

ISO/TC 255

Secretariat: SAC

Voting begins on:
2020-09-02

Voting terminates on:
2020-10-28

Household biogas system requirements: design, installation, operation, maintenance and safety

*Exigences relatives aux systèmes de biogaz domestiques: conception,
installation, utilisation, maintenance et sécurité*

iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
<https://standards.iteh.ai/catalog/standards/sist/72ae3755-1272-45ae-a8ca-a93e4a4084d6/iso-fdis-23590>

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.



Reference number
ISO/FDIS 23590:2020(E)

iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
<https://standards.iteh.ai/catalog/standards/sist/72ae3755-1372-45ae-a8ca-a93e4a4084d6/iso-fdis-23590>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2020

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

	Page
Foreword.....	iv
Introduction.....	v
1 Scope.....	1
2 Normative References.....	1
3 Terms and Definitions.....	1
4 Symbols and Abbreviated Terms.....	4
5 Household Biogas System (HBS) Design and Construction.....	4
5.1 HBS general design.....	4
5.2 Materials.....	5
5.3 Digester.....	5
5.3.1 General.....	5
5.3.2 Digester size.....	5
5.4 Pipes, fittings and Connections.....	6
6 Components Testing and Sampling Criteria.....	6
7 System Manuals.....	7
8 Prerequisites for Installation.....	7
9 Household Biogas System Operation.....	7
10 Maintenance and Troubleshooting.....	8
11 Markings.....	9
12 Safety.....	9
13 Warranty and Guarantee.....	10
Annex A Schematic of Household Biogas System.....	11
Annex B Effects on Humans for Different Concentrations of H₂S.....	12
Bibliography.....	13

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 255, *Biogas*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

A household biogas system processes organic waste such as food scraps and manure into biogas which can be used for cooking, and into digestate that is convertible to natural fertilizer which can be used for gardening or soil improvement.

Biogas is a flammable gas, mainly composed of methane and carbon dioxide, generated by the anaerobic fermentation (without oxygen) of organic matter.

A household biogas system operates as a continuous-flow system, i.e. organic waste is fed in one end, and the gas and fertilizer are emitted from the other. The generated biogas is filtered to remove any unpleasant odours and toxic gases.

The digestate can be sanitized to reduce the amount of active pathogens in the effluent.

This document for Household Biogas Systems covers the small sized production and output of biogas for personal use in homes, kitchens, small farms, etc.

This document is applicable to all types and styles of household biogas systems, and it does not address any particular manufacturer of household biogas systems.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
<https://standards.iteh.ai/catalog/standards/sist/72ae3755-1372-45ae-a8ca-a93e4a4084d6/iso-fdis-23590>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Full standard:
<https://standards.iteh.ai/catalog/standards/sist/72ae3755-1372-45ae-a8ca-a93e4a4084d6/iso-fdis-23590>

Household biogas system requirements: design, installation, operation, maintenance and safety

1 Scope

This document covers the requirements for the design, installation, operation, maintenance and the safety of Household Biogas Systems (HBSs), producing biogas in an amount equivalent to an installation capacity of less than 100 MWh per year.

The document applies to HBSs comprising of pipeline and equipment with pressure levels of less than 5 kPa.

Any equipment or appliances connected to an HBS or utilizing the biogas energy of an HBS are not a part of the scope of this document.

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.

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 <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

anaerobic digestion

biological conversion of biodegradable materials by micro-organisms in the absence of oxygen creating two main products: *biogas* (3.2) and *digestate* (3.6)

[SOURCE: ISO 20675:2018, 3.1]

3.2

biogas

gas produced by anaerobic digestion of organic matter without further upgrading or purification

[SOURCE: ISO 20675:2018, 3.2, modified — 'gasification of biomass or power to gas from biomass sources' removed.]

3.3

biogas installation

installation including its pipelines, pipes and accessories for anaerobic digestion of *biomass* (3.5)

[SOURCE: ISO 20675:2018, 3.5, modified — 'gasification of biomass and waste, upgrading of biogas, liquefaction of biogas, storage of CO₂, storage of auxiliaries, storage of biomass and digestate' removed.]

