EN |

C 3000
Calorimeter

IKA

analytical equipment
designed for scientists

C 3000 isoperibol calorimeter

When the monetary value of coal samples needs to be determined, for instance, accurate analysis is required. IKA calorimeters provide reliable and repeatable measurement results. With the IKA C 3000 isoperibol calorimeter we launch the technologically advanced successor of our C 2000 model, with great new features such as faster sample runs, a spherically shaped decomposition vessel for faster heat transfer and a convenient touch screen for easy operation. Both oxygen filling as well as the complete water handling are fully automated.

Its measurements and calculations of net calorific value are according to ISO 1928, ASTM D4809, ASTM D5865, ASTM D240 and GB T213. Areas of application include the power and cement industry where accurate analyses are vital.

Enjoy working with this automated unit and spend the time saved for other activities in your lab.

2 year warranty*

CE

RSD 0.05 % – 0.15 %
max. enegry Introduction 40,000 J

*1+1 years after registering at www.ika.com/register, wearing parts excluded

General operation

Easy handling by touch screen operation or a standard USB mouse

Control chart view and correction calculations according to a number of standards ISO, DIN, EN, ASTM, GB etc.

Simple and convenient touch screen operation

Software provides control chart view of globally used standards

Operating modes

For every operating mode, there are two different start temperatures to choose from depending on the required standard and room conditions.

Measurements	per hour	RSD in %
isoperibol:	4	0.05
dynamic:	6	0.15

▷ 22°C
▷ 30°C

The operator can choose between two different start temperatures

Interfaces

Ethernet interface for a network printer

RS 232 interfaces for a balance or PC software (e.g. Calwin C 6040)

SD card slot for software update as well as measurement data management to transfer the raw data of the sample run in ASCII format to another PC and import to MS Excel, for example.

SD card slot for additional data management

Ethernet interface for data management via FTP Server

Temperature control

The water jacket in the calorimeter completely surrounds the inner vessel. Water also flows through the lid.

Six temperature sensors are built into the unit to monitor all temperatures allowing best analysis of water-flow and controlling parameters for the inner and outer water cycle, environment and electronics.

Six temperature sensors ensure best analysis

Decomposition vessel

The decomposition vessel is spherically shaped on the top for better pressure stability and faster heat transfer. After each experiment, the vessel can be removed effortlessly. Its new design easily allows visual inspection of the combustion result as well as convenient cleaning. The decomposition vessel has a CE-certificate.

The halogen resistant decomposition vessel C 6012 included with the C 3000 Package 2/12 is equipped with the unique-to-IKA catalytic active inner surface. It supports the chemical reactions inside the vessel, resulting in a higher recovery rate for halogens and sulfur.

Decomposition vessel with spherical top, better heat transfer, faster experiment run times

Sample preparation

Sample preparation is easy and can be done without using a separate stand, as the electrodes and crucible holders of the decomposition vessel are upside down.

Simple decomposition vessel preparation due to new upside down crucible holder technology

C 3000 Packages

IKA calorimeter packages are carefully configured packages and contain a vast number of additional accessories and pre-assembled parts; allowing for a very simple installation process of the device.

Requirements on site are stable power, 5 liters of water (drinking water quality) as well as an oxygen tank with adjustable pressure reducer (that can be set to 30 bar). The oxygen (O_2) hose (included) comes with optional fittings for threads such as M 8x1, R1/4" or 1/4" NPT.

All packages include wear parts, consumables and tools that usually last for 500 measurements.

