
**Propylene and butadiene for
industrial use — Sampling in the
liquid phase**

*Propylène et butadiène à usage industriel — Échantillonnage en
phase liquide*

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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 8563:1987), which has been technically revised.

The main changes are as follows:

- [Clauses 2](#) and [3](#) have been added.
- content from [Clause 4](#) including safety precautions, has been moved elsewhere in the document;
- in [Clause 5](#), explanations regarding apparatus have been added;
- in [Clauses 5](#) and [6](#), some specific parameters, including size of connecting pipes and time to purge sampling cylinders, have been deleted;
- in [5.2](#), a recommendation regarding specially passivated sampling apparatus has been added.
- in [6.1](#), the procedure of purging the sampling cylinder for non-closed sampling has been revised;
- in [6.2](#), [Annex C](#) and [Annex D](#), two closed-sampling apparatuses have been added.
- [Annexes A](#) and [B](#), and [Figures 1](#), [2](#), [A.1](#) and [B.1](#) have been revised.

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.

Propylene and butadiene for industrial use — Sampling in the liquid 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 precautions to be taken in drawing representative samples of propylene and butadiene, in the liquid 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 not used in the analysis. [Annexes B, C and D](#) show the sequence of operations for filling a sampling cylinder in non-closed and closed sampling apparatus.

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*

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 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 surrounding environment

4 Safety precautions

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

When even small quantities of these products are vaporized, significant quantities of extremely combustible gas are produced which can form explosive mixtures with air. When liquefied propylene and butadiene evaporate from a metallic surface, intense cooling occurs which can cause burns if the surface is touched. To aid the handling of sampling cylinders, these can be fitted with a foot (see [Figure 1](#)) or handles.

When vessels containing liquefied propylene and butadiene are emptied, a considerable volume of vapour is produced which immediately spreads out in the surrounding atmosphere. This vapour has a high density and can accumulate at low levels.

It is thus essential to observe rigorously the following requirements and guidelines for the handling of liquefied propylene and butadiene, especially if the quantities are relatively large (e.g., 1 litre).

- a) It is presupposed that the use of the vessels, the plant and the equipment conform to the legal regulations in force. Ensure the vessels are periodically pressure tested by an approved organization.
- b) Bond the sample containers and sampling cylinders together. The sampling apparatus shall always be electrically grounded during the emptying and transfer of liquefied gases.
- c) Operate in premises separated from the work-room and in the absence of naked flames, sparks, sources of heat and non-explosion-protected electrical equipment.
- d) Ensure that there is good ventilation at both high and low levels by using a high-flow fume hood if the sampling is not carried out in an open-air environment.
- e) Verify that the electrical equipment, lighting, fume hood fan motors, etc., are explosion-protected. It is presupposed that these elements conform to the official regulations in force.

The safety precautions shall be taken when cleaning apparatus, discharging propylene or butadiene, wastes liquid and steam. The discharging site shall be equipped with safety devices.

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

It is recommended that operators wear safety glasses and gloves and that they expose as little skin as possible to avoid danger from splashing (arms, forearms, etc.).

Propylene is classified as a simple asphyxiant but butadiene has a threshold limit value (TLV) of 10 mg/kg.

5 Sampling apparatus

5.1 General

Given the wide variation in the sampling apparatus for propylene and butadiene, it is difficult to specify a uniform method for obtaining representative samples of heterogeneous mixtures. Examples of 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. They shall be capable of sampling propylene and butadiene in liquid phase.

5.2 Sampling cylinders

The sampling cylinders shall be capable of withstanding a pressure of 3,4 MPa, for liquid propylene, which has a vapour pressure of 1,1 MPa at 25 °C, or be capable of withstanding a vapour pressure of 1,4 MPa if used only for liquid butadiene, which has a vapour pressure of 0,3 MPa at 25 °C. Any sampling cylinder may be used. It is presupposed that these sampling cylinders meet sampling requirements and comply with applicable safety regulations. [Figures 1](#) and [2](#) show examples of the construction details of the sampling cylinder for reference.

The sampling cylinders should preferably be composed of stainless steel, and fitted with two stainless steel valves capable of withstanding a pressure equal to or greater than that of the sampling cylinder. This sampling cylinder shall be fitted with a dip pipe in order to ensure an unfilled space of 20 %, and it shall be marked in a suitable way. Relevant national regulations can stipulate otherwise, in such case, the minimum release capacity is adjusted accordingly.

