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DRAFT TANZANIA STANDARD

Biogas Cookstoves—Minimum Energy Performance and Labelling Requirements

TANZANIA BUREAU OF STANDARDS

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Tanzania Bureau of Standards (TBS) is the statutory national standards body for Tanzania established under the Standards Act No. 3 of 1975, repealed and replaced by the Standards Act No. 2 of 2009.

The Electrical Engineering Divisional Standards Committee, under whose supervision this Tanzania Standard was prepared, consists of representatives from the following organizations:

College of Engineering and Technology, University of Dar es Salaam

Tanzania Telecommunications Company Limited

Tanzania Electric Supply Company Limited

Ministry of Energy

Ministry of Information, Communication and Information Technology

Energy and Water Utilities Regulatory Authority

Tanzania Electric Goods Company Limited

Tanzania Electrical Mechanical and Electronics Service Agency

Tanzania Renewable Energy Association

Engineers Registration Board (ERB)

Dar es salaam Institute of Technology

The organizations marked with an asterisk (*) in the above list, together with the following were directly represented on the Technical Committee entrusted with the preparation of this Tanzania Standard:

1. Scope

This Tanzania Standard specifies requirements for minimum energy performance, maximum emissions, safety, and labelling of biogas cookstoves intended for domestic and institutional cooking applications.

This document also specifies test methods and procedures for assessing compliance of biogas cookstoves with the stated requirements.

This standard does not apply to other biogas-fired appliances not primarily used for cooking, including but not limited to boilers and furnaces.

For Public Comments Only

2. Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

TZS 3546 / ISO 21364, Domestic gas cooking appliances — Safety and test methods;

ISO 15156-1, General principles for selection of cracking-resistant materials

ISO 15156-2, Cracking-resistant carbon and low-alloy steels, and use of cast irons

ISO 15156-3, Cracking-resistant CRAs (corrosion-resistant alloys) and other alloys

TZS 2913-1 / ISO 19867-1, Clean cookstoves and clean cooking solutions — Harmonized laboratory test protocols — Part 1: Standard test sequence (STS)

ISO 5714, Clean cookstoves and clean cooking solutions — Test protocols for institutional cookstoves.

ISO 3821, Gas welding equipment — Rubber hoses for welding, cutting and allied processes

ISO 23936-1, Petroleum, petrochemical and natural gas industries — non-metallic materials in contact with media related to oil and gas production — Part 1: Thermoplastics

ISO 23936-2, Petroleum, petrochemical and natural gas industries — non-metallic materials in contact with media related to oil and gas production — Part 2: Elastomers

ISO 23550, Safety and control devices for gas and/or oil burners and gas and/or oil-burning appliances — General requirements

TZS 473, Biomass Cookstoves — Requirements

3. Terms and definitions

For the purpose of this standard, terms and definitions in TZS 2913-1/ ISO 19867-1, ISO 16559, TZS 473, ISO/TR 21276, TZS 2358 and the following shall apply:

3.1

domestic biogas cookstove

a biogas cookstove intended for household or similar use and cook on a pot size of less than 25 liters

3.2

institutional biogas cookstove

a biogas cookstove designed to hold and cook on a pot size of 25 liters and above that can be used in applications other than households including but not limited to hotels, schools, and hospitals

3.3

maximum heat input

highest achievable heat input under the allowable BIOGAS supply pressure range defined in this standard

3.4

user-grasped part

a component intended to be held, turned, or manipulated by the user during normal operation, including but not limited to control knobs, handles, and levers

3.5

flame stability

ability of a burner flame to remain continuously lit and correctly anchored at the burner ports without lift-off, flashback, or extinction under normal and specified disturbance conditions

3.6

test phase

a defined period of operation during a test, conducted at specified operating conditions, for which performance metrics are measured and calculated independently

3.7

biogas

gas produced by anaerobic digestion of organic matter, gasification of biomass or power to gas from biomass sources and without further upgrading or purification

4. General, safety and durability requirements

4.1 General

All biogas cookstoves within the scope of this standard shall be designed, constructed, and manufactured to ensure safe operation under normal and reasonably foreseeable conditions of use. Compliance with this requirement shall be demonstrated by valid test procedures including meeting the applicable standards specified in Table 1.

