



DDS CALORIMETERS

Scientific Analytical Calorimeter Solutions



E2K CALORIMETER

Isothermal Bomb Calorimeter

MANUFACTURING SUPERB CALORIMETERS FOR TODAY'S ANALYTICAL NEEDS

www.ddscalorimeters.com

E2K CALORIMETER

Digital Data Systems has upgraded the E2K bomb calorimeter system. The system now has full menu control. It can operate fully without a PC and results can be printed directly to a RS232 printer. PC and software is optional, however the system is now fully operational without software. All menu functions can be done via the calorimeter.

E2K SYSTEM FEATURES

We call the new upgraded version- Version 2. The system is middle of the range and available in a variety of system options to suit different customers options.

Please note that the E2K does not include the language option and some specifications may vary.



- Full menu control
- No PC or software required
- Intelligent operation support
- Very fast operation due to improved software
- Easy to maintain, self test for technicians and operators
- Compact size
- Operation can be configured to suit every laboratory
- Rapid and accurate determinations
- Capable of doing 6 CV samples per hour using two vessels and the e2k Water Cooler Unit
- Isothermal design using a waterless patented vessel (no bucket, spillage or measuring)
- Large memory for storing more than 1000 determinations
- Manual or automatic mass entry through the keyboard or balance interface
- Automatic correction of firing wire, cotton, spikes, etc.
- Easy to read LCD display in one standard (English) and one alternative language
- Fully automatic calibration in BTU, CAL or MJ/Kg.
- Calibrated sensors built into vessel wall
- Intelligent vessel with fault diagnostics and microprocessor
- Adjustable firing limits
- High and low mass limits to avoid operator error
- Determination cycle adjustment
- Interfaces to standard PS2 computer keyboard
- Acoustical warning for operator convenience
- Auto incrementing 5 digit sample identification
- Factory pre-setting parameters can be invoked from the keyboard
- Extra 8 digit group identification can be used as a sample ID
- Can print results directly without PC on standard 80 column serial printer with RS232 port
- Real time clock for date/time stamping of all results
- Pre-assembled optional cooler interface
- Increased MTBF, approximately 10 years
- Virtually maintenance free
- Protected card for easy exchange

E2K SOFTWARE FEATURES

- Software is optional, all menu functions can now be done via the calorimeter, no PC or software required.
- User controlled access for setting vital parameters once
- Automatic result retrieval for selected and formatted data
- Filing, printing and other operator functions, including data export to common formats.
- Real time graphical vessel temperature display
- Grouped sample determinations and analysis
- Alternative language management
- English Windows Operating Software version ONLY
- Real time clock setting
- Vessel data viewing
- High Speed communication for fast data retrieval.

E2K CALORIMETER

TECHNICAL SPECIFICATIONS

Power

50/60 Hz 90 - 260 VAC

Operating Temperature

0 - 60°C

Repeatability

0.1° (%RSD)

Resolution

0.001 (MJ/Kg)

Temperature Resolution

0.000001°C

Calibration

Calibration Details per Calibration Curve. 10 Stored Calibration and Deviation Curves. Automatic Standard Deviation Calculations.

Results per hour

6 samples (with two vessels)

ELITE SYSTEM OPTION

- 1 x E2K Bomb Calorimeter
- 1 x E2K-2 Cooler
- 1 x E2K-3 Filling Station
- 3 x E2K-4 Vessel

Multiple vessels recommended for high sample volumes. Total determination time 2-3 min per vessel. Discounted price offered on quantities of more than 2 vessels.

ENHANCED FEATURES

- Standard balance interface via 25 pin connector
- Alternative language switch at rear of unit
- Adjustable firing voltages for different firing wire
- Real-time clock with one week backup
- 1 watt power consumption while display is off
- Manufacturer and history information stored on each vessel
- Floating point calculations for high accuracy
- Single control card design
- Keyboard function key for often repeated operations
- Precise and reproducible determination of gross calorific values according to ISO 1928, DIN 51900 and BS 1016:105.

E2K SYSTEM OPTIONS

The E2K is available in 3 system options to accommodate different customer budgets.

MINIMUM SYSTEM OPTION

- 1 x E2K Bomb Calorimeter
- 1 x E2K-3 Filling Station
- 1 x E2K-4 Vessel

Determination time is 2-3 min., however it can take up to 20-30 min. to cool the CAL2K-4 Vessel naturally without the CAL2K-2 Cooler. Making your total determination time 22-33 min. Multiple vessels will increase your sample throughput.

