



**DDS CALORIMETERS**

Scientific Analytical Calorimeter Solutions



# CAL3K-AP CALORIMETER

## Oxygen Bomb Calorimeter

MANUFACTURING SUPERB CALORIMETERS FOR TODAY'S ANALYTICAL NEEDS



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# CAL3K-AP CALORIMETER

The CAL3K-AP is the first in the range of innovative new oxygen bomb calorimeters from DDS. The new range, from the engineers who designed the CAL2K oxygen bomb calorimeter range, features higher speeds and improved accuracy with a small carbon footprint (uses less resources; no water required, lower power consumption). The new bayonet bomb vessel with the option of the adiabatic, isothermal or dynamic calorimetry methods results in optimized speed and accuracy. This can be tailored to your laboratory needs by parameter settings via the USB port. The CAL3K-AP conforms to ASTM D5865-12, ASTM D4809-13, ISO 1928-2009, and DIN 51900-2 international standards. The traditional CAL2K-4 bomb vessel has been replaced with a self-locking and sealing **bomb** vessel with built-in temperature sensors. The vessel is completely removable for easy sample management, cooling, cleaning and maintenance. The CAL3K can interface with multiple devices required for sample determination.

## COMPLETE SYSTEM

The oxygen bomb calorimeter and air cooler are operated together for effective routine sample determination, using 2 or more bomb vessels. It is recommended to use the air cooler for optimum results and faster throughput.



## COMPLETE SYSTEM

FOR USE WITH THE CAL3K-AP.

The CAL3K-AP is best suited for a clean and well maintained laboratory with a requirement for very fast and accurate results.

The following accessories can be added to the calorimeter:

- Analytical Balance (sold separately)
- High Pressure Oxygen Regulator (sold separately)
- RS232 Printer (sold separately)

**CAL<sup>3</sup>K**  
NEXT GENERATION CALORIMETERS

The complete CAL3K-AP oxygen bomb calorimeter system contains all the parts and consumables necessary to set up the unit. The installation kits included with the setup of the calorimeter contains consumables for approximately 200 samples, depending on the type of sample being analyzed (coal analysis, animal feed analysis). Other samples like oil, might use more consumables as they are corrosive and could cause wear and tear. Additional consumables can be purchased separately from our authorized agents.

The complete calorimeter system is delivered with installation kits for the calorimeter, air cooler and vessels (for approx. 200 firings). The CAL3K-AP uses a combination of the Isothermal and Adiabatic calorimetry methods, while still using the dry method, i.e. it's waterless. The sample repeat speed is between 4-6 minutes.

The vessel is automatically filled with oxygen inside the calorimeter, and defilled on completion of a determination.

An average of 8 or more tests per hour can be achieved with 2 vessels.



