
**Ethylene for industrial use —
Sampling in the liquid and the gaseous
phase**

*Éthylène à usage industriel — Échantillonnage en phase liquide et en
phase gazeuse*

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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 document 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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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 47, *Chemistry*.

This second edition cancels and replaces the first edition (ISO 7382:1986), which has been technically revised.

The main changes are as follows:

- the Scope has been expanded to apply to sampling for the determination of trace polar compounds in ethylene products;
- [Clauses 2](#) and [3](#) have been added;
- content from [Clauses 4](#) and [7](#), including safety precaution and maintenance of sampling apparatus, has been moved elsewhere in the document;
- in [Clause 4](#), the critical pressure for ethylene has been corrected to 5,04 MPa;
- in [Clause 5](#), explanations regarding apparatus have been added;
- in [Clause 5](#), some specific parameters, including volume of sampling cylinder, size of connecting pipe and time to purge sampling cylinder, have been deleted;
- in [5.2.1](#), specially passivated sampling apparatus has been recommended, especially when sampling for the determination of trace polar compounds in ethylene products.
- [Annex A](#), and [Figures 1, 5](#) and [A.1](#) have been revised.
- in [5.2.2](#): the procedure of purging and sampling for non-closed sampling apparatus has been revised;

- sampling apparatus -no.2 in the first edition and its procedure have been deleted and a new sampling apparatus was introduced as closed sampling apparatus no.2;
- in [5.3](#), [5.4](#), [5.5](#), two closed-sampling apparatuses for liquefied ethylene and a sampling apparatus with heated pressure regulator have been added.
- in [6.2](#), the connecting pipes for non-closed sampling of gaseous ethylene has been revised;
- in [6.3](#), the closed-sampling apparatuses for gaseous ethylene has been 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.

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Ethylene for industrial use — Sampling in the liquid and the gaseous phase

WARNING — The use of this document can involve hazardous material, operation and equipment. This document does not purport to address all of the safety problems associated with its use. It is the responsibility of the users of this document to take appropriate measures to ensure the safety, health of personnel prior to application of the document and fulfil other applicable requirement for this purpose.

1 Scope

This document describes the procedures and the precautions to be taken in drawing representative samples of ethylene in the liquid phase stored at -100 °C and in the gaseous phase, for the purpose of their analysis.

[Annex A](#) sets out a diagrammatic representation of a system for the disposal of the portion of the sample which is not used in the analysis.

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 3165:1976, *Sampling of chemical products for industrial use — Safety in sampling*

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3 Terms and definitions

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

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

closed sampling apparatus

set of apparatus assembled by a sampling cylinder and connecting pipes to take samples under closed conditions, by which the sampling process does not permit the release of any sample or vapour to the surrounding environment

3.2

non-closed sampling apparatus

set of apparatus assembled by a sampling cylinder and connecting pipes to take samples in open air, by which the sampling process permits the release of sample or vapour to the surrounding environment

4 Safety precautions

The safety precautions in all sampling and testing operations with liquefied and gaseous ethylene shall be carefully followed in accordance with ISO 3165:1976. Relevant legal and statutory regulations to ensure the safety, health and environmental protection in the procedure of the sampling methods can apply.

The ethylene shall be stored and transported in the liquid phase at a temperature below - 100 °C.

The critical temperature of ethylene is 9,5 °C and its critical pressure is 5,04 MPa. As the boiling temperature of ethylene at atmospheric pressure is -103,9 °C, it follows that ethylene sampled in the liquid phase cannot be kept in the state at room temperature, without taking account of the pressure.

All sampling equipment shall be capable of resisting the sample pressure after complete vaporization. It is presupposed that the use of the vessels, the plant and the equipment conform to the legal regulations in force. Users shall have the vessels periodically pressure tested by an approved organization.

The construction materials shall be capable of withstanding rapid changes in temperature, for example, rising from - 100 °C to +20 °C in 1 to 2 min. Passivated stainless steel should be selected for preference.

Owing to the low temperatures of the product and its associated equipment, operators shall wear well-insulating, non-cracking plastics or rubber-coated gloves to protect themselves from burns. They shall also wear close-fitting protective goggles.

Ethylene is extremely flammable, and all precautions shall be taken to avoid forming an explosive atmosphere. Suitable ventilation is essential, particularly during the purging operations.