Table 1. General Requirements

Quality / Safety Element	Quantified Metric	Standard/ Clause
Gas tightness	Leakage	ISO 21364-1 Clause 10.3
Ignition performance	Time to stable flame	ISO 21364-1 Clause 9
Flame stability	Lift, flashback, extinction	ISO 21364-1 Clause 9
Surface temperature — metal	Maximum temperature	ISO 21364-1 Clause 7
Surface temperature — controls	Maximum temperature	ISO 21364-1 Clause 7
Structural thermal resistance	Permanent deformation	ISO 21364-1 Clause 8
Gas control valve durability	Operating cycles	ISO 23550
Material compatibility — metals	Visual or structural degradation	ISO 21364-1 Clause 11
Material compatibility — elastomers	Degradation indicators	ISO 23936-2
Material compatibility — H ₂ S and CO ₂ exposure	Resistance to corrosion, sulfide stress cracking, or material degradation	ISO 15156

	under declared H ₂ S concentration	
Flexible gas hose (if supplied)	Pressure resistance	ISO 3821

NOTE: Where gas control valves, seals, or flexible hoses are supplied as part of the appliance, such components shall be compliant components suitable for biogas service. Compliance shall be demonstrated by certification or declaration of conformity.

4.2 Requirements for compliance

For the purposes of compliance with this standard, a biogas cookstove shall comply with all safety, durability, marking, and all other mandatory technical and performance requirements.

Appliances shall operate safely and meet safety requirements within a methane content range of 50–70 % by volume.

4.3 Relationship to energy performance and labelling

Compliance with Clause 4 is a precondition for classification under the energy performance star rating system defined in Clause 5.4 and for the application of labels specified in Clause 6 and Annexes A and B.

Cookstoves that do not meet the requirements of Clause 4 shall not be labelled or marketed as compliant with this standard.

5. Energy performance and emissions requirements

Biogas cookstoves within the scope of this standard shall meet the minimum energy performance requirements specified in this clause when tested in accordance with Clause 5.2.

The same performance metrics and calculation methods shall apply across domestic and institutional biogas cookstoves. However, test conditions may be adapted to reflect differences in operating duration, firepower, and cooking vessel size.

5.1 Thermal efficiency and emissions requirements

All cookstoves within the scope of this standard shall meet the requirements specified in Table 2.

Table 2. Minimum thermal efficiency and maximum emissions requirements	
Thermal Efficiency (%)	CO (g/MJ _d)
≥ 35	≤ 4.4

5.2 Test methods

5.2.1 Test Gas and Inlet Conditions

For compliance testing, biogas cookstoves shall be tested using the reference biogas composition and inlet pressure defined below.

Testing shall be conducted at 12 mbar $\pm$ 5 %, unless specified by the manufacturer.

5.2.1.1 Reference Biogas Composition

The reference test biogas shall consist of:

Methane (CH₄): 60 % $\pm$ 2 % (vol)

Carbon dioxide (CO₂): balance to 100 %

The gas shall be dry and free from contaminants unless otherwise specified. Compliance testing shall be conducted using dry gas. However, appliances shall be designed to operate safely with biogas containing typical moisture levels from anaerobic digesters.

Measured composition shall be recorded in the test report.

5.2.2 Domestic BIOGAS cookstoves

Domestic biogas cookstoves shall be tested for energy performance and emissions in accordance with TZS 2913-1:2021 / ISO 19867-1

All test phases, operating conditions, cooking vessel sizes, water volumes, fuel measurement procedures, and calculation methods specified in TZS 2913-1:2021 / ISO 19867-1 shall apply without modification, unless otherwise stated in this standard.

5.2.3 Adaptation for institutional biogas cookstoves

Institutional biogas cookstoves shall be tested for thermal efficiency and emissions in accordance with ISO 5714:2023.

Test conditions, operating durations, power levels, cooking vessel sizes, and emissions measurement procedures shall be selected and documented in accordance with ISO 5714:2023 to reflect representative institutional use.

5.2.4 Applicability across stove categories

The same performance metrics, calculation methods, and compliance thresholds defined in this standard shall apply to domestic and institutional biogas cookstoves, unless explicitly stated otherwise.

Additional performance and emissions metrics, including particulate matter (PM) and Carbon Dioxide (CO₂), may be measured in accordance with the relevant test procedures specified in TZS 2913-1:2021 / ISO 19867-1, where applicable.

Differences in test methods between domestic and institutional cookstoves reflect differences in scale and operating conditions and shall not be interpreted as differences in performance requirements.

NOTE: TZS 2913-1:2021/ISO 19867-1 is intended for the evaluation of domestic-scale cookstoves, while ISO 5714:2023 is intended for the evaluation of institutional-scale cookstoves operating at higher firepower, longer durations, and with larger cooking vessels. The use of separate test methods reflects differences in scale and operating conditions rather than differences in minimum performance or safety expectations.

5.3 Energy performance star rating classification

Cookstoves that meet the minimum energy efficiency and maximum emission requirements outlined in Table 2 shall be classified in accordance with Table 3, respectively.

