

# calmetrix

## P-CAL 1000



### CALMETRIX P-CAL 1000 EQUIPMENT & SOFTWARE

#### **P-Cal 1000 High Performance Calorimeter for Cement / Concrete Professionals.**

The P-Cal is a high performance semi-adiabatic calorimeter with high efficiency insulation to achieve close to adiabatic conditions. It is the only high performance semi-adiabatic calorimeter that is truly portable and can easily be carried in concrete delivery trucks or other field applications. But don't be fooled by its size: the quality of the insulation gives the P-Cal 1000 laboratory-level quality, with precise and replicable measurements. Best of all, it's incredibly cost effective and easy to use.

P-Cal 1000 can be used to test concrete, mortar or paste in a standard 4"x8" (100 mm x 200 mm) cylinder or any standard container that fits inside. P-Cal measures changes in temperature, as a proxy for heat released as cement is hydrating. Because of its ultra-performance insulation, it closely mimics the conditions encountered in the core of mass concrete applications.

P-Cal's superior insulation also means that tests can be done in repeatable and controlled conditions. Repeatability makes it possible to compare tests conducted on different days or at different locations.

#### **Applications and uses.**

Beyond traditional uses of semi-adiabatic calorimeters, P-Cal can be used in combination with Calmetrix's CalCommander software to determine compressive strength and setting times using calorimetry curves and limited physical testing. This proves to be useful in a number of situations, more specifically to infer compressive strength and set time values for large test matrixes, or at curing ages where physical testing is impractical and too costly (test results needed outside of normal laboratory hours, or when a laboratory is not close by).

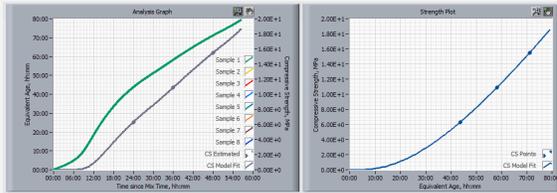
Typical applications are in the development of new admixture formulations, advanced mix design optimization or complex research projects.



Of course, P-Cal can also be used for other Quality Control and Research and Development applications, such as:

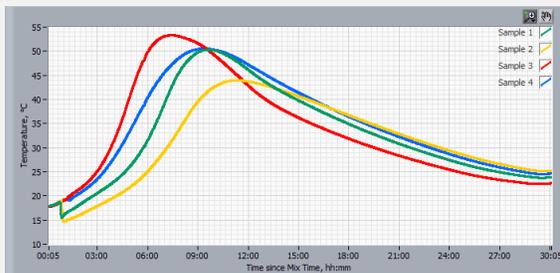
- troubleshooting and studies of adverse material interaction
- rapid screening of materials, e.g. different sources of cement, or brands of admixtures
- robustness testing (how performance holds up to variations in material dosages)
- mix design optimization
- admixture formulation

### Example of use: estimate compressive strength



This example shows a standard mix used for admixture formulations. As new formulations get developed, it is important to have data on early strength development. P-Cal was used to infer compressive strength values for 24, 36 and 48 hours on multiple formulations. The curves on the left show the correlation between temperature development, maturity and compressive strength. The right hand side graph shows compressive strength values as predicted by calorimetry at different curing ages.

### Example of use: test consistency of cement from different batches / delivery dates



Because tests conducted with P-Cal are replicable, it is possible to quasi-isolate the effect of the environment. In this example, we used this feature to compare the consistency of cement originating from the same source, but that was delivered on different dates. On each date, we prepared the same mix design with the same mixing procedure with the cement delivered on that day. Given the negligible effect from the environment, one can quickly assess that the cement delivered as shown in the red curve sets significantly faster than the cement delivered in the yellow curve, requiring adjustments in mix designs. A periodic test of the cement that is delivered to a concrete site helps make up for any unwanted differences and avoid surprises on the job site.

P-Cal is predominantly used by field laboratories with limited resources to do physical testing, research laboratories that work on large test matrixes, and ready mixed concrete delivery trucks.

### Specifications.

Specifications			
Power Supply	3-Volt CR-2032 Lithium Battery	Accuracy	+/- 0.25°C at 25°C (+/- 0.45°F at 68°F)
Number of Test Channels	1	Response Time	<6 min. to 90%
Sample Size	Up to 4.5 kg (10 lbs)	Resolution	0.05°C at 20°C (0.09°F at 68°F)
Battery Life	3 years (in continuous use)	Drift	<0.1°C (0.2°F) per year
Operating Temperature Range	-20 to 70°C (-4° to 158°F)	Sampling Rate	5 min.
Temperature Measurement Range	-40 to 100°C (-40° to 212°F)	Dimensions / Weight	7"Øx18" (18 cm Ø x 45 cm) / 10 lbs (4.5 kg)



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

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