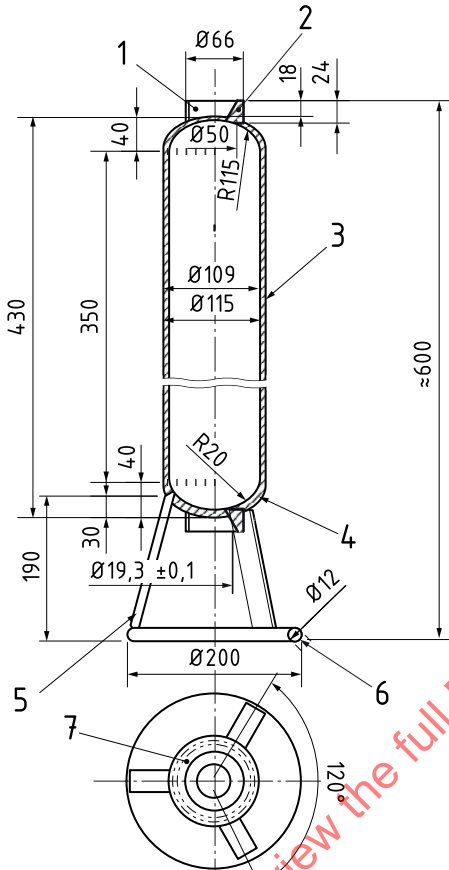
The sampling cylinders shall be checked at frequent intervals. It is presupposed that the sampling cylinders are tested according to the relevant national legislation in force.

Fluorocarbon-lined sampling cylinders, or containers 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.

It has been founded that sampling cylinders may be contaminated by oil, water or other solvents when they have been used for a certain time. This can cause irregularity in the results of subsequent analysis. If contamination is suspected, the sampling cylinder can be cleansed by purging with a flow of superheated steam followed by dry nitrogen while the sampling cylinder is still hot. The new cylinder can be made air-free by purging with an inert gas.

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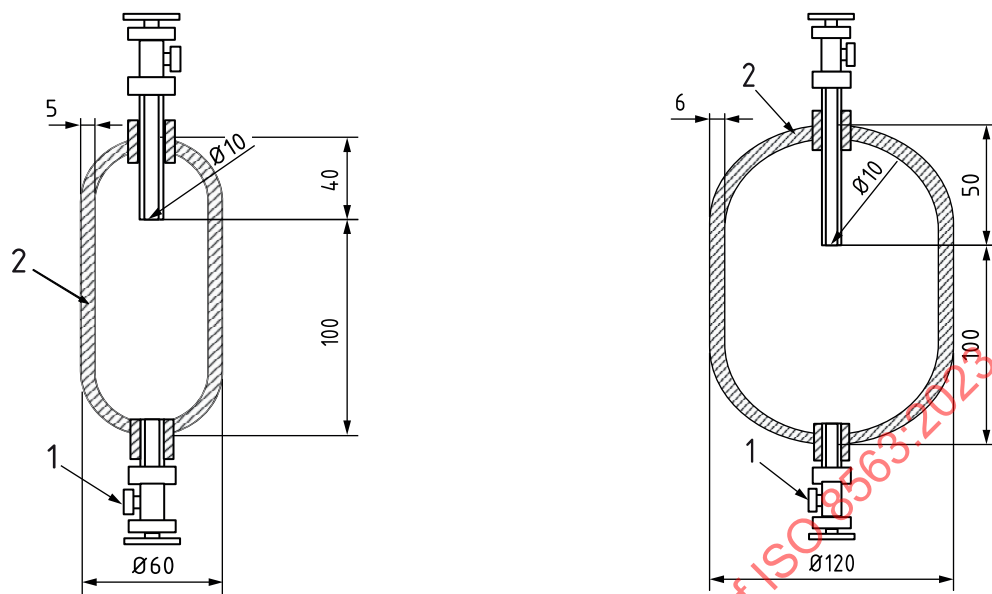
Dimensions in millimetres



