



DPC: 23/30450734 DC

BSI Group Headquarters

389 Chiswick High Road London W4 4AL

Tel: +44 (0)20 8996 9000

Fax: +44 (0)20 8996 7400

www.bsigroup.com

Date: 26 June 2023

Origin: International

Latest date for receipt of comments: 16 August 2023

Project No. 2022/00082

Responsible committee: PTI/12 Petroleum Measurement and Sampling

Interested committees:

Title: Draft BS ISO 8943 . Refrigerated light hydrocarbon fluids — Sampling of liquefied natural gas — Continuous and intermittent methods.

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Introduction

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

DRAFT INTERNATIONAL STANDARD

ISO/DIS 8943

ISO/TC 28/SC 5

Secretariat: JISC

Voting begins on:
2023-06-23

Voting terminates on:
2023-09-15

Refrigerated light hydrocarbon fluids — Sampling of liquefied natural gas — Continuous and intermittent methods

Hydrocarbures liquides légers réfrigérés — Échantillonnage de gaz naturel liquéfié — Méthodes en continu et par intermittence

ICS: 75.060

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Reference number
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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

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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).

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This document was prepared by Technical Committee ISO/TC 28, *[Petroleum and related products, fuels and lubricants from natural or synthetic sources]*, Subcommittee SC 5, *[Measurement of refrigerated hydrocarbon and non-petroleum based liquefied gaseous fuels]*.

This third edition cancels and replaces the second edition (ISO 8943:2007), which has been technically revised.

The main changes compared to the previous edition are as follows:

- overview of gasified LNG sampling is added
- CP/FP type gas sample holder is introduced
- multiple shore transfer pipeline is considered
- stable flow rate is specified
- an approach to find outlier of online analysis results is introduced
- an example of sampling report is added

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

In the custody transfer of liquefied natural gas, hereinafter referred to as LNG, it is common practice to determine the quantity transferred on a calorific-content basis. The total calorific content of quantities of LNG quoted in the custody transfer is determined by the liquid volume, liquid density and gross calorific value of the LNG delivered.

A knowledge of the composition of the LNG is required in order to calculate the density and the calorific content of quantities of LNG. Therefore, precise sampling is a prerequisite for precise analysis.

LNG is a complex mixture of low-molecular-weight hydrocarbons with nitrogen as a principal inert impurity. Typically, methane is the major component. Minor-component concentrations vary with the source of the raw gas, the liquefaction pre-treatment, the liquefaction process and the storage conditions.

Refrigerated light hydrocarbon fluids — Sampling of liquefied natural gas — Continuous and intermittent methods

1 Scope

This document specifies methods for the continuous and the intermittent sampling of LNG while it is being transferred through an LNG transfer line.

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.

ISO 10715:2022, *Natural gas — Gas sampling*

3 Terms and definitions

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

3.1

accumulator

storage provided to absorb pressure pulsations of gasified LNG and to homogenize it

[SOURCE: ISO 1998-5:1998, 5.20.275]

3.2

bubbling

procedure, in the case of water-seal-type gas sample holder, to saturate the seal water in a gas sample holder with gasified LNG for suppressing the effect of the seal water on the gas sample

[SOURCE: ISO 1988-5:1998, 5.20.287 modified]

3.3

compressor for transferring gasified LNG

compressor used for boosting the pressure of gasified LNG when gasified LNG in the LNG sample vaporizer cannot be transferred to the gas sample holder by its inherent pressure

3.4

constant pressure / floating piston sample holder or cylinder

CP/FP sample holder or cylinder

sample holder or cylinder abbreviated as CP/FP sample holder or cylinder and usually used for intermittent sampling, capable of maintaining constant pressure during the sampling of gas from the process line into the sample holder or cylinder

3.5

continuous sampling

continuous collection of LNG from the LNG transfer line during custody transfer in stable flow, the gasified LNG from the vaporizer is thereafter continuously fed into the gas sample holder

3.6

gas sample cylinder

sample cylinder, usually used for continuous sampling, used for the retention of the gas sample and for its transfer to an analyzing instrument

3.7

gas sample compressor

compressor used for charging the gas sample collected in a gas sample holder into a gas sample cylinder

3.8

gasify

term used to express “vaporization” related to a treatment during a process

3.9

intermittent sampling

process to collect samples from gasified LNG stream into a gas sample holder or cylinder intermittently, grab by grab, with predetermined time or flow amount intervals

3.10

LNG

liquids composed predominantly of methane

3.11

LNG sample vaporizer

apparatus to completely gasify the LNG sample collected from the LNG transfer line

3.12

LNG transfer line

pipeline used for transferring LNG

3.13

offline analysis

procedure of analysis implemented on the representative sample gas that is once charged into a gas sample cylinder or a CP/FP sample cylinder

3.14

online analysis

procedure of analysis implemented using an analytical equipment that is directly connected through pipelines or other means to the sampling device

3.15

online gas chromatograph

gas chromatograph that is connected to the gasified LNG stream, downstream of an offtake probe and vaporiser, to facilitate on-line analysis