The C 3000 is available in four different packages:

C 3000 isoperibol PACKAGE 2/10 | Ident. No. 0010003367

C 3000 Measurement cell isoperibol
C 6010 Standard decomposition vessel

C 3000 isoperibol PACKAGE 2/12 | Ident. No. 0010003368

C 3000 Measurement cell isoperibol
C 6012 Halogen resistant decomposition vessel

C 3000 PACKAGE 1/10 plus | Ident. No. 0010003635

C 3000 Measurement cell isoperibol
C 6010 Standard decomposition vessel
RC 2 basic recirculation chiller
Oxygen regulator
Pellet press

C 3000 PACKAGE 1/12 plus | Ident. No. 0010003636

C 3000 Measurement cell isoperibol
C 6012 Halogen resistant decomposition vessel
RC 2 basic recirculation chiller
Oxygen regulator
Pellet press

Scope of delivery

Every C 3000 package includes all parts required to set up the unit and connect it to a chiller such as RC 2 basic and oxygen pressure regulator.

> 2x pre-assembled hoses with clamps and quick connect fittings (M16x1)
> 1x C 6000.1 water protect
> 1x oxygen filling hose with two adapters to connect to an Oxygen pressure regulator either via M 8x1, R1/4" or 1/4" NPT
> 1x oxygen venting line with capillary venting tool for manual degassing of the decomposition vessel
> 1x C 60.1012 organizer for easier handling of the decomposition vessel
> 1x special tool to open/close the water filter
> 1x SD card to store all data or to transfer to another PC in ASCII code
> 1x warranty extension card

Included consumables

Consumables required to operate and calibrate the calorimeter are included in the scope of delivery as follows:

> 1x C 723 benzoic acid (50 pellets) – good for 25 calibrations with each 1 g benzoic acid

Further consumables, wear parts and tools are also included with the decomposition vessel as well as one pressure vessel test certificate, an operating manual, as well as warranty extension card.

i A detailed description on how to set up and operate the calorimeter can be found in the operating manual, available for download on our website: www.ika.com.

Technical data C 3000 calorimeter

Ident. No. 0020010637

TECHNICAL DATA

Measuring range max.	40,000 J / 9,560 cal
Temperature measurement resolution	0.0001 K
Oxygen operating pressure max.	40 bar
Display	TFT with touch screen
Measuring modes	dynamic 22 °C isoperibol 22 °C dynamic 30 °C isoperibol 30 °C
Reproducibility isoperibolic (1g benzoic acid NBS39i) Reproducibility dynamic (1g benzoic acid NBS39i)	0.05 % RSD 0.15 % RSD
Measurements per hour	Isoperibol (RP) 4 Dynamic 6
Working temperature min. Working temperature max.	22 °C 30 °C
Jacket control	Controlled, water
Operator time	< 1 min
Operation time	8 to 16 min
Number of possible decomposition vessels per device	4
Decomposition vessels	C 6010 / C 6012

INTERFACES

PC	9 pin (M) RS 232 serial
Printer	USB-B, Ethernet
Balance	9 pin (M) RS 232 serial
Ethernet	Yes
SD-Card	Yes
Ext. keyboard	Yes

CALORIMETER STANDARDS

Analysis according to ASTM D240
Analysis according to ASTM D4809
Analysis according to ASTM D5865
Analysis according to ISO 1928
Analysis according to GB T213

AUTOMATIC FUNCTIONS

Automatic water filling/draining	Yes
Automatic oxygen filling	Yes

COOLING WITH RC 2 BASIC CHILLER

Cooling medium temperature min.	12 °C
Cooling medium temperature max.	27 °C
Cooling medium permissible operating pressure	1.5 bar

GENERAL DATA

Weight	29 kg
Dimensions (W × H × D)	500 × 450 × 450 mm
Permissible ambient temperature	20 – 30 °C
Permissible relative humidity	80 %
Voltage	220 – 240 V
Frequency	50 / 60 Hz
Power input	1,700 W
Protection class according to DIN EN 60529	IP 20

Technical data RC 2 basic chiller

Ident. No. 0004171000

Recommendation

We recommend the combination of the calorimeter with the RC 2 basic chiller for most comfortable and optimized operation. The required hoses and hose stems for connecting the device properly are pre-assembled and included in the calorimeter package.

When operating the unit on tap water it is recommended to use the C 25 water pressure valve and hose set to adjust the water flow/pressure accordingly.