- Key**
- | | | | |
|---|------------------------------------|---|--|
| 1 | threaded connector | 5 | flat section (25X3 mild steel) |
| 2 | collar (18/10 stainless steel) | 6 | round section (mild steel) |
| 3 | drawn tube (18/10 stainless steel) | 7 | engraved marking (capacity, test pressure, maker's name and date of manufacture) |
| 4 | base (18/10 stainless steel) | | |

Figure 1 — Example of sampling cylinder for liquid butadiene

Dimensions in millimetres



a) Sampling cylinders A (Capacity: 250 mL; Gauge pressure: 4 MPa)

b) Sampling cylinders B (Capacity: 1 litre; Gauge pressure: 5 MPa)

Key

- 1 valve type GPL
- 2 cylinder body

Figure 2 — Examples of sampling cylinders for liquid propylene

5.3 Connecting pipes

5.3.1 Connecting pipes for non-closed sampling apparatus

A passivated stainless-steel pipes with couplings capable of withstanding the operating pressure shall be used.

5.3.2 Connecting pipes for closed sampling apparatus

5.3.2.1 Closed sampling apparatus no.1

The connecting pipes are made of stainless-steel tubing and equipped with two valves and a pressure gauge. The sampling valve is a three-way valve and discharge valve is an ordinary two-way valve.

5.3.2.2 Closed sampling apparatus no.2

The connecting pipes are made of stainless-steel tubing and metal hose equipped with three valves. Metal hose has threaded joints on one end to join to the inlet valve and outlet valve. All three valves are all ordinary two-way valves.

NOTE Quick joint operation is practicable for connecting the sampling cylinder and sample transfer line for non-closed and closed sampling apparatus.

6 Procedure

6.1 Non-closed sampling apparatus

This subclause shows an example of a non-closed sampling apparatus and its procedure. Connect the sampling cylinder and connecting pipes, see [Figure B.1](#). The sampling procedure shall be in accordance with the following procedures in this subclause. [B.2](#) provides a condensed step-by-step version of these procedures.

- a) Empty all liquid from the sampling cylinder ([5.2](#)) and connect it in a vertical position, with coupling connected to the sample capacity (R_1) and coupling connected to sampling cylinder (R_2). And the sampling cylinder shall be connected via the sampling line to the source of propylene or butadiene, at a point below the level of the liquid sample, so that the latter can occupy the lower part of the sampling cylinder.
- b) Close the inlet valve (V_2) and drainage valve (V_1) of the sampling cylinder and open the discharge valve (V_5) of the vessel to be sampled and then the sampling valve (V_4) and the drainage valve for the sampling line (V_3). As soon as the liquid hydrocarbon appears, close the drainage valve for the sampling line (V_3).
- c) Open the inlet valve (V_2) and drainage valves (V_1) of the sampling cylinder. Close the drainage valve (V_1), inlet valve (V_2) and sampling valve (V_4), then shake the sampling cylinder slightly. Open inlet valve (V_2) and drainage valve for the sampling line (V_3), empty the sampling cylinder, then close the drainage valve for the sampling line (V_3) and inlet valve (V_2). Repeat this operation until purging thoroughly.
- d) To fill, open sampling valve (V_4) and open the inlet valve (V_2) and the drainage valve (V_1). As soon as the liquid appears, close the drainage valve (V_1), then the inlet valve (V_2). To obtain a safe volume of the sampling cylinder, open the drainage valve (V_1) to evacuate the excess liquid and close the drainage valve (V_1) as soon as the vapour phase appears. Close the discharge valve (V_5) and open the drainage valve for the sampling line (V_3) to vent the remaining sample. then close the sampling valve (V_4) and the drainage valve for the sampling line (V_3), and then disconnect the sampling cylinder at the coupling connected to sampling cylinder (R_2).
- e) Whenever possible, it is advisable to use a sampling cylinder mounted on a support (see [Figure 1](#)) and fitted with a dip pipe in its upper part.

NOTE ASTM D1265-11 also describe practice for sampling liquefied petroleum (LP) gases with non-closed apparatus.

6.2 Closed sampling apparatus

6.2.1 Closed sampling apparatus No.1

This subclause shows an example of a closed sampling apparatus and its procedure. Connect the sampling cylinder and connecting pipes, see [Figure C.1](#). The sampling procedure shall be in accordance with the following procedures in this subclause. [C.2](#) provides a condensed step-by-step version of these procedures.