3.16

pressure regulator

pressure-regulating valve and pressure sensor provided to keep the gas pressure constant at the gas sample holder inlet

3.17

sample filter

filter used to protect the sampling valve for the online gas chromatograph from scoring due to the presence of foreign contaminants, such as metal shavings, dirt and so forth

3.18

sampling probe

device inserted into gas or liquid to be sampled from the transfer line or fitted to the transfer line for collecting a sample

[SOURCE: ISO 1988-6:2000, 6.40.104]

3.19**seal water**

water used in the water seal type gas sample holder to preclude contact of the gas sample with the atmosphere

3.20**sub-cooling****sub-cooled state**

lowering the temperature of LNG to below its boiling point at a given pressure, i.e. sub-cooled state

3.21**vaporize**

used when express “vaporization” related to a facility

3.22**waterless-type gas sample holder**

holder without seal water (typically using an expandable/contractible, transformable rubber membrane) and used for collecting gasified LNG

3.23**water-seal-type gas sample holder**

holder with seal water used for collecting gasified LNG

3.24**direct sampling**

sampling in situations where there is a direct connection between the natural gas to be sampled and the analytical unit

[SOURCE: ISO 10725:2022, 3.5]

3.25**indirect sampling**

sampling in situations where there is no direct connection between the natural gas to be sampled and the analytical unit

[SOURCE: ISO 10725:2022, 3.11]

3.26**spot sampling**

sampling of specified volume taken at a specified place at a specified time from a stream of gas

3.27**incremental composite sampling**

accumulate sampling from the process line into sample cylinder(s) during certain period to have representative sample

4 Outline of sampling system

4.1 General

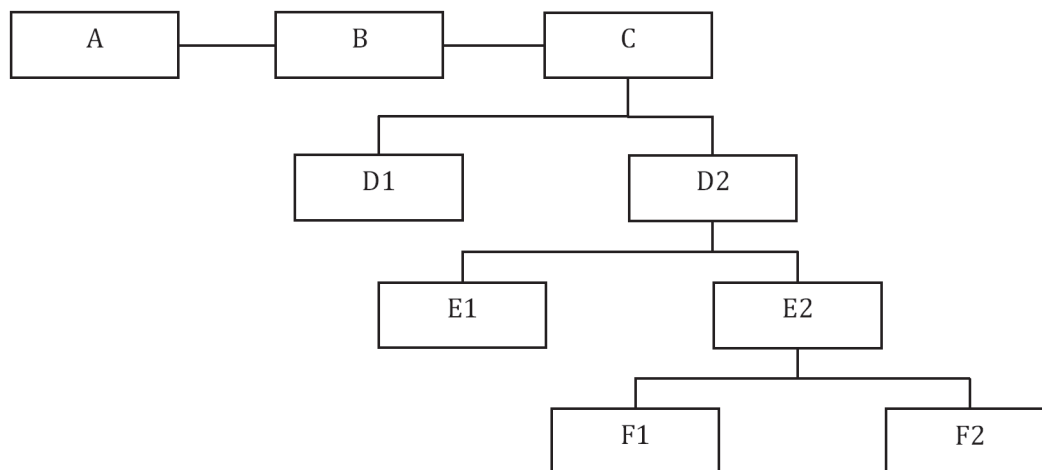
The purpose of sampling is to take a representative sample. The sample is analysed to determine the composition of the LNG transferred. Regardless of sampling method or system design, the LNG sample collected through the sampling probe provided on the LNG transfer line is gasified in the LNG sample vaporizer system. Samples shall be taken after the accumulator if an accumulator is installed in the gasified LNG stream. The samples are to be representative of the transferred LNG.

The primary isolation valve between the sample probe and the vaporiser should be an emergency shutdown (ESD) which fails safe to isolate the liquified LNG from the sampling system or GC. The valve will be closed if the temperature at the outlet of the vaporiser is below the working temperatures of the elements downstream to prevent damage and potentially external loss of LNG by leakage.

Typically, the sampling system is designed to take three physical samples, one for analysis, one for seller and the other for buyer.

Refer [figure 1](#) for outline of sampling.

Note The order of descriptions below [4.2](#) and [4.3](#) does not reflect a preference to any specific design or type or both of system.



Key

- A LNG transfer line
- B vaporiser
- C gasified LNG process line
- D1 direct sampling
- D2 indirect sampling
- E1 spot sampling
- E2 incremental composite sampling
- F1 continuous sampling
- F2 intermittent sampling

Figure 1 — Outline of gasified LNG sampling

4.2 Direct sampling

There is a direct connection between the gasified LNG stream and analytical unit such as gas chromatograph. Gasified LNG stream sample is taken and sent to analytical unit directly for online analysis. Pipeline temperature of gasified LNG stream shall be maintained appropriately to avoid partial condensation of the gasified components.

4.3 Indirect sampling

4.3.1 General

Gasified LNG samples in cylinders are taken for offline analysis. The samples are fed into the analytical unit from the cylinders which are filled from the gasified LNG stream.

4.3.2 Spot sampling

Sample is taken into a sample cylinder from the gasified LNG stream in a short period during LNG transfer on demand or predetermined intervals.