TECHNICAL DATA

Appliance type	Recirculating chiller
Class designation according DIN 12876	I
Identification according to DIN 12876	NFL
Temperature stability DIN 12876	±0.1 K
Working temperature display	LED
Cooling medium	tap water
Type of cooling	flow
Flow rate min.	60 l/h
Flow rate max.	70 l/h
Recommended flow rate at 18 °C	60 l/h
Cooling agent	R134a
Operating temperature min. Operating temperature max. (with external heating)	-20 °C +80 °C
Working temperature min. Working temperature max.	-20 °C Room temp.
Temperature control	PT 100
Interface	USB / RS 232
Warning function optical Warning function acoustic Warning function excess temperature Warning function insufficient temperature	Yes
Sub-level protection / Over-level protection	Yes
Filling volume	1.4 – 4.0 l
Permissible ON time	100 %
Cooling capacity (at 20°C) Cooling capacity (at 10°C) Cooling capacity (at 0°C) Cooling capacity (at -10°C) Cooling capacity (at -20°C)	400 W 370 W 320 W 240 W 130 W

PUMP

Pump type	Pressure- / suction pump
Pump capacity adjustable	Yes
Pump pressure max. (0 liters discharge flow)	0.3 bar
Pressure pump (suction side) (0 liter flow)	0.2 bar
Flow rate max. (0 bar back pressure)	18 l/min
Pump connection	M16x1

GENERAL DATA

Weight	28 kg
Dimensions (W × H × D)	220 × 475 × 525 mm
Permissible ambient temperature	5 – 32 °C
Permissible relative humidity	80 %
Voltage	230 V
Frequency	50 / 60 Hz
Power input	300 W
Protection class according to DIN EN 60529	IP 21
Technical data complies with the standard	DIN 12876

Technical data C 6040 CalWin

Ident. No. 0004040500

Calorimeter PC software

CalWin is the latest generation professional software for all IKA calorimeters (except C 7000). It has various features for the monitoring and analysis of results. The new CalWin C 6040 replaces the previous version CalWin C 5040. It offers a variety of modern solutions, ideas and possibilities to administer the measurements performed by our calorimeters.

TECHNICAL DATA

Windows XP	Yes
Windows Vista	Yes
Windows 7	Yes
Windows 10	Yes

HARDWARE AND SOFTWARE REQUIREMENTS

Windows XP (SP2), Windows Vista, Windows 7, Microsoft SQL Server and at least one free USB or RS 232 (9 pin Sub-D (M) serial interface. Processor with min. 1.6 GHz (single core-Processor); 2 GB RAM; 2.5 GB free hard-disc space; DVD-ROM-drive

Operating system	Windows XP (SP2) Windows Vista Windows 7 Microsoft SQL Server
Interface	USB or RS 232
Processor	min. 1.6 GHz (single core-Processor); 2 GB RAM
Free hard-disc space	min. 2.5 GB
DVD-ROM-drive	Yes

C 6010 Decomposition vessel

Standard vessel

Ident. No. 0003770000

C 6012 Decomposition vessel

Halogen resistant vessel

Ident. No. 0004504000

C 5010.5 Crucible holder, large

Required with C 6 quartz crucible, big and C 710.2 set of VA crucibles, big

Ident. No. 0003055900

C 5010.8 Crucible holder, small

Required with C 4 quartz crucible or C 5 set of VA crucibles

Ident. No. 0003055900

Oxygen Regulator

To reduce the oxygen pressure of the bottle to 30 bar

Ident. No. 0000750200

C 21 Pellet press

Manual pellet press for powders and other highly combustible substances

Ident. No. 0001605300

C 6030 Venting station

Ident. No. 0004504100

C 27 Calorimeter preparation set

Ident. No. 0004579700

C 6040 Calwin

Calorimeter PC Software. Enhances the datahandling (XLS, CSV, ...) and further correction calculation of data for the net heat of combustion after the experiment according to many different standards.

