ENHANCED FEATURES

- Computer, balance and calorimeter interface.
- Adjustable firing voltages for different firing wire.
- Real-time clock with one week backup.
- 1 Watt consumption.
- Manufacture and history information stored on the vessel.
- User audit trail on calorimeter and PC.

SOFTWARE FEATURES

- User controlled access for vital or routine operations.
- Automatic result retrieval for selected and formatted data.
- Weigh station operation.
- Calorimeter and vessel setup.
- Calibration management.
- Service and maintenance routines.
- Filing, printing and other operator functions, including data export to common formats.
- Real time graphical temperature display.
- Network status display.
- Grouped sample determinations and analysis.
- Colourful general user interface for all windows operating systems.

SYSTEM FEATURES

- Easy to maintain, self system test for Technicians.
- Compact size – able to fit more systems into a standard laboratory.
- Fully automatic operation – temperature readings and calculations are done for you.
- Possible to network up to 7 calorimeters.
- Rapid and accurate determinations (every 2 to 2,5 minutes).
- Isothermal design using a waterless patented vessel (no water bucket, spillage or measuring).
- Large memory for storing more that 2000 determinations, including operating conditions and user statistics.
- Manual or automatic mass entry through the front panel, balance interface or PC.
- Automatic correction for firing wire, cotton, spikes, etc.
- 4 Preprogrammed languages.
- 255 Automatic vessel Identification.
- Fully automatic calibration, with 10 stored calibration curves per vessel for standard deviation.
- Calibrated sensors built into vessel wall.
- Vessel is SMART with fault diagnostics and calorific processor.
- Adjustable firing limits set per vessel.
- High and low mass limits.
- Determination cycle adjustment.
- Other features include User, Group and Sample ID.
- CE Certified. TÜV Certificate.

MANAGEMENT INTERFACE

- Computer, balance and calorimeter interface.
- Adjustable firing voltages for different firing wire.
- Real-time clock with one week backup.
- 1 Watt consumption.
- Manufacture and history information stored on the vessel.
- User audit trail on calorimeter and PC.
MINIMUM SYSTEM For Manual Mass Entry

1 x CAL2k-1 Calorimeter
1 x CAL2k-2 Cooler
1 x CAL2k-4 Vessel
1 x CAL2k-3 Filling Station

Optional:
2 x CAL2k-4 Vessels for Improved Capacity

STANDARD SYSTEM For Automated Mass Entry

1 x Sartorius Balance
1 x CAL2k-1 Calorimeter
1 x CAL2k-2 Cooler
2 x CAL2k-4 Vessels
1 x CAL2k-3 Filling Station

Optional:
3 or 4 x CAL2k-4 Vessels

Networking Systems for Direct Automated Mass Entry
Multiple CAL2k-1 Calorimeters (Maximum of 7 Calorimeters)

SYSTEM with DOCKING STATION

The purpose of the CAL2K-5 DOCKING STATION is to allow the orderly preparation of bomb vessels in a high production environment with multiple calorimeters, multiple bomb vessels and multiple operators.

Connect to:
1. Balance
2. PC Keyboard:
   a) Keyboard entry
   b) Barcode scanner
   c) Both of the above
3. PC via RS232 interface

SYSTEM REPEATABILITY

Calculations:

<table>
<thead>
<tr>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO Spec (Mj/kg)</td>
</tr>
<tr>
<td>Average Value</td>
</tr>
<tr>
<td>Minimum Value</td>
</tr>
<tr>
<td>Maximum Value</td>
</tr>
<tr>
<td>Max. difference to average</td>
</tr>
<tr>
<td>Min. difference to average</td>
</tr>
<tr>
<td>Standard Deviation (Std Dev)</td>
</tr>
<tr>
<td>% Relative Std Dev (%RSD)</td>
</tr>
</tbody>
</table>

Note: %RSD = (Std Dev)/(Average value) * 100
**SYSTEM COMPONENT GUIDE**

### Minimum System

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAL2k-1</td>
<td>Calorimeter</td>
</tr>
<tr>
<td>CAL2k-1-KT</td>
<td>Calorimeter Installation Kit</td>
</tr>
</tbody>
</table>

Included in Kit:
- Printed Handbook
- Operating Manual on CD
- 2 Bottles Benzoic Acid Tablets (25)
- 5 Crucibles
- 1000 Firing Cottons
- Preparation Stand
- Wire Brush

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAL2k-2</td>
<td>Cooler</td>
</tr>
<tr>
<td>CAL2k-2-KT</td>
<td>Cooler Installation Kit</td>
</tr>
</tbody>
</table>

Included in Kit:
- Ambient Cable
- 10m Water Pipe
- 3 Water Pipe Hose Clamps

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAL2k-3</td>
<td>Filling Station</td>
</tr>
<tr>
<td>CAL2k-3-KT</td>
<td>Filling Station Installation Kit</td>
</tr>
</tbody>
</table>

Included in Kit:
- High Pressure Pipe 1m
- Oxygen Regulator Connection
- 2 Flow Adjustor O-Rings
- 5 Nozzle O-Rings
- Handling Hook
- Defiller Cap

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAL2k-4</td>
<td>Vessel</td>
</tr>
<tr>
<td>CAL2k-4-KT</td>
<td>Vessel Installation Kit</td>
</tr>
</tbody>
</table>

Included in Kit:
- Centre Electrode
- Outside Electrode
- Deflector Plate
- 5 Firing Wires
- 10 Top and Bottom O-Rings
- 5 Lid O-Rings

