number of Test Channels	8	Baseline over 24 hours	
Operating Temperature Range	5 to 50°C (41 to 140°F)	Drift	< +/-0.2 mW
Ambient Temperature Range - Control	5 to 40°C (41 to 104°F) - +/-1°C (+/-1.8°F)	Random noise	< +/-0.1 mW
Software Compatibility	CalCommander on Windows XP or later	Precision	+/-0.5 mW
Humidity	< 65% RH	Dimensions	L21"xW16"xH20" (52.5cmx40cmx50cm)
Sample size	up to 125ml/340g (12oz.)	Weight	87 lbs (39.5 kg)

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Innovation and QC for Cement and Concrete ... Made Easy

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