- a) Connect the sampling cylinder with sampling lines, in a vertical position. Close inlet valve (V_2) and drainage valve (V_1). Switch the sampling valve (V_3) to bypass position [flow to discharge valve (V_4)], and open discharge valve (V_4), purge the bypass pipelines and sampling line.
- b) Open the drainage valve (V_1) and inlet valve (V_2), switch the sampling valve (V_3) from bypass position to sampling position, obtain a purge of sample through the sampling cylinder for a few minutes until purging thoroughly.
- c) Regulate drainage valve (V_1) to slow down the purge and obtain an appropriate amount of liquefied product in the sampling cylinder. Close the inlet valve (V_2) and drainage valve (V_1), then switch

the sampling valve (V_3) to close position, relieve the pressure, close discharge valve (V_4), then disconnect the sampling cylinder from transfer line.

6.2.2 Closed sampling apparatus no.2

This subclause shows another example of a closed sampling apparatus and its procedure. Connect the sampling cylinder and connecting pipes, see [Figure D.1](#). The sampling procedure shall be in accordance with the following procedure in this subclause. [D.2](#) provides a condensed step-by-step version of these procedures.

- a) Connect the sampling cylinder with the sampling lines, in a vertical position. Close inlet valve (V_2) and drainage valve (V_1). Open sampling valve (V_3), pipeline valve (V_4) and discharge valve (V_5) in sequence, purge through bypass pipelines and sampling line. Open inlet valve (V_2) and drainage valve (V_1), close pipeline valve (V_4) and obtain a purge of sample through the sampling apparatus for a few minutes until purging thoroughly.
- b) Regulate drainage valve (V_1) to slow down the purge and obtain appropriate amount of sample in the sampling cylinder. Close inlet valve (V_2) and drainage valve (V_1). Close sampling valve (V_3), then open pipeline valve (V_4) to relieve the pressure. Close pipeline valve (V_4) and discharge valve (V_5), and disconnect sampling cylinder from transfer line.

7 Sampling report

A sampling report shall be written containing all essential information pertaining to the material samples. It shall contain at least the following particulars:

- a) a reference to this document (i.e. ISO 8563:2023);
- b) unambiguous sample identification such as the name and number of the label on the sampling bottle;
- c) date and duration of the sampling;
- d) approximate size of consignment;
- e) comments on abnormalities such as obvious contamination;
- f) any operation not included in this document or regarded as optional.

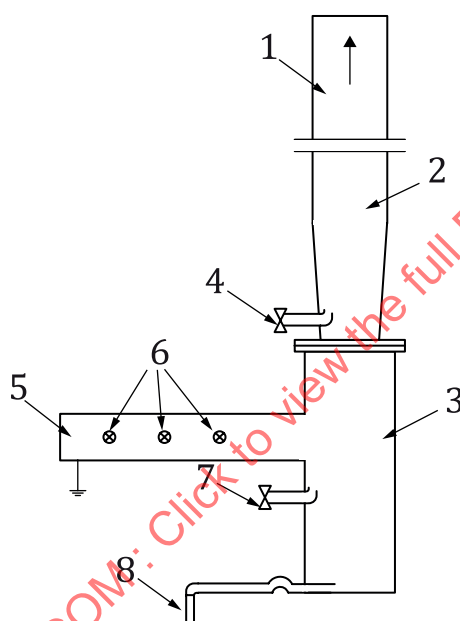
Annex A

(informative)

System for the disposal of samples of liquefied or gaseous light olefins

WARNING — Before purging the sampling cylinders, the sampling apparatus shall be electrically grounded by means of an equipotential clamp.

Figure A.1 shows the drainage system which is a flexible connection appropriate to the sampling cylinder used. The ejector to air shown in Figure A.1 is the standard model.



Key

- | | | | |
|---|--------------------------------|---|---|
| 1 | aligned heat-insulated chimney | 6 | connection points to the outlet of the sampling cylinders |
| 2 | ejector to air | 7 | steam inlet valve |
| 3 | aligned heat-insulated tank | 8 | drip trap for condensed water |
| 4 | compressed air inlet valve | | |
| 5 | drainage system | | |

Figure A.1 — System for the disposal of samples of liquefied or gaseous light olefins

Annex B
(informative)

Sequence of operations for filling a sampling cylinder in non-closed sampling apparatus

B.1 Figure for non-closed sampling apparatus

Figure B.1 illustrates the connecting of non-closed sampling apparatus.