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# CAL3K-AP CALORIMETER

## ADVANCED CAL3K-AP FEATURES



**VARIABLE FILLING PRESSURE**  
Allows for variable filling pressure



**FAULT FINDING**  
Extensive fault finding and testing



**STEP-BY-STEP HELP**  
Screen prompts assist with step-by-step instructions to operate the calorimeter



**15 CALIBRATION FIELDS**  
For different mode and different calorimeters



**TEMPERATURE ACCURACY**  
Temperature accuracy of 10ppm (parts per million)(0.00001°C)



**4K-4 THREAD TYPE BOMB VESSEL**  
Self-Locking and Self-Sealing thread type bomb vessel



**HIGH SPEED DETERMINATIONS**  
Choose between faster or more accurate determinations



**RESULTS**  
Results in KJ/g, KBTU/lb or KCal/g



**AIR COOLER**  
No water required to cool the bomb vessel



**EXTREMELY ACCURATE**  
Extremely accurate (%RSD - 0.05%) determination eliminates multiple sample repeats



**COMPENSATION\***  
Compensation for firing energy, sulphur, moisture, fibres



**BALANCE INTERFACE**  
Balance interface with baud speed setting



**MULTIPLE COMM CHANNELS**  
1 Wired (USB) and 2 optional wireless channels



**PRESET FIELDS**  
One default setting per mode



**TEMPERATURE CONTROL**  
No temperature control of room/lab required



**USER FRIENDLY**  
User Friendly Operation



**OPERATING PARAMETERS**  
Operating parameters can be changed via USB interface in experimental mode



**LEAK DETECTION**  
Detects leaks and aborts the firing in the vent of a leak



**15 CALIBRATION AVERAGE**  
For variable amount of calibration average to suit your application



**RESTRICT ACCESS**  
Operating parameter access is password restricted



**LOW POWER CONSUMPTION**  
Very low power consumption. No temperature controlling required.



**LARGE STORAGE**  
Up to 700 results storage



**ECO FRIENDLY**  
Eco Friendly - small carbon footprint. No water, low power consumption.



**INTELLIGENT VESSEL**  
Intelligent vessel with built-in temperature sensing



**TEMPERATURE RANGE**  
Extensive temperature range from 0°C to 70°C.



**LINEAR SENSORS**  
Linear temperature sensing with platinum sensors



**SAFETY**  
Safety checks guarantee the safety of the operator.



**NO WATER REQUIRED**  
No Water Bucket. No Spillage. No Measuring.



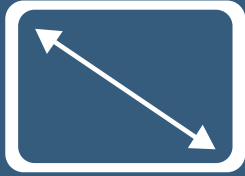
**THREE OPERATING MODES**  
Isothermal, Adiabatic and ISOBATIC (and experimental)



**AUTOMATIC OXYGEN FILLING**  
Automatic oxygen filling and de-filling of the reaction vessel



# TECHNICAL SPECIFICATIONS



## LCD Display

Large display for easy viewing.

# x3

## Easy to Use

With 3 different operating modes



## Compact Size

Approximately 350mm x 280mm x 240mm



## Lightweight

Light weight for easy moving.  
Approximately 12kg.



## TUV CE Certification

Complies with ASTM, DIN and ISO International Standards.

## Specification

## Information

Working (Operating) Temperature	15-70°C
Storage Temperature	0-70°C
Temperature Resolution	0.000001°C
Reproducibility/Repeatability	0.1% RSD
Resolution	0.0001 MJ/Kg
Results per hour	9 samples per hour using 2 bayonet bomb vessels
Measuring range max.	99MJ, 99,000,000Joules, 99KJ/g
Working temperature min.	0°C
Working temperature max.	50°C
Cooling Medium	Air



# TECHNICAL SPECIFICATIONS

Specification	Information
Type of Cooling	Airflow
Oxygen Operating Pressure Max	40 bar
Balance/Scale Interface	RS232
Printer Interface	RS232
PC Interface	USB
Power Input	12W
Interface External Keyboard	PS2
Oxygen Filling	Automatic
De gasification	Automatic
Halogen (Decomposition) Vessel	Yes, optional
Analysis according to DIN 51900	Yes
Analysis according to ASTM D240	Yes
Analysis according to ASTM D4809	Yes
Analysis according to ASTM D5865	Yes
Analysis according to ASTM E711	Yes
Analysis according to ISO 1928	Yes
Dimensions	350mm x 280mm x 240mm
Weight	~ 12.000kg
Permissible Ambient Temperature	0-35°C
Permissible Relative Humidity	80%
RS232 Interface	Yes
USB Interface	Yes
Voltage	220-240 / 100-120V, 12VDC, 3Amp
Frequency	50/60 Hz