3.4

biogas storage

buffer, gas holder, tank, vessel, bag or similar to store *biogas* (3.2)

[SOURCE: ISO 20675:2018, 3.7]

3.5

biomass

material of biological origin excluding material embedded in geological formations and/or transformed to fossilized material

[SOURCE: ISO 20675:2018, 3.9]

3.6

digestate

remaining effluent from the anaerobic digestion process including solid fraction and liquid fraction

[SOURCE: ISO 20675:2018, 3.19]

3.7

digester

anaerobic digestion installation including reactors, tanks and related equipment

[SOURCE: ISO 20675:2018, 3.20]

3.8

hydraulic retention time

theoretical average period of time a soluble compound remains in the *digester* (3.7)

Note 1 to entry: The hydraulic retention time (HRT) is calculated as net digester volume (m³)/daily feedstock input (m³/day).

[SOURCE: ISO 20675:2018, 3.28]

3.9

household biogas system

biogas installation which uses biomass from a single household for its own consumption and consists of a digester and an application for cooking, heating, lighting or power production.

[SOURCE: ISO 20675:2018, B.3.1.1]

3.10

household biogas system owner

legal entity, a company or natural person owning the *biogas installation* (3.3)

[SOURCE: ISO 20675:2018, 3.31 modified — term changed from 'installation owner'.]

3.11

methane content

mol percentage of methane in *biogas* (3.2)

3.12

organic dry matter

part of *biomass* (3.5) or *digestate* (3.6) which consists of dry matter containing carbon and originating from living materials

[SOURCE: ISO 20675:2018, 3.44]

3.13**organic loading rate digester**

amount of volatile *organic dry matter* (3.12) entering the anaerobic *digester* (3.7) over time, measured in kilograms per m³ digester volume and day

Note 1 to entry: The organic load gives an indication on biological degradation of the *substrates* (3.18). It provides information on nutrient supply levels of the microorganisms involved, overload or undersupply of the system as well as resulting technical and process control measures to be taken. The organic load describes the efficiency of the anaerobic digester.

[SOURCE: ISO 20675:2018, 3.45]

3.14**raw biogas**

biogas (3.2) directly from the *digester* (3.7) which is not conditioned, so it is not dried and cleaned

[SOURCE: ISO 20675:2018, 3.48]

3.15**solid retention time (SRT)**

period of time expressed in days the *biomass* (3.2) is in the *digester* (3.7) for anaerobic digestion

Note 1 to entry: The solid retention time (SRT) is calculated as the net capacity for biomass content in the digester (kg)/daily feedstock input (kg/day).

[SOURCE: ISO 20675:2018, 3.53]

3.16**specific biogas installation**

standard state volumetric *biogas* (3.2) installation expressed in normal cubic meters per liquid volume in cubic meters of the digester per day

[SOURCE: ISO 20675:2018, 3.54]

3.17**specific biogas yield**

standard state volumetric biogas installation expressed in normal cubic meters per kilogram *organic dry matter* (3.12) of the feedstock

[SOURCE: ISO 20675:2018, 3.55]

3.18**substrate**

part of the *biomass* (3.5) which is biodegradable and converted by micro-organisms and/or enzymes as catalyst into *biogas* (3.2)

[SOURCE: ISO 20675:2018, 3.56]

3.19**supplier of the household biogas system**

legal entity or a company which designs, manufactures or constructs and delivers the *biogas installation* (3.3) to the *household biogas system owner* (3.10)

[SOURCE: ISO 20675:2018, 3.57]

4 Symbols and Abbreviated Terms

HRT	Hydraulic retention time
MWh	Megawatt Hour
SRT	Solid retention time
HBS	Household Biogas System

5 Household Biogas System (HBS) Design and Construction

5.1 HBS general design

The HBS shall include the following devices:

- biomass inlet
- digester
- biogas storage
- biogas outlet
- biogas transfer system
- digestate outlet
- H₂S filter
- disinfection unit (optional, depending on local regulations)
- an excess biogas release valve which shall automatically open at pressures greater than 20% of the regular working pressure of the system.
- a manual biogas shutoff valve parallel to the automatic excess biogas release valve, from the biogas storage

NOTE 1 see [Annex A](#) Schematic of Household Biogas System.

The HBS shall be designed in a manner not to allow deformation due to environmental conditions, greater than 2 %.

The HBS shall be designed in a manner to exclude the entrance of air under all operating conditions.

The HBS shall not have any leakage during the hydrostatic pressure head test at 150 % of the regular system working pressure.

Where electrical service is required, the installation and all electrical wire, fixtures and equipment shall meet international and local standards.

Monitoring and alarm systems are allowed.

NOTE 2 Monitoring and alarm systems can enhance safety, especially in cases when using the HBS for indoor applications, but in most cases not feasible due to economic and technical reasons.

Chimneys are allowed to remove excess gas.