Table 3: Energy performance star rate-classification

Energy star rate	1	2	3	4	5
Efficiency η_c (%)	≥ 35	≥ 41	≥ 48	≥ 54	≥ 60
CO (g/ MJd)	≤ 4.4				

5.4 Reporting

Test reports shall be prepared in accordance with TZS 2913-1:2021 / ISO 19867-1 and any other applicable requirements specified in this standard, and shall include, as a minimum, the information required by that standard.

6. Labelling

6.1 The label shall be visibly affixed on the cookstoves, and shall be legible with the following information:

- a) Brand name;
- b) Model/Model number;
- c) Appliance type: Biogas Cookstove;
- d) Fuel type: Biogas;
- e) Energy Efficiency Rating (1–5 stars);
- f) Thermal efficiency (%);
- g) CO emission performance in mg/MJd; and
- h) Reference number of the applicable Tanzania Standard.

6.2 Label Specification and user guide

6.2.1 The label sizes shall be as follows:

The label sizes for both, institutional and domestic biogas cookstoves shall be 192mm x 96mm

Where the label is printed in a larger format, its content shall, nevertheless, remain proportionate to the specification.

6.2.2 The label's background Colours, text font sizes, user guide and the Colours codes of all other symbols shall be as specified in Annex A and Annex B.

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ANNEX A (Normative)

ENERGY LABEL SPECIFICATION AND USER GUIDE FOR INSTITUTIONAL COOKSTOVES

The Energy Efficiency labels shall be affixed to the CookStoves in a clearly visible and upright position. The label shall be self-adhesive or non-sticky and shall be as per the sample attached in A.1

A.1. Energy Label Sample



Figure A.1 Typical example for institutional BIOGAS CookStoves energy label

The following information shall be included on the label:

A.2. Dimensions and positions of Label Elements

The dimensions and positions of the elements constituting the label shall be as indicated below:

- a) **NATIONAL FLAG:** The Tanzania flag shall be in a 20-mm wide square area, placed 3 mm from the left and top margins of the label.
- b) **“ENERGY LABEL” title:** This shall be 20 mm wide and 70 mm long, positioned 3 mm from the top and right margin of the label.
- c) **Type of Unit:** The word ‘**BIOGAS COOKSTOVE**’ shall be 4 mm from the left margin and 27 mm from the top margin.
- d) **Colour bars:** They shall be 1.5 mm wide. The first and last bars, starting from the left, shall be 30 mm long, while each intermediate bar shall be 10 mm long. All bars shall be positioned 34 mm from the top margin
- e) **Most efficient” text:** The text shall be located 4 mm from the left margin and 42 mm from the top margin.
- f) **Least efficient” text:** The text shall be located 4 mm from the left margin and 97 mm from the top margin.
- g) **Stars bars:** The enclosing bar for the 5-star rating shall measure 8.5 mm in width and 50 mm in length. The subsequent bars for the 4-star, 3-star, 2-star, and 1-star ratings shall maintain the same width of 8.5 mm with a uniform spacing of 1.5 mm between each subsequent bar. The length of the enclosing bar shall decrease in length by 10 mm for each level, starting from 50 mm for the 5-star rating and reducing progressively. The 5star enclosing bar shall be positioned 4 mm from the left margin and 47 mm from the top margin.
- h) **Stars:** Shall be 8mm wide, 8.4 mm long, with a uniform spacing of 1.6 mm between each star, and centered within the star bar.
- i) **The pointing arrow:** The arrow indicating the CookStoves star rating (Y) shall be 10 mm wide and 23 mm long, with a pointer angle of 73.74°, positioned 3 mm from the right margin and aligned centrally with the corresponding star bar (ranging from 1 to 5)."
- j) **CookStoves icon:** The CookStoves icon shall fit within a rectangle measuring 32 mm in height and 30 mm in width, positioned 3 mm from the left margin and 50 mm above the bottom margin
- k) **Symbol squares:** The symbol squares for the QR code and CO emission colour codes shall each measure 20 mm by 20 mm. The emission colour code squares shall be spaced 2 mm apart and positioned 5 mm from the right margin and 50 mm above the bottom margin. The QR code square shall be placed 5 mm from the right margin and 2 mm away from the CO emission square, vertically.
- l) **Footer:** The bar shall be 40 mm wide and 96 mm long.

