

# DRAFT UGANDA STANDARD

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## Ceramic water filter— Specification

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## Foreword

Uganda National Bureau of Standards (UNBS) is a parastatal under the Ministry of Trade, Industry and Cooperatives established under Cap 327, of the Laws of Uganda, as amended. UNBS is mandated to coordinate the elaboration of standards and is

- (a) a member of International Organisation for Standardisation (ISO) and
- (b) a contact point for the WHO/FAO Codex Alimentarius Commission on Food Standards, and
- (c) the National Enquiry Point on TBT Agreement of the World Trade Organisation (WTO).

The work of preparing Uganda Standards is carried out through Technical Committees. A Technical Committee is established to deliberate on standards in a given field or area and consists of key stakeholders including government, academia, consumer groups, private sector and other interested parties.

Draft Uganda Standards adopted by the Technical Committee are widely circulated to stakeholders and the general public for comments. The committee reviews the comments before recommending the draft standards for approval and declaration as Uganda Standards by the National Standards Council.

The committee responsible for this document is Technical Committee UNBS/TC 301, Chemistry.

## Introduction

Globally, the world is expected to exceed the Millennium Development Goal target of halving the proportion of people without access to safe drinking water by 2051

Despite this, many people still lack access to safe drinking water, leaving them vulnerable to diseases such as diarrhoea, typhoid and hepatitis. When people fall sick, local economies are affected and children stay home from school.

Household water treatment and safe storage can dramatically improve drinking water quality, positively impacting the lives of those who rely on water from polluted rivers or lakes, or from unsafe wells or piped water supplies.

Ceramic water filters are a low-cost, effective, simple and easily maintained method for water treatment at a household level (or “point of use”) – enabling families’ to access safe drinking water, free from disease-causing pathogens.

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# Ceramic water filter— Specification

## 1 Scope

This Draft Uganda Standard specifies the requirements, sampling and test methods for ceramic water filter.

## 2 Normative references

The following referenced documents 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.

ISO 11923, Water quality — Determination of suspended solids by filtration through glass-fibre filters

US ISO 10523, Water quality — Determination of pH

US ISO 7887, Water quality — Examination and determination of colour

US ISO 7888, Water quality — Determination of electrical conductivity

US ISO 7027-1, Water quality — Determination of turbidity – Part 1: Quantitative methods

ISO 9308-1, Water quality — Enumeration of *Escherichia coli* and coliform bacteria — Part 1: Membrane filtration method for waters with low bacterial background flora

ISO 10359, Water quality - Determination of fluoride

ISO 11969, Water quality - Determination of arsenic - Atomic absorption spectrometric method (hydride technique)

ISO 12846, Water quality - Determination of mercury - Method using atomic absorption spectrometry (AAS) with and without enrichment

ISO 15681, Water quality - Determination of orthophosphate and total phosphorus contents by flow analysis (FIA and CFA)

ISO 16266, Water quality - Detection and enumeration of *Pseudomonas aeruginosa* — Method by membrane filtration

ISO 21567, Microbiology of food and animal feeding stuffs — Horizontal method for the detection of *Shigella* spp.

ISO 5961, Water quality -- Determination of cadmium by atomic absorption spectrometry

ISO 6222, Water quality -- Enumeration of culturable microorganisms — Colony count by inoculation in nutrient agar culture media

ISO 6333, Water quality -- Determination of manganese -- Formaldoxime spectrometric method

ISO 6461, Water quality -- Detection and enumeration of the spores of sulphite-reducing anaerobes (clostridia) — Method by membrane filtration

ISO 6777, Water quality -- Determination of nitrite -- Molecular absorption spectrometric method

ISO 6785, Milk and milk products -- Detection of Salmonella spp.

ISO 6888, Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of coagulase-positive staphylococci (Staphylococcus aureus and other species)

ISO 7890, Water quality -- Determination of nitrate -- Part 3: Spectrometric method using sulfosalicylic acid

ISO 7899, Water quality -- Detection and enumeration of intestinal enterococci

ISO 8288, Water quality -- Determination of cobalt, nickel, copper, zinc, cadmium and lead -- Flame atomic absorption spectrometric methods

ISO 4832, Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of coliforms — Colony-count technique

ASTM D 3866-18, Standard Test Methods for Silver in Water

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <http://www.iso.org/obp>

**3.1 ceramic**  
brittle, corrosion and heat resistant, inorganic non metallic material produced by high -temperature processing

**3.2 firing**  
controlled heat treatment of ceramic ware in a kiln or furnace, during the process of manufacture, to develop the desired properties.

