

DIN EN ISO 21654:2021-12 (E)

Solid recovered fuels - Determination of calorific value (ISO 21654:2021)

Contents		Page
	European foreword	4
	Foreword	5
	Introduction	6
1	Scope	7
2	Normative references	7
3	Terms and definitions	7
4	Principle	8
	4.1 Gross calorific value.....	8
	4.2 Net calorific value.....	9
5	Reagents	9
6	Laboratory conditions	10
7	Apparatus	11
	7.1 General.....	11
	7.2 Auxiliary equipment.....	13
	7.3 Balances.....	13
8	Preparation of test sample	14
9	Calorimetric procedure	14
	9.1 General.....	14
	9.2 Preparing the combustion vessel for measurement.....	15
	9.2.1 General procedure.....	15
	9.2.2 Using combustion aids.....	16
	9.3 Assembling the calorimeter.....	17
	9.4 Combustion reaction and temperature measurements.....	17
	9.5 Analysis of products of combustion.....	18
	9.6 Corrected temperature rise θ	18
	9.6.1 Observed temperature rise.....	18
	9.6.2 Isoperibol and static-jacket calorimeters.....	18
	9.6.3 Adiabatic calorimeters.....	20
	9.6.4 Thermometer corrections.....	20
	9.7 Reference temperature.....	20
10	Calibration	20
	10.1 Principle.....	20
	10.2 Calibration reference.....	21
	10.2.1 Certification conditions.....	21
	10.2.2 Calibration conditions.....	21
	10.3 Valid working range of the effective heat capacity ϵ	21
	10.4 Ancillary contributions.....	22
	10.5 Calibration procedure.....	22
	10.6 Calculation of effective heat capacity for the individual experiment.....	23
	10.6.1 Constant mass-of-calorimeter-water basis.....	23
	10.6.2 Constant total-calorimeter-mass basis.....	23
	10.7 Precision of the mean value of the effective heat capacity ϵ	24
	10.7.1 Constant value of ϵ	24
	10.7.2 ϵ as a function of the observed temperature rise.....	25
	10.8 Repetition of the determination of effective heat capacity.....	25

11	Gross calorific value	25
11.1	General.....	25
11.2	Combustion.....	26
11.3	Calculation of gross calorific value	26
11.3.1	General.....	26
11.3.2	Constant mass-of-calorimeter-water basis.....	26
11.3.3	Constant total-calorimeter-mass basis.....	28
11.3.4	ϵ as a function of the observed temperature rise.....	29
11.4	Expression of results.....	29
11.5	Calculation to other bases.....	29
12	Precision	30
12.1	Repeatability limit.....	30
12.2	Reproducibility limit.....	30
13	Calculation of net calorific value at constant pressure	30
13.1	General.....	30
13.2	Calculations.....	30
14	Test report	31
	Annex A (normative) Adiabatic combustion vessel calorimeters	33
	Annex B (normative) Isoperibol and static-jacket combustion vessel calorimeters	37
	Annex C (normative) Automated combustion vessel calorimeters	42
	Annex D (normative) Removed ash contributors	45
	Annex E (informative) Checklists for the design and procedures of combustion experiments	48
	Annex F (informative) Examples to illustrate the main calculations used in this document if an automated (adiabatic) combustion vessel calorimeter is used for determinations	53
	Annex G (informative) List of symbols used in this document	56
	Annex H (informative) Flow chart for a routine calorific value determination	59
	Annex I (informative) Interlaboratory test results	60
	Annex J (informative) Additional terms for the basis of results expression	63
	Annex K (informative) Environmental aspects	64
	Bibliography	66