Also, the sampling apparatus shall always be electrically grounded.

The safety precautions shall be taken when cleaning apparatus, discharging ethylene, wastes liquid and steam. The discharging site shall be equipped with safety devices. It is expected that the sites meet relevant safety, health and environmental protection requirements.

If the container is to be transported, it is expected to conform to specifications of applicable legislation regarding transportation for hazardous materials.

5 Sampling from a container filled with ethylene in the liquid phase

5.1 General

Given the wide variation in the sampling apparatus for ethylene, it is difficult to specify a uniform method for obtaining representative samples of heterogeneous mixtures. The four examples of non-closed and closed sampling apparatus described in 5.2 and 5.3 have been found satisfactory and are available commercially. Any other sampling apparatus may be used, however, it is presupposed that they conform to the relevant official decrees and regulations. The apparatus shall be capable of sampling ethylene.

5.2 Non-closed sampling apparatus and procedure

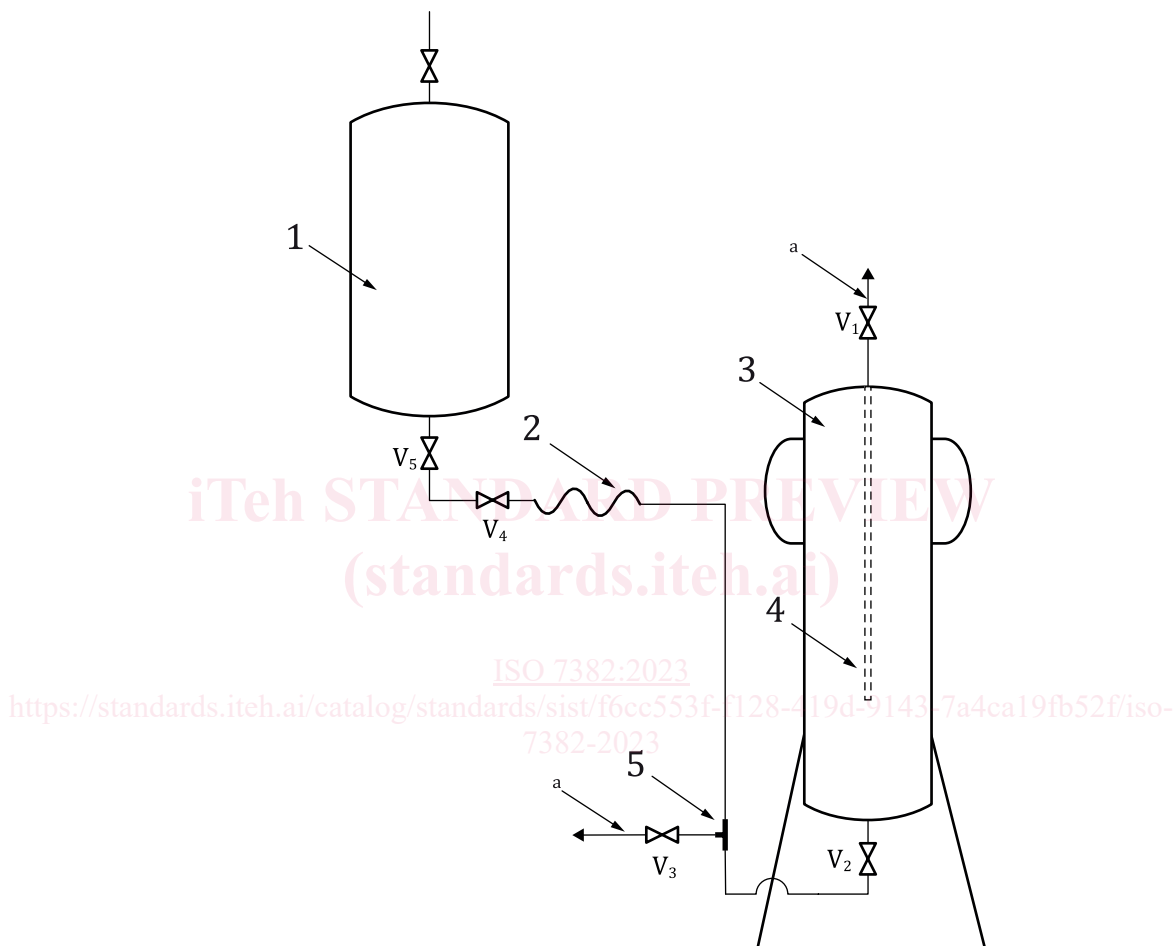
5.2.1 Sampling apparatus

The apparatus shown in [Figure 1](#) is an example of non-closed sampling apparatus and is composed of the following parts.

