



**DDS CALORIMETERS**

Scientific Analytical Calorimeter Solutions



# CAL3K-A CALORIMETER

## Oxygen Bomb Calorimeter

MANUFACTURING SUPERB CALORIMETERS FOR TODAY'S ANALYTICAL NEEDS

[www.ddscalorimeters.com](http://www.ddscalorimeters.com)

# CAL3K-A CALORIMETER

The CAL3K-A is the second in the range of innovative new oxygen bomb calorimeters from DDS. It is the companion product to the CAL3K-AP, but with external oxygen filling. 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-A 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 bayonet vessel with built-in temperature sensors. The vessel is completely removable for easy sample management, cooling, cleaning and maintenance.

## COMPLETE SYSTEM

The oxygen bomb calorimeter, filling station 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-A.

The CAL3K-A is best suited for a production environment with shared oxygen supply (to other users) and robust handling.

The following accessories can be added to the calorimeter:

- CAL3K Air Cooler
- CAL3K Manual Bayonet Bomb Vessel
- Sartorius Balance (sold separately)
- High Pressure Oxygen Regulator

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

The complete CAL3K-A 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, filling station, air cooler and vessels (for approx. 200 firings). The CAL3K-A uses a combination of the Isothermal and Adiabatic and Dynamic (Isoperibol) calorimetry methods, while still using the dry method, i.e. it's waterless. The sample repeat speed is between 4-5 minutes.

The vessel is manually filled with oxygen via the external oxygen bomb filling station.

An average of 10 or more tests per hour can be achieved with 2 vessels.

# CAL3K-A CALORIMETER

## ADVANCED CAL3K-A FEATURES



### TEMPERATURE CONTROL

No temperature control of room/lab required



### FAULT FINDING

Extensive fault finding and testing



### STEP-BY-STEP HELP

Screen prompts assist with step-by-step instructions to operate the calorimeter



### 7 CALIBRATION FIELDS

For different mode and different calorimeters



### TEMPERATURE ACCURACY

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



### BAYONET BOMB VESSEL

Self-Locking and Self-Sealing manual bayonet bomb vessel



### HIGH SPEED DETERMINATIONS

Choose between faster or more accurate determinations



### RESULTS

Results in MJ/Kg, BTU/lb or Cal/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 and sulphur



### 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



### IMPROVED INITIAL TIMING

Based on drift and time, or time after drift



### USER FRIENDLY

User Friendly Operation



### OPERATING PARAMETERS

Operating parameters can be changed via USB interface in experimental mode



### FULL LIMS SUPPORT

For the assignment, scheduling, and tracking of samples.



### 10 CALIBRATION AVERAGE

For variable amount of calibration average to suit your application



### RESTRICT ACCESS

Operating parameter access is password restricted



### FILTER DATA ON EVENTS

Extensive testing and detailed data viewing



### LOW POWER CONSUMPTION

Very low power consumption. No temperature controlling required.



### LARGE STORAGE

Up to 1024 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



### EVENT LOGGING

Built-in event logging for ~6000 events



### 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 ISO BATIC (and experimental)



### MANUAL OXYGEN FILLING

Makes use of an external oxygen filling station

# CAL3K-A CALORIMETER

## The CAL3K Bomb Calorimeter Installation Kit includes :

- Power Supply (3K-SM)
- Mains Cable 220V (KETTLECORD)
- Balance Cable (3K-BC)
- PC Cable USB (USBCABAB)
- PC Keyboard PS2 (CAL2K-KB)
- Preparation Stand (3K-4-PS)
- Stainless Steel Tweezers (TWEEZERS/S/S)
- Certified Benzoic Acid Tablets (50 x 0.5g tablets per bottle)(CAL2K-4-BA)
- High Pressure Oxygen Pipe 4mm (4m long, clear)(3K-1-OP)
- Oxygen Regulator Connection Standard (Quick Fit)(3K-1-RC)
- Calorimeter O-Rings (1 packet of 5)(3K-1-CF-05)
- O-Ring Retainer for Centre Filling Plastic (3K-1-LCR)
- Tool to Remove O-ring Retainer (3K-1-LCR-TOOL)
- Vessel Nozzle Kit complete with nozzle o-ring and nut (3K-4-VN-KT)
- Printed Installation Guide (3K-1-INST)

## CAL3K-A KIT AND CONSUMABLES

### The CAL3K Air Cooler Installation Kit includes :

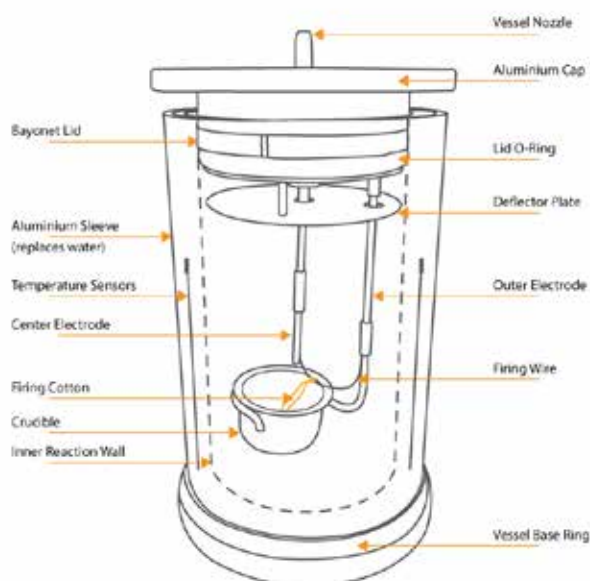
- Power Supply (3K-SM)
- Mains Cable 220V (KETTLECORD)

### The CAL3K Bayonet Vessel Installation Kit includes :

- Center Electrode (3K-4-CE)
- Vessel Nozzle O-Ring (3K-4-VNR)
- Outside Electrode (3K-4-OE)
- Crucibles (CAL2K-4-CB-SINGLE)
- Deflector Plate (3K-4-DP)
- Firing Wire (3K-4-FW)
- Firing Cotton (1 packet of 200 threads)(3K-FC)
- Lid O-Rings (1 packet of 5)(3K-4-LR-5)

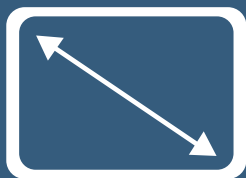
### The CAL3K Filling Station Installation Kit includes :

- 2 x Flow Adjustor O-Rings (3K-3-FR)
- 5 x Nozzle O-Rings (3K-3-NR)
- 1 x High Pressure Pipe 4mm (2m, clear)(3K-3-OP)
- 1 x Oxygen Regulator Connection (3K-3-RC)
- 1 x Defiller Cap (3K-3-DC)



CAL3K Bayonet Bomb Vessel & Air Cooler

# TECHNICAL SPECIFICATIONS



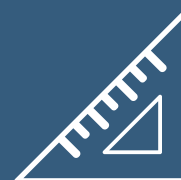
## LCD Display

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	<0.01% RSD
Resolution	0.0001 MJ/Kg
Results per hour	12 samples per hour using 3 bayonet bomb vessels
Measuring range max.	99MJ, 99000J
Working temperature min.	0°C
Working temperature max.	50°C
Temperature Measurement Resolution	10ppm (parts per million)
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	Manual
De gasification	Manual
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

**Please Note : Technical Specifications subject to change without prior notice.**

**Please contact our team for accurate technical specifications at the time.**



# 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



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

For more details and application notes visit our website at [www.ddscalorimeters.com](http://www.ddscalorimeters.com)

# 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.

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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](http://www.ddscalorimeters.com).

### DDS Calorimeters

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