

**DDS CALORIMETERS**

Scientific Analytical Calorimeter Solutions

Digital Data Systems (Pty) Ltd.

Reg. No. 1995/001201/07

Tel : (011) 791-5947

Fax : (011) 792-9818

Certificate of Analysis

CERTIFIED REFERENCE MATERIAL (CRM)
BENZOIC ACID CALORIMETRIC STANDARD.

0.5g BENZOIC ACID TABLETS

0.5g x 14mm diameter x ± 2.5 mm thick with (BA) stamped on facePart Number: **3K-4-125**Batch Number: **20251112**

The intended use of this CRM standard is for the calibration and continued quality verification of combustion calorimetric methods.

Please visit www.ddscalorimeters.com/applications-notes for a list of applications.

26.4397 MJ/ Kg	+/- 0.027 MJ/ Kg
26439.7 J/ g	+/- 27 J/ g
11367.02 Btu/ Ib	+/- 26.37 Btu/ Ib
6319.23 cal/ g	+/- 6.65 cal/ g

Average mass per tablet: 0.494883g

This value is the average of the combustion of 32 benzoic acid samples (batch no: 20251112). The material used in production of this standard was identified in accordance with **ISO GUIDE 35** (*Reference materials-guide for characterization and assessment of homogeneity and stability*). The samples for round robin testing were selected in accordance with **ISO GUIDE 33** (*Reference materials-good practice in using reference materials*). The precision values represent the mean value and expanded uncertainty at a (percentage number "95")% confidence limit ($k=2$) derived from analysis. This was determined by utilizing ANOVA and The Guide to Uncertainty Measurement. The calorimeter was calibrated with **NIST** Standard Reference Material (**SRM**) **39j** benzoic acid. The results of the tests indicated no significant difference between the heat of combustion values of **NIST SRM 39j** and **3K-4-125** benzoic acid (Batch no: 20251112). Metrological traceability is to the SI derived unit of mass fraction expressed as J/g, BTU/lb., and Kcal/g. This reference was produced in accordance with **ISO17034**. The above values relate only to the material used to produce this standard. Minimum and or alternative sample size may be used per your test method or instrument manufacturer.

Handling and Storage: Benzoic acid will not absorb moisture from the atmosphere if the relative humidity does not exceed 90%. The heat of combustion of the sample will not change with time if adequate precautions are taken to avoid the introduction of impurities.

Expiration of Certification: This reference material is stable while kept stored and sealed properly under normal laboratory conditions. This reference will expire 20 years from the date of certification

[1] Combustion vessel Conditions:

- Measuring mode static dry jacket (ISO 1928).
- Oxygen operating pressure charged to 3000Kpa.
- Combustion reaction is between 27-32°C.
- Approximately 1-gram sample of benzoic acid is combusted.

DirectorsK.F. Ludwig
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[2] The reduction of weight in air to weight in vacuum results in heat of combustion value of 26439.7 J/ g for benzoic acid. This value uses the following assumptions:

- The density of benzoic acid at 25°C is 1.320 g/cc.
- The density of dry air (1 atm and 20°C) is 0.0012 g/cc.
- The density of brass is 8.4 g/cc.

In routine fuel testing with the combustion vessel calorimeter, where an accuracy of not better than 0.1% is required, this buoyancy correction is generally not used. HP Benzoic Acid contains no Sulphur or Nitrogen, no correction is needed.

Reference material Manager: Mr Rolf Ludwig, CEO, Digital Data Systems Pty Ltd

Date: November 2025

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