**3.3 unglazed**  
hard, dense material of homogeneous composition , deriving colour and texture from materials of which the body is made

### 4. Material

**4.1** Ceramic water filter shall be fired, unglazed porous ware and subsequently suitably treated chemically so that fine silver is embedded in the body of the filter.

**4.2** The manufacturer shall provide a suitable food grade material for cleaning the ceramic filter.



## 5. Requirements

### 5.1 General requirements

- 5.1.1 Ceramic filter shall be properly fired so as not to shed particles under conditions of normal use.
- 5.1.2 Ceramic filter shall also be free from large discrete cavities, warpage, uneven firing and protrusion.
- 5.1.3 Ceramic filter shall not have visible external cracks.

### 5.2 Specific requirements

5.2.1 The ceramic water filter shall comply with the specific requirements given in table 1 when tested in accordance with the methods described therein.

Table 1 — Specific requirements for ceramic water filter

S/No.	Parameter	Requirement	Test method
i	Detection of internal cracks	To pass test	Annex A
ii	Rate of filtration, l/hr	To pass test	Annex B
iii	Presence of Silver	To pass test	Annex C

5.2.2 The ceramic water filter shall comply with the performance requirements done on the filtrate given in table 2 when tested in accordance with the methods described therein.

Table 2 — Performance requirements for the filtrate

S/No.	Parameter	Requirement	Test method
i	Suspended matter	Not detectable	ISO 11923
ii	pH	6.5 – 8.5	US ISO 10523
iii	Conductivity, $\mu\text{S/cm}$ , Max	1500	US ISO 7888
iv	Color, TCU, Max	15	US ISO 7887
v	Turbidity, NTU, Max	5	US ISO 7027- 1
vi	Silver, mg/L, max	0.1	ASTM D 3866-18
vii	Arsenic, as As	0.01	ISO 11969
viii	Cadmium, as Cd	0.003	ISO 5961
ix	Lead, as Pb	0.01	ISO 8288
x	Copper, as Cu	1.000	
xi	Mercury (total as Hg)	0.001	ISO 12846
xii	Manganese, as Mn	0.1	ISO 6333
xiii	Nickel, as Ni	0.02	ISO 8288
xiv	Nitrate as $\text{NO}_3^-$	45	ISO 7890

xv	Nitrite	0.003	ISO 6777
xvi	Phosphates, as PO <sub>4</sub> <sup>3-</sup>	2.2	ISO 15681
xvii	Fluoride, as F	1.5	ISO 10359
xviii	E.coli, in 100 mL	Absent	ISO 9308 - 1
xix	Total coliforms, in 100 mL	Absent	ISO 4832
xx	Total viable counts at 22 °C, in mL, max. a)	100	ISO 6222
	Total viable counts at 37 °C, in mL, max. a)	50	
xxi	<i>Staphylococcus aureus</i> in 100 mL	Absent	ISO 6888-1
xxii	Sulphite reducing anaerobes in 100 mL	Absent	ISO 6461-2
xxiii	<i>Pseudomonas aeruginosa</i> fluorescence in 100 mL	Absent	ISO 16266
xxiv	<i>Streptococcus faecalis</i> in 100mL	Absent	ISO 7899-2
xxv	<i>Shigella</i> in 100 mL	absent	ISO 21567
xxvi	<i>Salmonella</i> in 100 mL	Absent	ISO 6785

## 6 Packaging

Ceramic water filter shall be packaged in suitable containers that permits the product's integrity.

## 7 Labelling

7.1 The ceramic water filter shall be labelled with the following information:

- a. Manufacturer's name and the recognized trade-mark, if any;
- b. Rate of filtration, l/hr
- c. Lot number or batch number
- d. Country of origin and
- e. Physical address of the manufacturer

7.2 The manufacturer shall provide an information leaflet with the following information

- a. Clean the ceramic water filter every 14 days or when clogged.
- b. Scrub the ceramic water filter with clean water and a suitable food grade material, as provided by the manufacturer. DO NOT use soap to clean the filter pot.
- c. Wash the bucket, tap and lid with clean water and soap
- d. Replace the ceramic water filter after two (2) years of use or when the filtration rate is reduced.

