CAL2k ECO

www.cal2k.com

Bomb Calorimeter System

Manufacturing Superb Calorimeters for today's Analytical Needs

System Features

The ECO Bomb Calorimeter is the most affordable of the DDS Scientific product range. The ECO is the most Compact and Cost-Effective of all the models on offer. The ECO can handle 1 determination in an hour. It has been designed with the academic User in mind. It is ideal for low volume sample requirements typically found in Educational Institutions. The ECO Bomb Calorimeter System is packaged complete with : Calorimeter, Filling Station and Two Vessels.

- Conforms to ISO, DIN and ASTM International Standards
- Ideal for low volume applications up to 1 sample per hour with one vessel. Max. 8 samples per day.
- 20 minutes per determination and a further 20 minutes to cool the vessel naturally, total 40 minutes per determination resulting in 1 sample per hour.
- No Water Required
- INEXPENSIVE. Breaks all price/performance norms due to mass production.
- No operator attention required during analysis, the LCD display prompts the operator and displays faults in progress.
- Uses the proven CAL2k "SMART VESSEL"
- Small and compact
- Uses standard PC keyboard (PS2)
- Result retrieval connected to a PC, using the supplied WINDOWS XP software.
- Factory calibrated, but can be calibrated in the field.
- Stores 1000 results and other variables
- Sample identification is settable and self-incrementing
- Vessel temperatures can "stream" to a PC for user spreadsheet analysis.
- Factory setup for standard operation, however some values can be changed via the keyboard to suit specific applications.
- Default setup, which can be invoked from the keyboard
- Can use multiple vessels
- Can use "SPIKING" for hard to combust samples
- Can connect directly to a balance for MASS entry, or the mass can be entered via the keyboard.
- Built-in user diagnostic, which is ideal for first hand diagnostic
- Vessels are pre-programmed for 5000 determination cycles before inspection.
- Factory guaranteed for 3 years
- External power supply for 9 Volts, 100mA is supplied
- Works in BTU/lb, CAL/g, or MJ/Kg

Software Features

- Upload results from ECO
- Interaction between the ECO and software
- View Vessel Data
- View real time graphical temperature display
- High speed data communication
- Allows for on-site firmware upgrades
- Grouped sample determination and analysis

Technical Specification

- **Operating Temperature**
  0 - 60°C
- **Resolution**
  0.001 (MJ/Kg)
- **Temperature Resolution**
  0.000001°C
- **Results per hour**
  1 sample per hour / 8 per day (1 vessel)
- **Repeatability**
  0.1° (%RSD)
- **Power**
  90-260VAC 50/60Hz

Complete ECO System

The Calorimeter

A small, desktop apparatus, in a warm buttercup yellow. It performs the temperature analysis of a sample. The operator, balance, vessel and PC interface together. It is insulated against ambient temperature changes via an "air barrier" and polystyrene. The ambient temperature is measured. It "fires" the sample by heating the firing wire inside the vessel.

The ECO has been designed for the low volume market and is most suitable for customers running less than 8 CV samples per day.

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 microporcessor built into its base. The vessel is capable of : firing counts, identification, memory and reconditioning data.

The vessel is the combustion chamber. It is made of stainless steel and tested up to a pressure of 300 atmospheres (4200psi).

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 disrupt the sample in the crucible. The Filling Station is extremely easy to operate and requires minimal adjustments and maintenance.

The High Pressure Regulator

A supply of oxygen at a pressure of 3Mpa (30 bar) (3000Kpa) within 10 meters of the calorimeter system is required. A suitable high pressure regulator MUST be supplied to allow for this pressure. DDS can supply a suitable regulator at an additional cost or this item should be sourced locally by the agent or customer. However it is important to note that this item is VITAL and MUST be supplied before installation of the system.

Traditional Applications

Fossil Fuels

Producers and users of solid combustible fuels like COAL and OIL use the instrument for quality assurance and exploration. The unit has excellent repeatability and accuracy in accordance with ISO, DIN and ASTM.

Propellants

Here the instrument is used as a quality assurance tool. The vessel is not charged at all, or charged with an inert gas. A small sample is burned and the energy is displayed.

Safety Applications

These applications are mainly concerned with the energy of a substance when burned in a domestic or industrial fire. Seat material in cars, paint on furnishings, plastic used in airliners, floor covers etc. Obviously the flashpoint and gas emissions are important, but the energy of the substance is as well.

Heat Ignitable Explosives (Armaments)

The development and secrecy in the industry prevents us from publishing details. But if the substance can be ignited by heat, then the DDS range of bomb calorimeters can measure it. Typical applications are igniter caps and charges. The vessel is at present used for quality control. The speed of combustion is not measured.

Scientific Research

These applications are endless. Most refer to methods related to combustible energy. However, the rising cost of traditional energy has resulted in more research. A shroud of mystery surrounds the un-conventional energy research, but we have heard of measuring the energy absorption of leaves during sunshine, measuring the energy contained in production by-products, and measuring the energy in vegetable oils. The unit measures disposable waste in accordance with ASTM D5468-02.