# SYSTEM COMPARISON

FEATURE	CAL3K-AP	CAL3K-A	CAL3K-F	CAL3K-S	CAL3K-ST
BALANCE INTERFACE	Yes, from 2.4 to 38.4KB	Yes, from 2.4to 38.4KB	Yes, from 2.4 to 38.4KB	Yes, from 2.4 to 38.4KB	Yes, from 2.4 to 38.4KB
RESULT MEMORY	700 records, 262KB	700 records	900 records	480 records	430 records
TEMPERATURE RESOLUTION	0.000'001°C	0.000'001°C	0.000'001°C	0.000'001°C	0.000'001°C
DISPLAY	4 x 40 character LCD	4 x 40 character LCD	4 x 40 character LCD	2 x 20 character LCD	4 x 40 character LCD
KEYBOARD	QWERTY, External, PS2	QWERTY, External, PS2	QWERTY, External, PS2	QWERTY, External, PS2	QWERTY, External, PS2
SAMPLE ID	16 characters, auto-increment	16 characters, auto-increment	16 characters, auto-increment	16 characters, auto-increment	16 characters, auto-increment
GROUP ID	16 characters	16 characters	16 characters	16 characters	16 characters
REAL TIME	Yes	Yes	Yes	Yes	Yes
CALIBRATION	15	15	15	15	15
UNITS	KJ, KBTU, CKAL	KJ, KBTU, KCAL	KJ, KBTU, KCAL	KJ, KBTU, KCAL	KJ, KBTU, KCAL
RESULT COMPENSATION	Automatically applied	Automatically applied	Automatically applied	Automatically applied	Automatically applied
VESSEL PRESS. MONITOR	Up to 100 bar	No	No	No	No
OXYGEN FILLING	Internal, automatic filling	External manual filling station	External manual filling station	External manual filling station	External manual filling station
DE-FILLING	Automatic	Manual	Manual	Manual	Manual
MAX CHASSIS RECORDING	Yes	Yes	Yes	Yes	Yes
CHASSIS NAME	16 characters, Bluetooth name	16 characters, Bluetooth name	16 characters, Bluetooth name	16 characters, Bluetooth name	16 characters, Bluetooth name
KEYBOARD PASSWORD	CAL3K	CAL3K	CAL3K	CAL3K	CAL3K
VESSEL LEAK MONITOR	Yes, flags result and warning	No	No	No	No
EXTERNAL COOLER	Yes	Yes	Yes	No, Built-tin	Yes
ACCEPT CAL2K VESSEL	No	No	No	No	Yes
VESSEL LOCKOUT, LOCK-IN	Yes, 2500 firings	Yes, 2500 firings	Yes, 2500 firings	Yes 5000 firings	Yes, 5000 firings
SAMPLE REPEAT SPEED	6 min	4-5 min	7-8 min	20 min	20 min
OPERATOR TIME PER TEST	+/- 3 min	+/- 3 min	+/- 3 min	+/- 3 min	+/- 3 min
COOLING	Air	Air	Air	Built-in	Built-in
COOLING MODES	Ambient/Fixed	Ambient/Fixed	Ambient/Fixed	Ambient/Fixed	Ambient/Fixed
RSD	0.1	0.1	0.1	0.1	0.1
POWER CONSUMPTION	12W	12W	6W	6W	6W
POWER SUPPLY	External 12V	External 12V	External 12V	External 12V	External 12V
WATER CONSUMPTION	None	None	None	None	None
REPEATABILITY	0.10%	0.10%	0.10%	0.10%	0.10%
OPERATING MODES	Dynamic, Isothermal, Adiabatic	Dynamic, Isothermal, Adiabatic	Dynamic	Dynamic	Dynamic
NUMBER OF VESSELS	4	4	4	1	2
CLOSURE TYPE	Screw (Thread) Cap	Screw (Thread) Cap	Screw (Thread) Cap	Screw (Thread) Cap	Screw (Thread) Cap
TESTS P/H WITH 2 VESSELS	8+	10+	4-6+	2	3+
BOMB VESSEL TYPE	Removable	Removable	Removable	Removable	Removable
OXYGEN FILLING	Fully Automatic	Semi-Automatic	Semi-Automatic	Semi-Automatic	Semi-Automatic
BOMB VESSEL WASHING	Manual	Manual	Manual	Manual	Manual
PRINTER CONNECTION	RS232	RS232	RS232	RS232	RS232
BALANCE CONNECTION	RS232	RS232	RS232	RS232	RS232
ENVIRONMENTAL	5-40°C	5-40°C	5-40°C	5-40°C	5-40°C
PRINTING OF RESULTS	Via PC or RS232 Printer	Via PC or RS232 Printer	Via PC or RS2232 Printer	Via PC or RS2232 Printer	Via PC or RS2232 Printer
PC SOFTWARE	Advanced	Advanced	Advanced	Advanced	Advanced
CORRECTION FACTORS	4	4	4	4	4
MASS ENTRY	Auto & Manual	Auto & Manual	Auto & Manual	Auto & Manual	Auto & Manual
CE/TUV CERTIFICATE	Yes (Pending)	Yes (Pending)	Yes	Yes	Yes (Pending)
SPIKING	Yes	Yes	Yes	Yes	Yes

## DDS Calorimeters I CAL3K-AP Oxygen Bomb Calorimeter



# SYSTEM COMPARISON

FEATURE	CAL3K-AP	CAL3K-A	CAL3K-F	CAL3K-S	CAL3K-ST
SELF TESTING	Yes	Yes	Yes	Yes	Yes
AI COMPENSATION	Yes	Yes	Yes	Yes	Yes
CONNECTIVITY	USB 2.0, 2 x RS232 at 115.2KB for bluetooth	USB 2.0, 2 x RS232 at 115.2KB for bluetooth	2 x RS232 at 115.2KB	2 x RS232 at 115.2KB	2 x RS232 at 115.2KB
PRINTING	Yes	Yes,	Yes	Yes	Yes
MOISTURE COMPENSATION	Yes	Yes	Yes	Yes	Yes
FOOD FIBRE COMPENSATION	Yes	Yes	Yes	Yes	Yes
REAL TIME PRINTOUT	Yes,	Yes,	Yes	No	No
GELATINE CAPSULE COMP.	Yes	Yes	Yes	Yes	Yes