### Optional Extras

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAL2k-PCC</td>
<td>PC Cable</td>
</tr>
<tr>
<td>CAL2k-PCS</td>
<td>PC Software</td>
</tr>
<tr>
<td>CAL2k-BC</td>
<td>Balance Cable</td>
</tr>
<tr>
<td>CAL2k-CIC</td>
<td>Calorimeter Interconnection Cable</td>
</tr>
<tr>
<td>CAL2K-5</td>
<td>Docking Station</td>
</tr>
</tbody>
</table>

### Items to Source Locally

- Balance
  - Note: The recommended balance is Sartorius CP64 but any other equivalent balance can be used. The balance must have the following specifications:
    - Analytical balance with weighing Shield
    - Readability: 0.1mg
    - Output: RS 232
- Oxygen Pressure Regulator
- Water Tap Connection

### TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th></th>
<th>CAL2k-1</th>
<th>CAL2k-2</th>
<th>CAL2k-3</th>
<th>CAL2k-4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dimensions:</strong></td>
<td>mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Width, Height, Depth)</td>
<td>280 x 290 x 400</td>
<td>280 x 250 x 320</td>
<td>220 x 450 x 300</td>
<td>82mm Diameter 150mm Height</td>
</tr>
<tr>
<td><strong>Weight:</strong></td>
<td>kg</td>
<td>9</td>
<td>10</td>
<td>4.5</td>
</tr>
<tr>
<td><strong>Power:</strong></td>
<td></td>
<td>90 – 260 VAC 50/60Hz</td>
<td>90 – 260 VAC 50/60Hz</td>
<td>-</td>
</tr>
<tr>
<td><strong>Operating Temperature:</strong></td>
<td>0 – 60°C</td>
<td>0 – 60°C</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Repeatability:</strong></td>
<td>0.1 (%RSD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Resolution:</strong></td>
<td>0.001 (MJ/kg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature Resolution:</strong></td>
<td>0.000001°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Calibration:</strong></td>
<td>Calibration Details per Calibration Curve</td>
<td>10 Stored Calibration and Deviation Curves</td>
<td>Automatic Standard Deviation Calculations</td>
<td></td>
</tr>
<tr>
<td><strong>Results:</strong></td>
<td>10 per Vessel, per Calorimeter per hour</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The CAL2k system is the most advanced, fully automatic calorimeter system available today. The result of years of research with dedicated engineers employing the latest state-of-the-art technology and the highest quality materials.

The CAL2k is easy to use and has special features which places it in a league of its own. Accuracy is guaranteed with microprocessors that use self-correcting processes, exceeding the standard requirements of DIN, ASTM and ISO. Its ability to interface with a personal computer, ensure preferred results with displays, data printouts and connectivity across a network.

THE CALORIMETER

The CAL2k-1 Calorimeter can operate as either a stand-alone unit or via a PC. When operating as a stand-alone unit it is operated via the keyboard and all relevant information is displayed on the LCD Display. Up to 7 Calorimeters can be connected as a network with or without a PC.

THE VESSEL

The CAL2k-4 vessel is the first of its kind and is the heart of the CAL2k System. Its sophisticated design allows the temperature to be measured to five decimal places in degrees Celsius. The vessel is an intelligent (SMART) vessel with a microprocessor built into its base. The vessel is capable of: firing counts, identification, memory and reconditioning data.

THE FILLING STATION

The Filling Station is designed to fill the vessel with oxygen to 3Mpa. The filling rate is controlled so as not to disturb the sample in the crucible. The Filling Station is extremely easy to operate and requires minimal adjustments and maintenance.

THE COOLER

The unit is designed to reduce the temperature of a recently fired vessel, obtained from the calorimeter, to ambient temperature. Solid state cooling is used and the hot junction of the peltier elements is cooled by a continuous trickle from the mains water supply.
HISTORY OF THE CAL2K

Digital Data Systems (DDS) has more than 30 years experience in calorimetry. In 1972, DDS produced the first unit, the AMPC (Automatic Micro Processor Calorimeter). The AMPC was a dual water isothermal unit controlled by a microprocessor fully designed, developed and produced in South Africa and later exported to the USA, Europe and Australia.

Early in 1980 work began on a new revolutionary design of vessel, namely the DRY vessel or CP510 (patented), which meant that there was no surrounding water jacket. A copper sleeve pressed over the vessel replaced the water jacket and the temperature sensors were placed inside the vessel resulting in the heat transfer being extremely fast. Determination time was significantly reduced, increasing the unit efficiency by 4 times.

With the processing power of the microprocessors available at the time, the CP500 Calorimeter was born. The striking “buttercup yellow” colour gave a splash of brightness to the then drab laboratories. The CP500 proved to be a very fast and reliable machine for doing CV determinations and soon it too was exported to the USA, Europe, Scandinavia, Australasia, Africa and India. The CP500 was used in many industries including: collieries, food (production and research), animal feeds, cement manufactures, brick manufactures, ammunition & explosives, pyrotechnics and liquid fuels.

In early 2002 work began on the CAL2k. The tried and tested DRY system was retained and only the very latest electronic technology was used, including surface mount devices. The vessel is now an INTELLIGENT or SMART unit with a microprocessor and memory built into its base, and the entire system is more compact and has enhanced PC capabilities.

The CAL2k is now in full production and is sure to be an even bigger success than its predecessor, the CP500. Please visit www.cal2k.com for further details about this innovative product.

DDS has also just recently launched a new bomb calorimeter to the CAL2k range, the CAL2k-ECO. Please visit the website: www.cal2k.com/eco_system.asp for more information.

Presented By:  
Manufactured By: