LVC 390

High Sensitivity Large Volume 60 Liters Tritium Calorimeter for Non Destructive Assay

LVC 390

High precision Calvet Differential Calorimeter

- Designed to measure in an optimized time small or large volume
- User friendly software including predictive function for the determination of equilibrium and end point of the measurement
- High precision and accuracy, capable to detect mg of waste materials
- NDA method, complementary to gamma spectroscopy

3D sensor inside

CALISTO Thermal Analysis Software

SETARAM Instrumentation
KEP Technologies

The Series 390 is a high sensitive twin cells calorimeter designed for the characterization of nuclear materials and more particularly for the analysis of radioactive wastes and quantification of radioactive elements (e.g. curium, plutonium, tritium) contained in shielded containers.

The HIGHLIGHTS

Differential Calorimetric technique

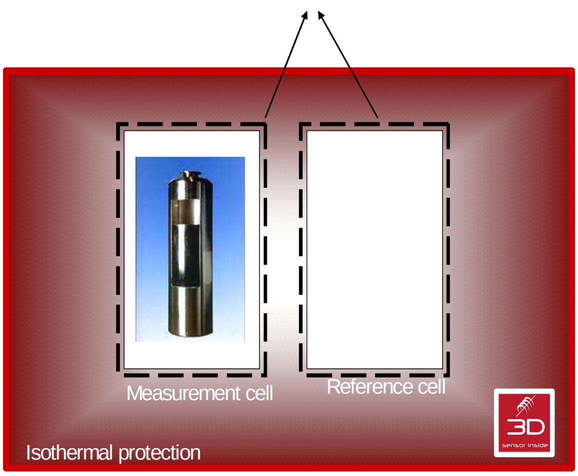
- **NDA Method**
- **Large Variety of samples**: Special 60 liters cylindrical sample volume, able to measure small or large samples
- **Predictive software**: enables the determination of equilibrium and measurement end point, and therefore reduces the measurement time
- **Movable or fixed** : Fixed or mounted on trolley calorimeter, separated electronical rack
- **Enhanced safety** : installation in glove box or hot cell possible
- **Ease of calibration** : Joule effect calibration (removable or built-in)
- **Large measurement window** : power measurement range from 30 mW to 13 W
- **Ultra sensitive** : Measurement accuracy < 1 %, Precision < 0.5 %
- **Ease of use** : Use of state of the art calorimetric software interface CALISTO
- **Ease of sample access** : the sample and reference chambers are accessible from the top of the calorimeter, opened by an automated system with an actuator.

PRINCIPLE

The **LVC-390** is based on the Calvet calorimeter principle : the sensors surround the sample and the reference, collecting all the heatflow emitted by the sample.

The Peltier sensors provide a difference of tension proportional to the difference of temperature between reference cell and measurement cell, both regulated at a fixed temperature.

Sensors (Peltier)



Applications

The waste from the dismantling of equipment facilities or consumables containing residues of radioactive material is subject to rigorous accounting. Conventional methods of measuring radiation (gamma spectrometry, neutron counting) are very often sensitive to the problems of attenuation due to the matrix of the package in which the radioactive material is disseminated among assorted objects (glass, plastics, metal,etc.). As these objects cannot absorb the heat produced by the radioactive material, calorimetry represents the ideal measuring method. The coupling of gamma spectrometry and calorimetry can be used to determine the isotopic composition and the quantity of radioactive species respectively.

Software

The calorimeter will use the SETARAM **Calisto** CGV Software running on PC. **Calisto** CGV software allows the user to prepare the experimental conditions to start the corresponding experiment and to process the results.

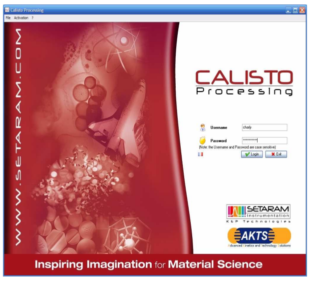
Calisto also offers a whole range of tools to help the user customize their experiments:

• Defining **standard procedures** in order to record the signal coming from the calorimeter, the calorimeter temperature, the Joule effect power.

• **Calibrate** the calorimeter by means of Joule effect.

• **Data management** of the experiments and procedures stored (sorts, filtering as a function of the instrument and the user, etc.).

• Option : **prediction of signal at equilibrium package**. This is a computerized numerical extrapolation system that predicts the value of the signal at equilibrium, and detect the end of measurement. It uses the fact that the calorimetric signal stabilizes exponentially according to the calorimeter characteristics and its load (m.Cp).



Joule effect calibration

The Joule effect calibration system allows for the dissipation of a predefined power level between of 30 mW to 13 W. Calibration by Joule effect uses an electrical cell consisting of a resistive element wound around a metal cylinder. A constant level of power is dissipated in the sensitive area of the instrument. The calculation of the relation between the calorimetric signal (µV) and the power (mW) gives the calibration coefficient (µV /mW) at an isothermal temperature.

Specifications

Calorimeter type	Isothermal heat Flow Differential
Number of cells	2
Volume of measurement cell (liter)	60
Measuring range (mW)	30 – 13000
Approximate measuring range (gT) (1 gT ~ 325 mW)	0.1 - 40
Approximate measuring range (gPu) (1 gPu ~ 3 mW)	10 – 4300
Temperature range (°C)	25 – 40
Accuracy (%)	1
Precision (%)	0.5
Measurement time (h)	5 - 6 (predictive calculation)
Cooling system	Water
Calibration system	Standard electrical heaters
External dimensions Width/ Depth / height(mm)	1500 x 1000 x 960
Weight (kg)	1000

Some of our references

CEA (Commissariat à l'énergie Atomique) – France
BARC (Bhabha Atomic Research Center) – India
AWE – UK
KEPRI – Korea
COGEMA - France

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