
**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*

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 8943 was prepared by Technical Committee ISO/TC 28, *Petroleum products and lubricants*, Subcommittee SC 5, *Measurement of refrigerated hydrocarbon and non-petroleum based liquefied gaseous fuels*.

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This second edition cancels and replaces the first edition (ISO 8943:1991), which has been technically revised.

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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.

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

1 Scope

This International Standard 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 referenced documents are indispensable for the application 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 10715:1997, *Natural gas — Sampling guidelines*

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3 Terms and definitions **(standards.iteh.ai)**

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

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3.1 accumulator

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storage vessel provided to absorb pressure pulsations of gasified LNG and to homogenize the same

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 in order to suppress the effect of the seal water on the gas sample

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 container CP/FP sample container

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

3.5 continuous sampling

sampling from gasified LNG with constant flow rate

3.6 gas sample container

sample container, 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 container
- 3.8**
gasify
term used to express “vaporization” related to a treatment during a process
- 3.9**
intermittent sampling
sampling from gasified LNG with predetermined intervals or with predetermined 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 container or a CP/FP sample container
- 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 directly connected to the pipelines or sampling device to implement online 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**
sample probe
device inserted into the LNG to sample from the LNG transfer line to collect an LNG sample
- 3.19**
seal water
water used in the water seal type gas sample holder to preclude contact of the gas sample with the atmosphere

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3.20**sub-cooling**

lowering the temperature of LNG below its boiling point at a given pressure

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**

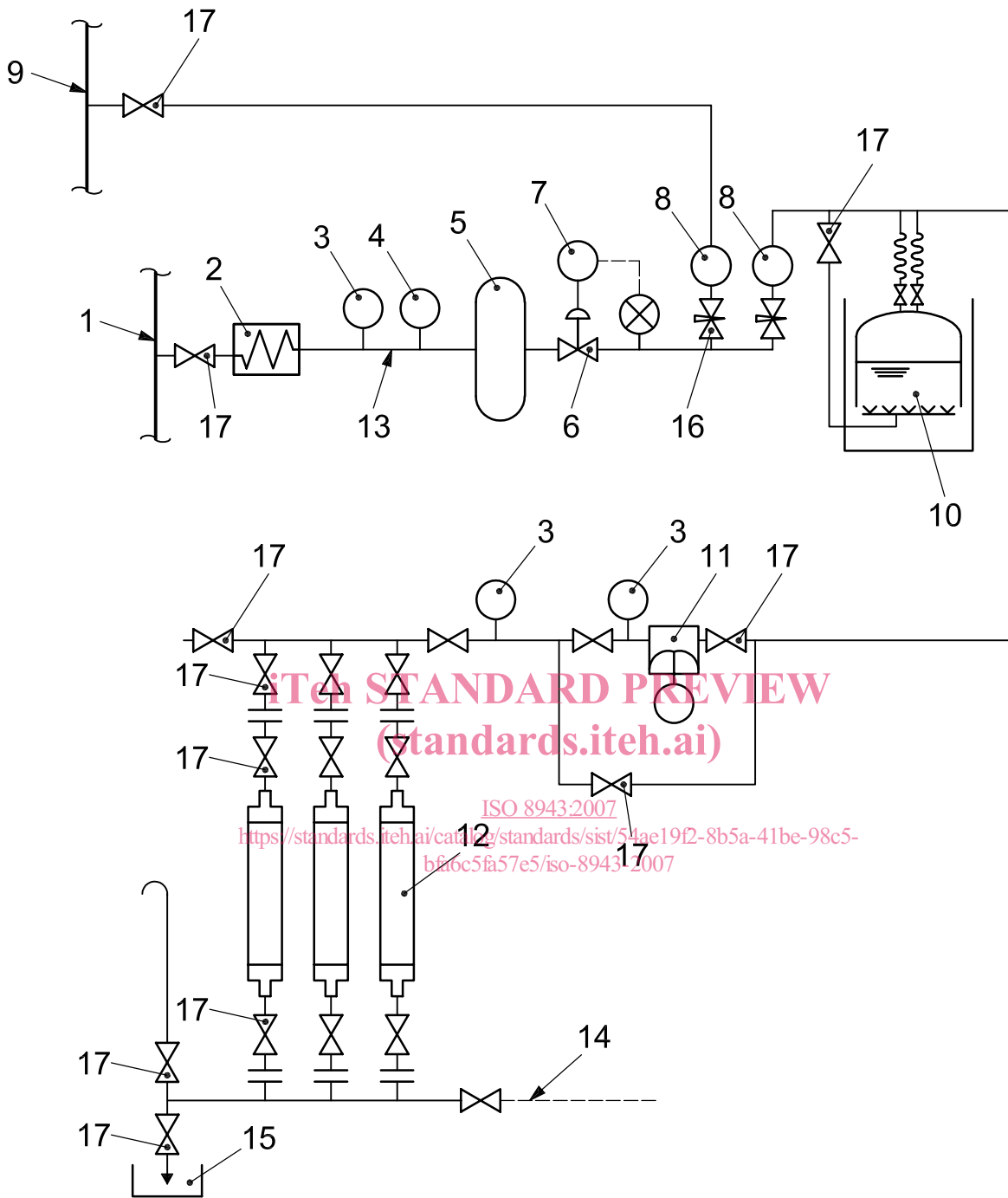
holder with seal water used for collecting gasified LNG

4 Outline of sampling system**4.1 General**

Regardless of whether the sampling method is continuous or intermittent, the LNG sample collected through the sample probe provided on the LNG transfer line is gasified in the LNG sample vaporizer.