STANDARD SYSTEM OPTION

- 1 x E2K Bomb Calorimeter
- 1 x E2K-2 Cooler
- 1 x E2K-3 Filling Station
- 2 x E2K-4 Vessels

Determination time is 2-3 min and using the CAL2K-2 Cooler the vessel will take a further 2-3 min. Making your total determination time 4-6 min.

Optional Extras :

- 1 x Oxygen Regulator for Filling Station
- 1 E2K Air Cooler (Applicable only to the Minimum System Option)

E2K CALORIMETER

COMPONENTS & ACCESSORIES

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

E2K 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.

AIR COOLER (FAN)

The e2k calorimeter can be used with a Fan Air Cooler the e2k-FAN, however this is only applicable with the minimum system option. It takes approximately 20 minutes for the e2k Fan Air Cooler to bring the vessel temperature back to ambient temperature.

E2K WATER COOLER

The unit is designed to reduce the temperature of a recently fired vessel, obtained from the calorimeter, to ambient temperature in 2-3 minutes. Solid state cooling is used and the hot junction of the peltier elements is cooled by a continuous trickle of water from the main water supply.



E2K CALORIMETER

HIGH PRESSURE OXYGEN 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.



E2K DRY STATIC JACKET ISOTHERMAL BOMB CALORIMETER

The E2K, like both the CAL2K and the ECO, is a “dry” static jacket isothermal calorimeter system. Isothermal design using a waterless patented vessel (no water bucket required)

The advantages are :

- No complicated water pipes and valves and the associated switching circuitry is not required.
- This makes the unit virtually maintenance free.
- The electronic control circuits are reduced, thus making the unit very easy to fault find in the case of failure.
- With reduced electronics in the calorimeter, the training of the service technician is reduced to an absolute minimum.

By making the vessel removable and by removing the cooling of the vessel from the calorimeter, the speed of each determination is greatly increased.

- Once a result is obtained for a determination, the hot vessel can be removed and cooled in a separate cooling unit (optional).
- This allows for another vessel to be inserted into the calorimeter and another determination to be started even before the previous vessel has been cooled.
- This allows for a higher throughput in a single calorimeter.



The use of the dry static jacket method allows all water to be removed from the vessel surrounds which in turn allows electronics to be built into the vessel itself.

- Temperature measurements of the vessel are totally independent of the calorimeter and all calibration data is stored inside the vessel.
- Multiple vessels can be used in a single calorimeter.
- Any vessel can be used in any e2k calorimeter without calibration.
- If a vessel needs reconditioning or fails, the calorimeter can still be used with another vessel.

TRADITIONAL APPLICATIONS

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.



FOSSIL FUELS

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



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 flash point and gas emissions are important, but the energy of the substance is as well.

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 unconventional 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.

HEAT IGNITABLE EXPLOSIVES

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.

VOLATILE FUEL & OILS

With the price of crude oil escalating as it is as present, the energy or 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 feed and dairy research, Departments of Agriculture, Universities and the 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