## 8 Sampling

The sampling procedure and the criteria for conformity shall be as given in Annex D

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## **ANNEX A**

**(normative)**

### **Detection of internal cracks**

#### **A.1 Principal**

This test is to detect internal cracks on the filter element

#### **A.2 Procedure**

**A.2.1** submerge a filtering element in water only up to its rim, without letting water flow into the filter

**A.2.2** hold it for about 10 seconds to see if any water seeps through the walls of the filter

**A.2.3** If water seeps through the walls of the filter after being submerged for the 10 seconds it is an indication of internal cracks and the filter has failed this test.

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## ANNEX B (normative)

### Determination of rate of filtration

#### B.1 Apparatus

**B.1.1** A calibrated T-Device is used to measure the change in water level

**B.1.2** A stop watch

#### B.2 Procedure

**B.2.1** Soak the filtering element for 24 hours in a pool of water

**B.2.2** The soaked filter pots are removed from the pool and laid on a raised platform [racks]

**B.2.3** Fill up the pot with clean water to full capacity

**B.2.4** A stopwatch is set for one hour

**B.2.5** After one hour of filtration, the water level in litres per hour is read from the calibrated T-Device

**B.2.6** The acceptable rate of filtration shall be as declared by the manufacturer



Figure B, showing the rate of filtration setup

## ANNEX C (normative)

### Method of test for presence of silver

#### C.1 Preparation of sample

Break the ceramic water filter, take sufficient quantity of pieces in agated pestle and mortar and grind it to fine powder to give more than 5 g of powder.

#### C.2 Reagents

C.2.1 Dilute Nitric Acid 50 Percent (v/v)

C.2.2 Dilute Hydrochloric Acid 35 Percent (v/v)

C.2.3 Liquor Ammonia

#### C.3 Procedure

C.3.1 Take 5g of finely agated ceramic water filter material, wash with distilled water, allow the mixture to settle and decant the supernatant and wash out at least thrice and decant the supernatant liquid.

C.3.2 Digest the residue with 50 ml of dilute nitric acid on a hot plate and allow settling.

C.3.3 Decant the supernatant liquid into a suitable glass tube.

C.3.4 Add into the glass tube a few mills of dilute hydrochloric acid.

C.3.5 If solution shows white turbidity, confirm presence of silver by adding an excess of liquid ammonia, when the turbidity will disappear.

## ANNEX D (normative)

### Sampling and criteria for conformity

#### D.1 Lot

**D.1.1** In a consignment all the ceramic water filters, manufactured from the same type of material and belonging to the same batch of manufacture shall be grouped together to constitute a lot.

**D.1.2** Each lot shall be tested for conformity to the requirements of this standard.

#### D.2 Scale of sampling and criteria for conformity

##### D.2.1 General

**D.2.1.1** The number of ceramic water filters to be sampled from each lot depends on the size of the lot and shall be as given in Table 3.

**D.2.1.2** These ceramic water filters shall be selected at random making use of random number tables.

##### D.2.2 Detection of internal cracks

**D.2.2.1** The number of ceramic water filters to be sampled for examining the above parameter is given in col 3 of Table 3

**D.2.2.2** Any ceramic water filter failing in one or more of the tests shall be termed defective.

**D.2.2.3** The number of defective ceramic water filter shall not exceed the acceptance number (col 4 of Table 3), if the lot is to be accepted under this clause.

##### D.2.3 Tests for Rate of Filtration, Presence of Silver and all parameters for table 2

**D.2.3.1** The number of tests to be conducted for each of the above parameters is given in col 5 of Table 4.

**D.2.3.2** For conducting these tests, sample test pieces shall be obtained from the sample ceramic water filters as described in the respective test methods.

**D.2.3.3** No failures shall occur, if the lot is to be declared satisfactory under this clause

Table — 3 Scale of Sampling and Criteria for Conformity

S/No.	Lot Size	Sample Size for detection of cracks	Acceptance No.	No. of tests for rate of filtration, presence of silver and all parameters for tables 2 and 3
i	Up to 25	3	0	1
ii	26 to 50	5	0	1
iii	51 to 100	8	1	2
iv	101 to 200	13	1	3
v	201 and above	20	2	4

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- [4] Alemu Lelago Bulta<sup>1\*</sup> and Geremew Arega W. Micheal<sup>2</sup> ((2019). Evaluation of the efficiency of ceramic filters for water treatment in Kambata Tabaro zone, southern Ethiopia

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