- a) A sampling cylinder tested at 34,5 MPa. Any sampling cylinder that meets sampling requirements can be used. It is presupposed that sampling cylinders also comply with any applicable national safety regulations. This sampling cylinder shall be fitted with one dip pipe, marked on the cylinder, ending at 30 % of the distance from the base, and ensuring that the sampling cylinder can be filled to only 30 % of its capacity. If relative national regulations stipulate otherwise, it is expected that the maximum fill capacity is adjusted accordingly. An inlet valve (V_2) is fitted to the sampling cylinder, and a drainage valve (V_1) to the dip pipe.
- b) Fluorocarbon lined sampling cylinders that have been specially passivated are recommended, especially when sampling to determine trace levels of polar compounds. Otherwise, determinations of these polar compounds can be misleading. Internal surfaces of sample containers and associated

lines and fittings may be surface coated to reduce bare metal surfaces reacting with trace reactive components.

- c) A passivated stainless-steel connecting pipe, with threaded joints, is joined to the ethylene tank (via sampling valves (V_4) and discharge valve for sampling capacity (V_5)) and to the inlet valve (V_2) of the cylinder.
- d) A T-union is fitted into the above pipe as close as possible to inlet valve (V_2) of the sampling cylinder, to connect a stainless-steel vent line to a discharge valve for sampling line (V_3).



Key

- 1 storage of liquid ethylene
- 2 connecting pipe
- 3 sampling cylinder
- 4 dip pipe
- 5 T-union
- V_1 drainage valve
- V_2 inlet valve
- V_3 discharge valve for sampling line
- V_4 sampling valve
- V_5 discharge valve for sampling capacity
- a Vent line.

Figure 1 — Example of non-closed sampling apparatus for ethylene in the liquid phase (non-closed sampling apparatus)

A stainless-steel vent line with appropriate length is fitted to the drainage valve (V_1) of the sampling cylinder.

5.2.2 Procedure

Connect the sampling cylinder with the sampling lines in vertical position. Close drainage valve (V_1) and inlet valve (V_2), open the discharge valve for sampling capacity (V_5) and then open sampling valve (V_4) at the point of sampling and slowly open the discharge valve for sampling line (V_3) to purge the sampling line.

Avoid excessive purging, which would cause ice formation at the outside or on the internal parts of the valve and also a pollution of the atmosphere.

As soon as the liquid ethylene appears at the vent line of discharge valve line (V_3), close discharge valve for sampling line (V_3).

Open drainage valve (V_1) completely. Open inlet valve (V_2) slowly and allow the sampling cylinder to fill. As soon as the liquid ethylene appears at the vent line of drainage valve (V_1), close drainage valve (V_1), inlet valve (V_2) and sampling valve (V_4). Shake the sampling cylinder slightly, then open inlet valve (V_2) and discharge valve for sampling line (V_3). Empty the sampling cylinder, then close discharge valve for sampling line (V_3) and inlet valve (V_2). Repeat this operation until purging thoroughly.

To sample, open sampling valve (V_4), inlet valve (V_2) and drainage valve (V_1) in turn. As soon as the liquid ethylene appears at the vent line of drainage valve (V_1), close inlet valve (V_2), then drainage valve (V_1) and afterwards close sampling valve (V_4) and discharge valve for sampling capacity (V_5).

Open discharge valve for sampling line (V_3) to vent the remaining sample, relieve the pressure, then disconnect the sampling cylinder from transfer line, and close discharge valve for sampling line (V_3).

5.3 Closed sampling apparatus no.1 and procedure

5.3.1 Sampling apparatus

The apparatus no.1 shown in [Figure 2](#) is one example of closed sampling apparatus and is composed of the following parts.

- a) The sampling cylinder is of same type of that in the non-closed sampling apparatus and is specially passivated.