FEATURE	ECO	E2K	CAL2K	CAL3K-AP	CAL3K-A	CAL3K-U	CAL3K-F
LIMS	No	No	No	2 x via RS232, or Bluetooth	Yes	Yes	Yes
MASS HEAP	No	No	Yes	No	No	No	No
BALANCE INTERFACE	Yes	Yes	Yes, at 2.4KB	Yes, from 1.2 to 38.4KB	Yes, from 1.2 to 38.4KB	Yes, from 1.2 to 38.4KB	Yes, from 1.2 to 38.4KB
RESULT MEMORY	1000 records	+1000 records	2048 records, 131KB	1024 records, 262KB	1024 records	300 records	300 records
TEMPERATURE RESOLUTION	0.000'01°C	0.000'01°C	0.000'01°C	0.000'001°C	0.000'001°C	0.000'001°C	0.000'001°C
DISPLAY	2 x 16 LCD	2 x 16 LCD	4 x 40 character LCD	4 x 40 character LCD	4 x 40 character LCD	4 x 40 character LCD	4 x 40 character LCD
KEYBOARD	PC Type PS2	PC Type PS2	Limited, front panel, no ASCII, on-board	QWERTY, External, PS2	QWERTY, External, PS2	QWERTY, External, PS2	QWERTY, External, PS2
SAMPLE ID	5 characters	5 characters	6 characters	16 characters, auto-increment	16 characters, auto-increment	16 characters, auto-increment	16 characters, auto-increment
GROUP ID	No	8 characters	8 characters	16 characters	16 characters	16 characters	16 characters
VESSEL RECORD	No	No	No	Yes, unlimited	Yes, unlimited	Yes, unlimited	
REAL TIME	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CHASSIS IDENTIFICATION	No	No	No	Yes, number	Yes, number	Yes	Yes
CALIBRATION	Single	Single	Normal replace, single or multiple	Normal average & PC	Normal average & PC	Normal average & PC	Normal average & PC
HISTORY CALIBRATION	No	No	No	Yes, up to 10 runs	Yes, up to 10 runs	Yes, up to 10 runs	Yes, up to 10 runs
UNITS	KJ, BTU, CAL	KJ, BTU, CAL	KJ, BTU, CAL	KJ, BTU, CAL	KJ, BTU, CAL	KJ, BTU, CAL	KJ, BTU, CAL
RESULT COMPENSATION	No	No	No	Via PC (IntelCal), Default	Via PC (IntelCal), Default	Via PC (IntelCal), Default	Yes
RESULT VALIDATION	No	No	No	Yes	Yes	Yes	Yes
VESSEL PRESS. MONITOR	No	No	No	Up to 100 bar	No	No	No
OXYGEN FILLING	External manual filling station	External manual filling station	External manual filling station	Internal, automatic filling	External manual filling station	External manual filling station	External manual filling station
DE-FILLING	Manual	Manual	Manual	Automatic	Manual	Manual	Manual
MAX CHASSIS RECORDING	-	-	-	Yes	Yes	Yes	Yes
CHASSIS NAME	No	No	No	20 characters, Bluetooth name	20 characters, Bluetooth name	20 characters	20 characters, Bluetooth name
PASSWORD	No	No	User Security Manager Password, PC Password	CAL3K & PC Password	CAL3K & PC Password	CAL3K & PC Password	CAL3K & PC Password
NETWORK MULTIPLE CALORIMETERS	No	No	Yes, up to 7 x CAL2K	No	No	No	No
VESSEL LEAK MONITOR	No	No	No	Yes, flags result and warning	No	No	No
EVENT STORAGE	No	No	No	~6000 events	~6000 events	~3000 events	~3000 events
EVENT TYPES	-	-	-	~70 different events	~70 different events	~70 different events	~80 different events
EVENT CLASSIFICATION	-	-	-	Operational & Technical	Operational & Technical	Operational & Technical	Yes