A.3 Label Design and Colours Specifications

- **Background:** The background of the label shall be 100% white. ○ **Border:** The label border shall be 0.5 mm wide.
- **Typeface:** The typefaces used shall be Verdana and Calibri.
- **Colour Specifications (CMYK format):** The label's Colours shall follow the CMYK format:
 - **Label and squares Border:** 100, 50, 0, 0
 - **National flag Logo:** Original Colours as per the official logo
 - **Background of the Energy Label section:** 100, 0, 100, 50.

- **The text colour for 'ENERGY LABEL'** shall be 100% white (CMYK: 0, 0, 0, 0), while the text colour for **'BIOGAS COOKSTOVE'** shall be 100% black
- **Bars enclosing the star ratings:** Similar to the corresponding star's colour codes

A.3.1 Star bars size

The star efficiency rating bars shall follow these dimensions:

- **5-star bar:** 8.5 mm width, 50 mm length.
- **4-star bar:** 8.5 mm width, 40 mm length.
- **3-star bar:** 8.5 mm width, 30 mm length.
- **2-star bar:** 8.5 mm width, 20 mm length.
- **1-star bar:** 8.5 mm width, 10 mm length.

A.3.2 The star colours for energy efficiency rating:

- **5 stars (most efficient):** 100, 0, 100, 0.
- **4 stars:** 30, 0, 100, 0.
- **3 stars:** 0, 0, 100, 0.
- **2 stars:** 0, 30, 100, 0.
- **1 star (least efficient):** 0, 100, 100, 0.

A.3.3 Energy Efficiency Class Number (star rating) inside the stars arrow:

The energy efficiency class number shall be:

- **Colour:** 100% white.
- **Font:** Calibri Bold, size 33 pt.
- The rectangular black section of the arrow shall contain the star rating number, which is centered.

A.3.4 CookStoves icon

- Colour shall be 100% black.
- The background color shall be 100% white.

A.3.5 QR Code

The QR code shall be 100% black.

A.3.6 Additional Text Elements

- **The phrase "MORE STARS, MORE SAVINGS":**
 - **Font:** Calibri Bold, size 14 pt.
 - **Colour:** 100% black.
- **Texts within the symbol squares:**
 - **Font:** Verdana Bold, 12 pt for the main element, Verdana Regular 10 pt for the unit.
 - **Colour:** 100% black.

A.3.7 Emission classification & Colours Codes

The emission graphic shall be labeled from A to E using the specified color codes and shall display the emission rating as shown in Figure A.1.

- **Green portion (A):** 100, 0, 100, 0.
- **Light green (B):** 30, 0, 100, 0
- **Yellow (C):** 0, 0, 100, 0
- **Orange portion (D):** 0, 30, 100, 0.
- **Red portion (E):** 0, 100, 100, 0.

A.3.8 Footer

- **Background shall be:** 100, 50, 0, 0.
- **The texts:**
 - **Font:** Calibri, size 12 pt.
 - **Colour:** 100% white.

A.3.9 The Standard Mark

The standard mark shall be as follows:

- 20mm square wide
- Positioned 5mm from the right and bottom margin
- The colour codes shall be as the original from TBS
- The background colour shall be 100% white
- The text for standard number shall be as specified in the original standard mark.

ANNEX B (Normative)

ENERGY LABEL SPECIFICATION AND USER GUIDE FOR DOMESTIC COOKSTOVES

The Energy Efficiency labels shall be affixed to the CookStoves in a clearly visible and upright position. The label shall be self-adhesive or non-sticky and shall be as per the example attached in B.1

B.1. Energy Label Sample



Figure B.1 Typical example for domestic BIOGAS CookStoves energy label

The following information shall be included on the label:

B.2. Dimensions and positions of Label Elements

The dimensions and positions of the elements constituting the label shall be as indicated below:

- a) **NATIONAL FLAG:** The Tanzania flag shall be in a 20-mm wide square area, placed 3 mm from the left and top margins of the label.
- b) **“ENERGY LABEL” title:** This shall be 20 mm wide and 70 mm long, positioned 3 mm from the top and right margin of the label.
- c) **Type of Unit:** The word ‘**BIOGAS COOKSTOVE**’ shall be 4 mm from the left margin and 27 mm from the top margin.
- d) **Colour bars:** They shall be 1.5 mm wide. The first and last bars, starting from the left, shall be 30 mm long, while each intermediate bar shall be 10 mm long. All bars shall be positioned 34 mm from the top margin
- e) **Most efficient” text:** The text shall be located 4 mm from the left margin and 42 mm from the top margin.
- f) **Least efficient” text:** The text shall be located 4 mm from the left margin and 97 mm from the top margin.
- g) **Stars bars:** The enclosing bar for the 5-star rating shall measure 8.5 mm in width and 50 mm in length. The subsequent bars for the 4-star, 3-star, 2-star, and 1-star ratings shall maintain the same width of 8.5 mm with a uniform spacing of 1.5 mm between each subsequent bar. The length of the enclosing bar shall decrease in length by 10 mm for each level, starting from 50 mm for the 5-star rating and reducing progressively. The 5star enclosing bar shall be positioned 4 mm from the left margin and 47 mm from the top margin.
- h) **Stars:** Shall be 8mm wide, 8.4 mm long, with a uniform spacing of 1.6 mm between each star, and centered within the star bar.
- i) **The pointing arrow:** The arrow indicating the CookStoves star rating (Y) shall be 10 mm wide and 23 mm long, with a pointer angle of 73.74°, positioned 3 mm from the right margin and aligned centrally with the corresponding star bar (ranging from 1 to 5)."
- j) **CookStoves icon:** The CookStoves icon shall fit within a rectangle measuring 32 mm in height and 30 mm in width, positioned 3 mm from the left margin and 50 mm above the bottom margin
- k) **Symbol squares:** The symbol squares for the QR code and CO emission colour codes shall each measure 20 mm by 20 mm. The emission colour code squares shall be spaced 2 mm apart and positioned 5 mm from the right margin and 50 mm above the bottom margin. The QR code square shall be placed 5 mm from the right margin and 2 mm away from the CO emission square, vertically.
- l) **Footer:** The bar shall be 40 mm wide and 96 mm long.

B.3 Label Design and Colour Specifications

- **Background:** The background of the label shall be 100% white. ○ **Border:** The label border shall be 0.5 mm wide.
- **Typeface:** The typefaces used shall be Verdana and Calibri.
- **Colour Specifications (CMYK format):** The label's colours shall follow the CMYK format:
 - **Label and squares Border:** 100, 50, 0, 0
 - **National flag Logo:** Original colours as per the official logo
 - **Background of the Energy Label section:** 100, 0, 100, 50.

- **The text colour for 'ENERGY LABEL'** shall be 100% white (CMYK: 0, 0, 0, 0), while the text colour for **'BIOGAS COOKSTOVE'** shall be 100% black
- **Bars enclosing the star ratings:** Similar to the corresponding star's colour codes

B.3.1 Star bars size

The star efficiency rating bars shall follow these dimensions:

- **5-star bar:** 8.5 mm width, 50 mm length.
- **4-star bar:** 8.5 mm width, 40 mm length.
- **3-star bar:** 8.5 mm width, 30 mm length.
- **2-star bar:** 8.5 mm width, 20 mm length.
- **1-star bar:** 8.5 mm width, 10 mm length.

B.3.2 The star colours for energy efficiency rating:

- **5 stars (most efficient):** 100, 0, 100, 0.
- **4 stars:** 30, 0, 100, 0.
- **3 stars:** 0, 0, 100, 0.
- **2 stars:** 0, 30, 100, 0.
- **1 star (least efficient):** 0, 100, 100, 0.

B.3.3 Energy Efficiency Class Number (star rating) inside the stars arrow:

The energy efficiency class number shall be:

- **Colour:** 100% white.
- **Font:** Calibri Bold, size 33 pt.
- The rectangular black section of the arrow shall contain the star rating number, which is centered.

B.3.4 CookStoves icon

- Colour shall be 100% black.
- The background color shall be 100% white.

B.3.5 QR Code

The QR code shall be 100% black.

B.3.6 Additional Text Elements

- **The phrase "MORE STARS, MORE SAVINGS":**
 - **Font:** Calibri Bold, size 14 pt.
 - **Colour:** 100% black.
- **Texts within the symbol squares:**
 - **Font:** Verdana Bold, 12 pt for the main element, Verdana Regular 10 pt for the unit.
 - **Colour:** 100% black.

B.3.7 Emission classification & Colours Codes

The emission graphic shall be labeled from A to E using the specified color codes and shall display the emission rating as shown in Figure A.1.

- **Green portion (A):** 100, 0, 100, 0.
- **Light green (B):** 30, 0, 100, 0
- **Yellow (C):** 0, 0, 100, 0
- **Orange portion (D):** 0, 30, 100, 0.
- **Red portion (E):** 0, 100, 100, 0.

B.3.8 Footer

- **Background shall be:** 100, 50, 0, 0.
- **The texts:**
 - **Font:** Calibri, size 12 pt.
 - **Colour:** 100% white.

B.3.9 The Standard Mark

The standard mark shall be as follows:

- 20mm square wide
- Positioned 5mm from the right and bottom margin
- The colour codes shall be as the original from TBS
- The background colour shall be 100% white
- The text for standard number shall be as specified in the original standard mark.