Ident. No. 0004040500

C 1.50 Dot matrix printer

Includes connection cable, spare printer cartridge and paper rolls.

Ident. No. 0004500600

C 60.1012 Organizer

Required if additional decomposition vessels are ordered for ease of handling and organisation.

Ident. No. 0004504200

For more accessories & consumables visit www.ika.com

C 723 Benzoic acid, blister package

50 pieces; 0.5 g per pellet; Benzoic acid included, with analysis certificate from a DAkkS accredited laboratory with ISO 17025 certificate

Ident. No. 0003243000

C 723 Benzoic acid, blister package

450 pieces (9 packages); 0.5 g per pellet; Benzoic acid included, with analysis certificate from a DAkkS accredited laboratory with ISO 17025 certificate

Ident. No. 0003717400

C 43 Benzoic acid NBS 39i

High pure benzoic acid powder; 30 g; standard reference material with certificate of the National Institute of Standards & Technology (NIST), USA

Ident. No. 0000750600

C 710.8 Cotton thread

500 pieces; cut to length; thick, with known calorific value

Ident. No. 0004579900

C 710.4 Cotton thread, cut to length

500 pieces; cut to length; thin; with known calorific value

Ident. No. 0004579900

C 15 Paraffin strips

600 pieces; 45 mm x 3 mm; especially for hard flammable, water containing samples

Ident. No. 0003131100

C 16 Parafilm

Tape for closing the crucible; 1000 x 50 mm; especially for samples with volatile components

Ident. No. 0003055900

C 17 Paraffin oil

30 ml; combustion aid for samples with high water content or hardly flammable samples containing mainly inorganic matter

Ident. No. 0003801200

C 9 Gelatine capsules

100 pieces; with known calorific value; to fill in samples with volatile compounds

Ident. No. 0000749900

C 10 Acetobutyrate capsules

100 pieces; with known calorific value; to fill in samples with volatile compounds; not hygroscopic

Ident. No. 0000750000

C 12 A Combustion bags 70 x 40 mm

100 pieces; 70 mm x 40 mm; polyethylene; with known calorific value; to fill in samples with low calorific value, powdery and with low specific weight

Ident. No. 0002201500

C 12 Combustion bags 40 x 35 mm

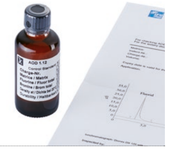
100 pieces; 40 mm x 35 mm; polyethylene; with known calorific value; to fill in samples with low calorific value, powdery and low specific weight

Ident. No. 0002201400

AOD 1.11 Control standard

50 ml; mineral oil with certified sulfur and chlorine content. For checking AOD decomposition and peripheral detection devices

Ident. No. 0003044000



AOD 1.12 Control standard

50 ml; mineral oil with certified fluorine and bromine content. For checking AOD decomposition and peripheral detection devices

Ident. No. 0003080200

C 1.103 Ignition wire

5 pieces; kantal ignition wire for up to 100 ignitions each; especially for decomposition vessels C 6010 and C 1.10

Ident. No. 0004579300

C 1.123 Ignition wire, platinum

2 pieces; platinum ignition wire for about up to 50 combustions each; especially for decomposition vessels C 6012 and C 1.12

Ident. No. 0002994900

C 5 Set of VA combustion crucibles

25 pieces; Ø 20 mm x 19,5 mm high; 25 combustions per piece

Ident. No. 0003055900

C 710.2 Set of VA combustion crucibles

25 pieces; Ø 23 mm x 16 mm high; 25 combustions per piece

Ident. No. 0001483500

C 4 Quartz dish

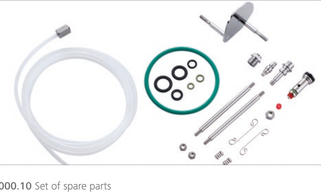
Ø 20 mm x 20,5 mm high

Ident. No. 0001695500

C 6 Quartz crucible, big

Ø 26 mm x 18 mm high; to fill in a higher amount of material with low calorific value; especially for samples with high ash content; C 5010.5 crucible pan, big is required