SYSTEM COMPARISON

FEATURE	ECO	E2K	CAL2K	CAL3K-AP	CAL3K-A	CAL3K-U	CAL3K-F
VESSEL INTERCHANGE	No	No	No	Yes	Yes	Yes	Yes
VESSEL LOCKOUT, LOCK-IN	No	No	No	Yes, Manual/Auto Linking	Yes, Manual/Auto Linking	Yes, Manual/Auto Linking	Yes, Manual/Auto Linking
SAMPLE REPEAT SPEED	40 min	10 min (water cooler) 25min (air cooler)	7-8 min	4-6 min	4-5 min	8-10 min	5-7 min
OPERATOR TIME PER TEST	5 min	2 min	2 min	2 min	2 min	1 min	1 min
COOLING	Air	Air/Water	Water	Air	Air	Air	Air
COOLING MODES	-	-	-	Ambient/Fixed	Ambient/Fixed	Ambient/Fixed	Ambient/Fixed
RSD	0.1	0.1	0.1	<0.1	0.1	0.1	0.1
POWER CONSUMPTION	0-264 VAC 50/60 Hz 1W	0-264 VAC 50/60 Hz 1W	0-264 VAC 50/60 Hz 5W	0-264 VAC 12W	0-264 VAC 12W	12 VAC 6W	12 VAC 6W
POWER SUPPLY	External 9V	External 9V	External 9V	External 12V	External 12V	External 12V	External 12V
WATER CONSUMPTION	Waterless	Yes, re-circulating	Yes, re-circulating	None	None	None	None
REPEATABILITY	0.1%	0.1%	0.1%	<0.1%	0.1%	0.1%	0.1%
CALORIMETER TYPE	Static Jacket	Static Jacket	Static Jacket (Isothermal)	Dynamic, Isothermal, Adiabatic	Dynamic, Isothermal, Adiabatic	Dynamic	Dynamic
NUMBER OF VESSELS	Limited (Up to 4)	Limited (Up to 8)	Unlimited (10+)	Unlimited	Unlimited	Unlimited	Unlimited
CLOSURE TYPE	Screw Cap	Screw Cap	Screw Cap	Bayonet Lid	Bayonet Lid	Bayonet Lid	Bayonet Lid
TESTS P/H WITH 2 VESSELS	1	6	10	10+	10+	8+	8+
BOMB VESSEL TYPE	Removable	Removable	Removable	Removable	Removable	Removable	Removable
OXYGEN FILLING	Semi-Automatic	Semi-Automatic	Semi-Automatic	Fully Automatic	Semi-Automatic	Semi-Automatic	Semi-Automatic
BOMB VESSEL WASHING	Manual	Manual	Manual	Manual	Manual	Manual	Manual
PRINTER CONNECTION	RS232	RS232	RS232	RS232	RS232	RS232	RS232
BALANCE CONNECTION	RS232	RS232	RS232	RS232	RS232	RS232	RS232
ENVIRONMENTAL	10-40°C	10-40°C	10-40°C	5-40°C	5-40°C	5-40°C	5-40°C
PRINTING OF RESULTS	Via PC Software	Print without PC (direct)	Via PC Software	Via PC Software	Via PC Software	Via PC or RS2232	Via PC or RS2232
PC SOFTWARE	Limited	Limited	Advanced	Advanced	Advanced	Advanced	Advanced
CORRECTION FACTORS	1	2	2	8	8	8	8
MASS ENTRY	Auto & Manual	Auto & Manual	Auto & Manual	Auto & Manual	Auto & Manual	Auto & Manual	Auto & Manual
CE/TUV CERTIFICATE	Yes	Yes	Yes	Yes (Pending)	Yes (Pending)	Yes (Pending)	Yes (Pending)
VESSEL DETERMINATIONS	5000	5000	5000	Unlimited	Unlimited	Unlimited	Unlimited
SPIKING	Yes	Yes	Yes	Yes	Yes	Yes	Yes

SYSTEM COMPARISON

FEATURE	ECO	E2K	CAL2K	CAL3K-AP	CAL3K-A	CAL3K-U	CAL3K-F
SELF TESTING	No	No	No	Yes	Yes	Yes	Yes
CONNECTIVITY	RS232	RS232	Multi-drop RS232 port at 9.6KB	USB 2.0, 2 x RS232 at 115.2KB for Bluetooth	USB 2.0, 2 x RS232 at 115.2KB for Bluetooth	USB 2.0, 2 x RS232 at 115.2KB	USB 2.0, 2 x RS232 at 115.2KB
STATS	No	No	No	Yes	Yes	Yes	Yes
PRINTING	No	No	No	Yes, D1 port, 1.2 to 115.2KB	Yes, D1 port, 1.2 to 115.2KB	Yes, D1 port, 1.2 to 115.2KB	
MOISTURE COMPENSATION	No	No	No	Yes	Yes	Yes	Yes
FOOD FIBRE COMPENSATION	No	No	No	Yes	Yes	Yes	Yes
LIMS	No	No	No	Yes	Yes	Yes	Yes
RESULT APPROVAL	No	No	No	Yes, keyboard or PC	Yes, keyboard or PC	Yes, keyboard or PC	Yes, keyboard or PC
REAL TIME PRINTOUT	No	No	No	Yes, optional customer and parameter header	Yes, optional customer and parameter header	Yes, optional customer and parameter header	Yes, optional customer and parameter header
GELATINE CAPSULE				Yes	Yes	Yes	
COMPENSATION							
SPIKING	Yes	Yes	Yes	Yes	Yes	Yes	Yes

INTERNATIONAL STANDARDS

ASTM	Description	Year	Complies
	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 adiabatic, 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	Solid mineral fuels- Determining Gross calorific value by bomb calorimetric methods and calculation of net CV	1995	Yes

E2K CALORIMETER

COMPANY HISTORY

Digital Data Systems (DDS has more than 40 years of 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.

digital data systems (pty) ltd

dds

**DDS Calorimeters are proudly manufactured by :
Digital Data Systems (Pty) Ltd.**

For more information about any of our products visit our website at www.ddscalorimeters.com.

DDS Calorimeters

Email : calo@ddsystems.co.za
Tel : +2711 792 9805
www.ddscalorimeter.com

22 Arbeid Avenue
Strydom Park
Randburg, Gauteng
2196

