

# Contents

Page

|   |           |
|---|-----------|
| Foreword  | v         |
| <b>1 Scope</b>  | <b>1</b>  |
| <b>2 Normative references</b>   | <b>1</b>  |
| <b>3 Terms and definitions</b>  | <b>1</b>  |
| <b>4 Principle</b>  | <b>2</b>  |
| 4.1 Gross calorific value   | 2         |
| 4.2 Net calorific value   | 3         |
| <b>5 Reagents</b>   | <b>3</b>  |
| <b>6 Apparatus</b>  | <b>4</b>  |
| <b>7 Preparation of test sample</b>                                       | <b>7</b>  |
| <b>8 Calorimetric procedure</b>   | <b>8</b>  |
| 8.1 General   | 8         |
| 8.2 Preparing the bomb for measurement                                    | 10        |
| 8.2.1 General procedure   | 10        |
| 8.2.2 Using combustion aid  | 10        |
| 8.3 Assembling the calorimeter  | 11        |
| 8.4 Combustion reaction and temperature measurements                      | 11        |
| 8.5 Analysis of products of combustion                                    | 12        |
| 8.6 Corrected temperature rise $\theta$                                   | 12        |
| 8.6.1 Observed temperature rise   | 12        |
| 8.6.2 Isooperibol and static-jacket calorimeters                          | 12        |
| 8.6.3 Adiabatic calorimeters  | 14        |
| 8.6.4 Thermometer corrections   | 14        |
| 8.7 Reference temperature   | 14        |
| <b>9 Calibration</b>  | <b>14</b> |
| 9.1 Principle   | 14        |
| 9.2 Calibrant   | 15        |
| 9.2.1 Certification conditions  | 15        |
| 9.2.2 Calibration conditions  | 15        |
| 9.3 Valid working range of the effective heat capacity $\epsilon$         | 15        |
| 9.4 Ancillary contributions   | 16        |
| 9.5 Calibration procedure   | 16        |
| 9.6 Calculation of effective heat capacity for the individual experiment  | 17        |
| 9.6.1 Constant mass-of-calorimeter-water basis                            | 17        |
| 9.6.2 Constant total-calorimeter-mass basis                               | 17        |
| 9.7 Precision of the mean value of the effective heat capacity $\epsilon$ | 18        |
| 9.7.1 Constant value of $\epsilon$  | 18        |
| 9.7.2 $\epsilon$ as a function of the observed temperature rise           | 19        |
| 9.8 Redetermination of the effective heat capacity                        | 19        |
| <b>10 Gross calorific value</b>   | <b>19</b> |
| 10.1 General  | 19        |
| 10.2 Combustion   | 20        |
| 10.3 Calculation of gross calorific value                                 | 20        |
| 10.3.1 General  | 20        |
| 10.3.2 Constant mass-of-calorimeter-water basis                           | 20        |
| 10.3.3 Constant total-calorimeter-mass basis                              | 22        |
| 10.3.4 $\epsilon$ as a function of the observed temperature rise          | 23        |
| 10.4 Expression of results  | 23        |
| 10.5 Calculation to other bases   | 23        |
| <b>11 Performance characteristics</b>                                     | <b>24</b> |

|                     |  |           |
|---------------------|--|-----------|
| 11.1                | Repeatability limit.....   | 24        |
| 11.2                | Reproducibility limit.....   | 24        |
| <b>12</b>           | <b>Calculation of net calorific value at constant pressure.....</b>  | <b>24</b> |
| 12.1                | General.....   | 24        |
| 12.2                | Calculations.....  | 24        |
| <b>13</b>           | <b>Test report.....</b>  | <b>25</b> |
| <b>Annex A</b>      | <b>(normative) Adiabatic bomb calorimeters.....</b>  | <b>26</b> |
| <b>Annex B</b>      | <b>(normative) Isoperibol and static-jacket bomb calorimeters.....</b>   | <b>30</b> |
| <b>Annex C</b>      | <b>(normative) Automated bomb calorimeters.....</b>  | <b>36</b> |
| <b>Annex D</b>      | <b>(informative) Checklists for the design and procedures of combustion experiments.....</b>   | <b>39</b> |
| <b>Annex E</b>      | <b>(informative) Examples to illustrate the main calculations used in this document<br/>when an automated bomb calorimeter is used for determinations.....</b> | <b>44</b> |
| <b>Annex F</b>      | <b>(informative) List of symbols used in this document.....</b>  | <b>48</b> |
| <b>Annex G</b>      | <b>(informative) Default values of most used solid biofuels for the calculations of<br/>calorific values.....</b>  | <b>51</b> |
| <b>Annex H</b>      | <b>(informative) Flow chart for a routine calorific value determination.....</b>   | <b>52</b> |
| <b>Bibliography</b> | .....  | <b>53</b> |
| <b>Index</b>        | .....  | <b>54</b> |