Volatile Fuel & Oils

With the price of crude oil escalating as it is at present, the energy of calorific value of fuels is becoming more and more critical. The calorific value of fuel determines the amount of energy contained in it - this means that a fuel of high calorific value will give more energy and thus more propulsion to the vehicle than the fuel of lower calorific value. All liquid fuels can be analyzed in a bomb calorimeter unit. The determination is performed in accordance with ASTM D240-02 and D4809-00 standards.

Non-Traditional Applications

Animal Feed Production

It is obvious that digestible energy is not equivalent to combustible energy. However, the bomb calorimeter can be used in a comparative fashion in quality control in animal feed production and optimization of feed consumption. The instrument is used in animal and dairy research, Departments of Agriculture, Universities and private industry.

The aims are to improve the nutritional value of the feed, or optimize the nutritional absorption by animals. The unit has proved to be a fast and reliable tool in comparison to wet digestive methods.

Production and use of edible oils

The digestive calories of vegetable oils are nearly the same as combustible energy. Therefore the instrument is ideally suited for incoming control of raw products during oil production.

Consequently, any food production, which uses oil in the process, can use the calorimeter to measure the oil content of the final product. Since we are all concerned with the daily intake of calories, the instrument is used to control the use of oil during production of potato chips, canned beef and fish.





System Comparison :

Features	CAL2k	e2k	ECO
Operator Time per test :	2 minutes	2 minutes	5 minutes
Repeatability (%RSD) :	0.1%	0.1%	0.1%
Calorimeter Type :	Static Jacket (Isothermal)	Static Jacket	Static Jacket
Number of Vessels :	Unlimited (10+)	Limited (Up to 8)	Limited (Up to 4)
Closure Type :	Screw Cap	Screw Cap	Screw Cap
Test per hour with 1 vessel :	6-8	6	1
Bomb Type :	Removable	Removable	Removable
Oxygen Filling :	Semi-Automatic	Semi-Automatic	Semi-Automatic
Bomb Washing :	Manual	Manual	Manual
Printer Connection :	RS232	RS232	RS232
Balance Connection :	RS232	RS232	RS232
Temperature Resolution :	0.00001°C	0.00001°C	0.00001°C
Environmental :	10-40°C	10-40°C	10-40°C
Printing of results :	Only via PC Software	Print results without PC on Std Printer	Only via PC Software
PC Software :	Advanced	Limited	Limited
Correction Factors :	2	2	1
Mass Entry :	Auto or Manual	Auto or Manual	Auto or Manual
Keyboard :	Built In	PC Type (Std PS2)	PC Type (Std PS2)
Display :	LCD - English Only	LCD English & one alternative language	PC Type (Std PS2)
CE/TUV Certificate :	Yes	Yes	Yes

System Comparison :

Features	CAL2k	e2k	ECO
Calibration :	Single or Multiple	Single	Single
Power Supply :	External 9V	External 9V	External 9V
Memory :	2000 results	+1000 results	1000 results
Vessel Determinations :	5000	5000	5000
Spiking :	Yes	Yes	Yes
Units of measure :	BTU/Mj/Cal	BTU/Mj/Cal	BTU/Mj/Cal

International Standards

ASTM	Description	Year	Complies
D240-02	Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter	2002	Yes
D4809-00	Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter (Precision Method)	2000	Yes
E144-94	Standard Practice for Safe Use of Oxygen Combustion Bombs	1994	Yes
British	**Description**	**Year**	**Complies**
BS 4791:1985	Specification for Calorimeter Bombs	1985	Yes
BS 1016:105:1992	Methods for analysis and testing of coal and coke. Determination of gross calorific value using adiabetic, isothermal or static bomb calorimeter.	1992	Yes
DIN	**Description**	**Year**	**Complies**
DIN 51900-2	Determining the Gross Calorific value of solid and liquid fuels using isoperibol or static jacket calorimeter and calculation of net CV	2003	Yes
ISO	**Description**	**Year**	**Complies**
ISO 1928 : 1995	Solid mineral fuels - Determining Gross calorific value by bomb calorimetric methods and calculation of net CV	1995	Yes

History of DDS Calorimetry

Digital Data Systems (DDS) has more than 40 years experience in calorimetry.

In 1972, DDS produced their first calorimeter, the AMPC (Automatic Micro Processor Calorimeter). The AMPC was a dual water isothermal unit controlled by a microprocessor.

In 1980 work began on a new revolutionary design of vessel, namely the DRY vessel or CP510, 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.

In 2002 work began on the CAL2K. The tried and tested DRY system was retained and only the very latest electronic technology was used, including the surface mount devices.

In 2005, DDS came to realize the need for smaller, low volume, inexpensive calorimeter systems, with the same accuracy and reliability of the CAL2K. The ECO was then created as an alternative system to the CAL2K. The ECO is suitable for the following markets : Universities, Research Facilities, Brick Manufacturers, Animal Feed Industries, Food Quality, and Food Production.

In 2007 the new e2k system was developed.

Should you require more information on our superb range of bomb calorimeters please contact your nearest dealer or visit our website.

www.cal2k.com

Manufactured by :

digital data systems (pty) ltd dds