Ident. No. 000355100



C 6000.10 Set of spare parts

for C 6000/C 3000 calorimeter and C 6010 decomposition vessel; includes various o-rings and seals; a ventilation hose with capillary; two ignition and ground electrodes; 10 ignition wires; a complete piston; a nozzle; two compression springs; spare Hastelloy nuts

Ident. No. 0004504300

C 6000.12 Set of spare parts

for C 6000/C 3000 calorimeter and C 6012 decomposition vessel; includes various o-rings and seals; ventilation hose with capillary; two hastelloy ignition and ground electrodes; 4 platinum ignition wires; a complete piston; a nozzle; two compression springs; spare Hastelloy nuts

Ident. No. 0004504400

For more accessories & consumables visit www.ika.com

Coal analysis with C 3000

With our IKA C 3000 calorimeter, the heat that is created from a coal sample is measured during its combustion under controlled conditions.

Coal is a natural product and its quality can vary widely. Obtaining a representative result of such a heterogeneous material is quite a challenge. Coal has to pass proper sampling, a number of drying and grinding stages before it is ready for analysis.

Coal samples for laboratories often consist of 10 kg or more with quite different dimensions. Since only one gram of sample material is being burned in a calorimeter, a proper and expert sampling is required in order to be able to obtain comparable and reasonably analyzable results. The finer the sample particles are the better the homogeneity and the burning behavior of the sample.

In the decomposition vessel the sample is burned with an excess amount of oxygen. The heat arising from this process is remitted by the vessel into the surrounding water and measured. In order to avoid disruptive external temperature influences and in order to only measure the heat created during the combustion of the sample, the system is in turn surrounded by an air jacket followed by a water containing jacket that can be controlled in different ways. Measurement methods such as isoperibol and dynamic can be derived from this.

FAQ

Which calorimeter is most suitable for my application and requirements?
The main questions that should be answered are as follows:

1. How many experiments do you plan on conducting in a day?
2. Are there any standards that have to be followed, such as ISO, ASTM, DIN, GB, GOST etc.?
3. Do samples contain halogens and sulphur and if so, what is the concentration (approximately)?
4. Is it required to analyze the halogens and sulphur content after the calorimeter experiment has concluded?
5. Do you prefer any of the following methods: adiabatic, isoperibol, static jacket isoperibol, dry or dynamic?

How do I know my calorimeter is still in calibration?
Most customers operate their calorimeters with control charts. After calibrating the unit, check runs are performed with benzoic acid, for instance. The results of these check runs have to match the certified calorific value of the benzoic acid within a defined range. The definition of the range is laid out in standards and the frequency of doing these checks differs from one a day, to one after and before every sample. The control charts show the performance of the unit under the previously described circumstance over a long period of time.

How often do I have to calibrate the calorimeter?
The control chart also shows when a new calibration might be required.

What are the min. and max. calorific values that I can measure with the calorimeter?
The max. allowed energy input into our calorimeters is 40,000 J. The calorific value of a sample is always expressed in energy per weight (J/g). Based on that information, you can adjust the weight of your sample such that it does not exceed 40,000 J. The energy amount created by the sample should not be significantly higher than the one obtained during calibration with benzoic acid. Our calorimeters do have a high measuring sensitivity and can detect low quantities of energy. For example, the ignition energy of 70 J can be measured with an absolute error of ± 20 J. The relative error rises naturally (± 30%) hyperbolically the smaller the energy input is. If your sample has a very low calorific value you can also use combustion aids, since they add energy to the calorimeter to minimize the error.