4.2 Continuous sampling

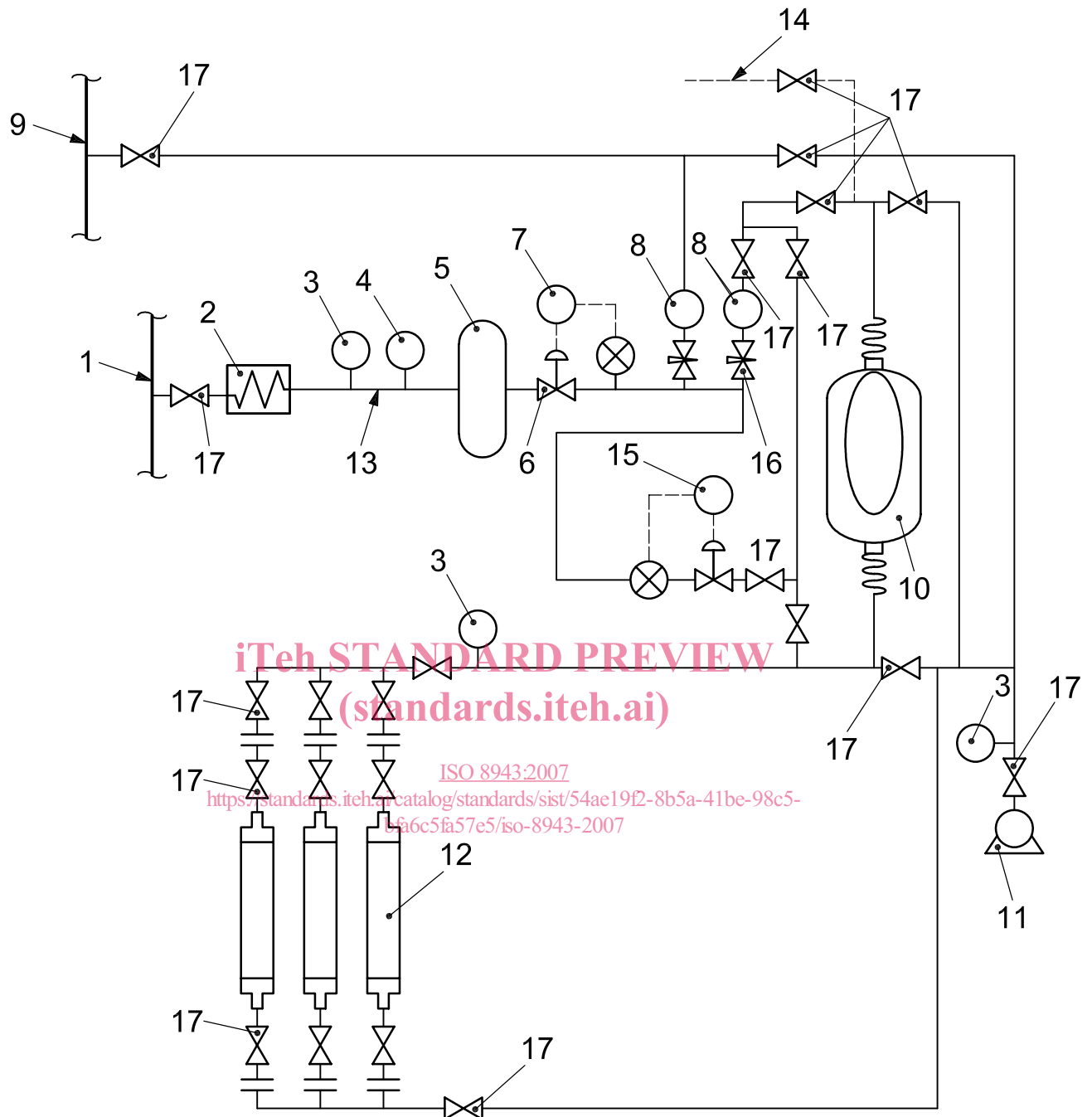
Gasified LNG from the LNG sample vaporizer outlet is continuously fed into the gas sample holder by its inherent pressure when the pressure is sufficiently high or after its pressure has been boosted by the compressor for transferring gasified LNG when the pressure is insufficient. In this process, the gas pressure in the sampling line is controlled by a pressure regulator and the flow into the gas sample holder is maintained by the gas sample holder inlet valve. The gas sample collected in the gas sample holder is fed into the gas sample container. An outline flow process diagram of the sampling system is shown in Figure 1 for a water-seal-type gas sample holder and in Figure 2 for a waterless-type gas sample holder.



Key

- | | | | |
|---|--------------------------------|----|------------------------------------|
| 1 | LNG transfer line | 10 | water-seal-type gas sample holder |
| 2 | LNG sample vaporizer | 11 | compressor for charging gas sample |
| 3 | pressure gauge | 12 | gas sample container |
| 4 | thermometer | 13 | sampling line |
| 5 | accumulator | 14 | water pipeline |
| 6 | pressure regulator | 15 | drain pit |
| 7 | pressure indicating controller | 16 | needle valve |
| 8 | flow meter | 17 | valve |
| 9 | gas line | | |

Figure 1 — Example of continuous sampling for a water-seal-type gas sample holder with a compressor

**Key**

- | | |
|----------------------------------|---|
| 1 LNG transfer line | 10 waterless-type gas sample holder |
| 2 LNG sample vaporizer | 11 vacuum pump |
| 3 pressure gauge | 12 gas sample container |
| 4 thermometer | 13 sampling line |
| 5 accumulator | 14 inert gas line (for compressing gas of inner layer of sampling holder) |
| 6 pressure regulator | 15 flow indicating controller |
| 7 pressure indicating controller | 16 needle valve |
| 8 flow meter | 17 valve |
| 9 gas line | |

Figure 2 — Example of continuous sampling for a waterless-type gas sample holder