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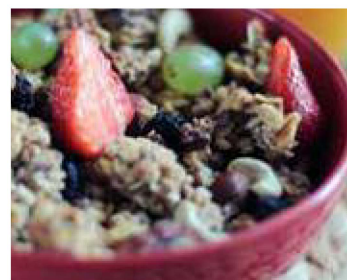
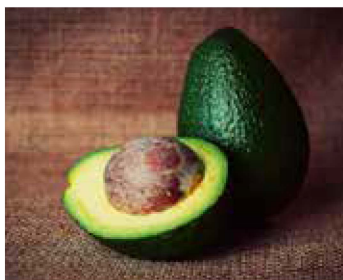
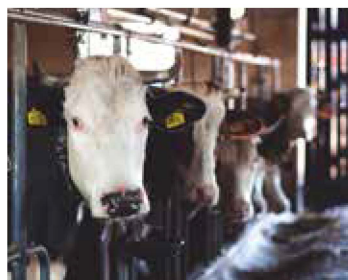
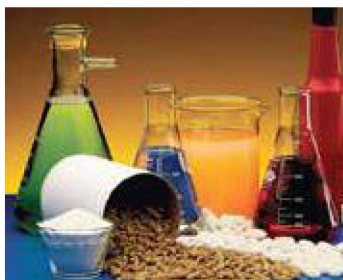
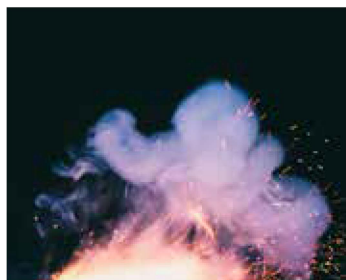
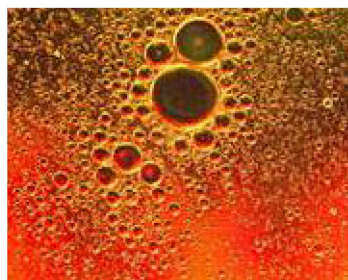


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# APPLICATIONS



The CAL3K-AP Oxygen Bomb Calorimeter System can be used with most applications including, but not limited to : Coal Analysis, Fuel Analysis, Alternative Energy, Waste Analysis, Animal Feed Research, University Research, Food/Nutrition Analysis, Explosives Analysis, Coal Analysis, Oil Analysis, and other traditional and non-traditional applications.



# CONTACT US

## 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.

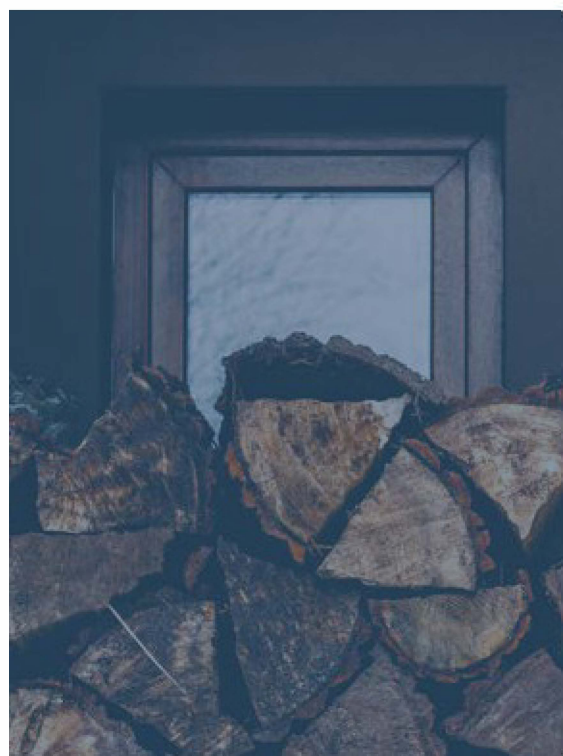
In 2002 work began on the CAL2K. The tried and tested DRY system was retained and only the very latest electronic technology was used, including the surface mount devices.

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



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