When do I have to send in the decomposition vessel for high pressure inspection at IKA?
We recommend checking the vessel after 1000 experiments or after 1 year of operation, whichever comes first. During the overall inspection process we perform both a high pressure and an operating pressure test. A new certificate will be issued for the vessel after it has passed both of these tests. More detailed information can be found in the manual of your calorimeter and/or the manual of your decomposition vessel. Alternatively, you can always contact your local service department for further information and assistance: service.iwb@ika.in

Where do I find a list of spare parts and how many of these do I need?
We offer sets of spare parts that include parts for 1000 experiments e.g. 1 year operation. The actual amount of spare parts can vary based on the application. If a specific spare part is required, you can find further information in the service section of the operating manual. In addition, under the “Service” section of our website (www.ika.com), you can download service drawings with detailed descriptions of each part. Alternatively, you can always contact our service department for further information and assistance: service.iwb@ika.in

How can I get the gross and net calorific value – easily explained?
A calorimeter measures the preliminary gross calorific value of the sample. To get the gross calorific value, correction calculations are required for the acids formed during the combustion. For instance, the method of titration used to obtain the amount of nitric acid and sulphuric acid are described in detail in the standard ISO 1928. To get to the net calorific value, further corrections need to be applied concerning the amount of water that was formed during the combustion from hydrogen. Based on the state (dry, analytical moisture, as received) your sample was in before combustion, further corrections may apply. Moistures are determined by drying the samples. The Hydrogen content is usually measured with an elemental analyzer. For a more detailed explanation, we ask you study the standards you might have to use depending on your application requirements.

IKA Calorimeter Portfolio

IKA oxygen bomb calorimeters are the market leaders when it comes to determining the calorific values of liquid and solid samples. The selection of IKA oxygen bomb calorimeters is optimally geared towards various different demands. Functionality, safety, and longevity are the main goals in the development of IKA oxygen bomb calorimeters.

C 200

The compact semi-automated combustion calorimeter is used for determining the calorific value of liquid and solid samples. Suitable for teaching and training (e.g. technical schools, universities) and for industrial laboratories with low number of samples.

C 1

The oxygen bomb calorimeter C 1 is a little giant that sets new standards for the industry. The C 1 represents the smallest static jacket (Regnault-Pfaundler) calorimeter in the world. IKA® has combined modern technology with unique automation to provide the user with a never before seen experience in the world of oxygen bomb calorimeter and is defining the future for this technology.

C 6000

The C 6000 global standards offers a fast dynamic method, the classical adiabatic as well as isoperibol measurement modes. The C 6000 isoperibol offers the same advantages and features, with the exception of the adiabatic measurement mode.

C 7000

The C 7000 is the IKA calorimeter with a completely dry system for measuring the calorific value of solid and liquid samples. The temperature is measured directly in the decomposition vessel. This results in measurement times in the range of three to seven minutes (depending on the sample). The system can manage up to eight different decomposition vessels.

service.iwb@ika.in

Free Hotline:
1800-42-555-444

Worldwide service network – direct contact in your region

Our dedicated team of engineers provides comprehensive worldwide technical service. Please feel free to contact IKA directly or your dealer in case of any service questions.

For spare parts IKA® guarantees 10 years of availability. In the event of an equipment malfuncation or technical questions regarding devices, maintenance and spare parts, please call us at the Free Hotline 1800-42-555-444 or send an email to service.iwb@ika.in

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IKA Application Support

Our Application Center spans 400 sqm and offers modern facilities for presenting and testing lab devices and processes. We are pleased to help you find the perfect device to serve your application requirements. Call us at +91 (080) 26253 940 or send us an e-mail to applicationsupport@ika.in

You may also send us your sample. We will test it for you with a device suitable for your application. To ensure that all goes smoothly, please send your sample along with a completed data sheet to:

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Karnataka, India

Contact
info@ika.in
for your free
demo

Subject to technical changes

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KEY FEATURES CALORIMETER C 3000

> Easy and convenient touch screen operation
> Software provides control chart view and correction calculation of globally used standards
> SD card slot for additional data management
> Ethernet interface for data management via FTP server
> Decomposition vessel with spherical top, better heat transfer, faster sample runs
> Easy decomposition vessel preparation due to upside down crucible holder technology

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