WARNING — Take care that a sampling cylinder full of liquid can burst as the result of a rise in temperature.

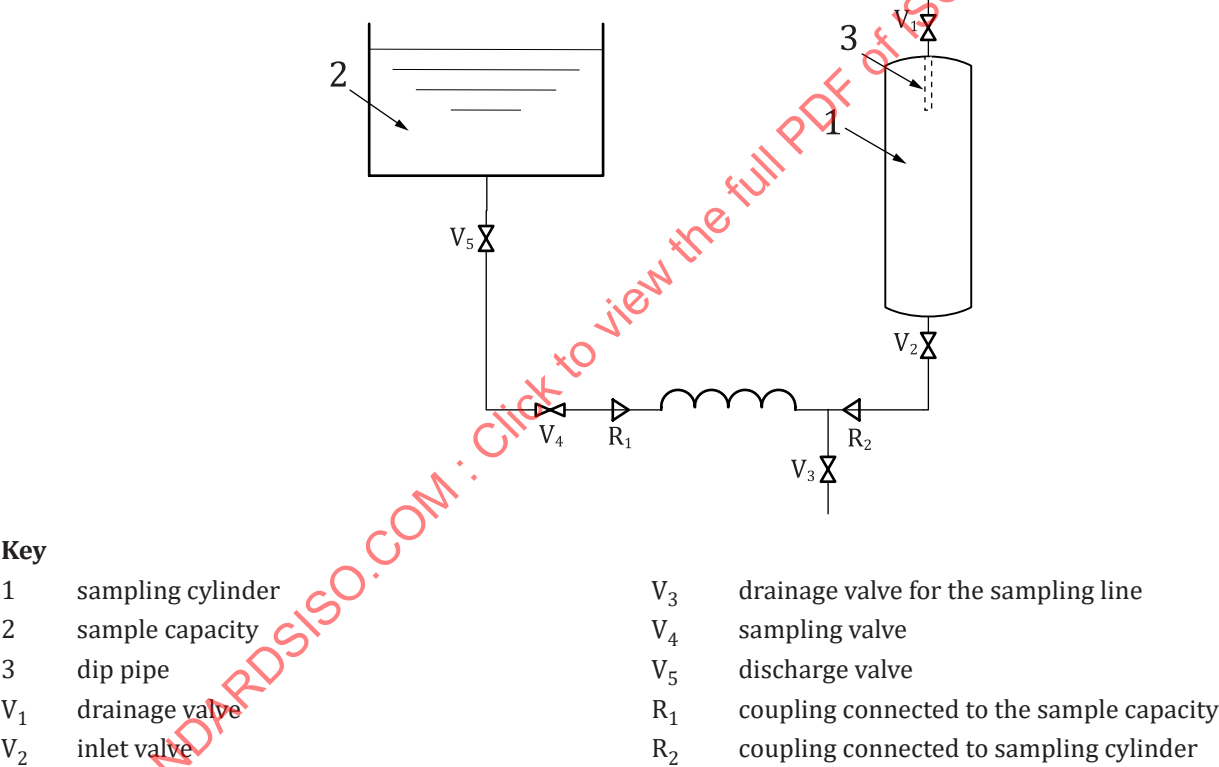


Figure B.1 — Example of non-closed sampling apparatus

B.2 Procedures

B.2.1 General

B.2.2 and B.2.3 show a condensed step-by-step version of the procedure described in 6.1, for non-closed sampling apparatus.

B.2.2 Purging of the sampling line and sampling cylinder

- a) Place the sampling cylinder vertically with, at the top, V₁ fitted with a dip pipe.
- b) Tighten R₂, with V₁ and V₂ being closed.

- c) Open V_5 fully with V_3 and V_4 being closed.
- d) Open V_4 , then open V_3 .
- e) Allow to purge, then close V_3 .
- f) Open V_2 fully, then V_1 gradually.
- g) Close V_1 , V_2 and V_4 , then shake the sampling cylinder slightly.
- h) Open V_2 and V_3 , and purge through V_3 .
- i) Close V_2 and V_3 .
- j) Repeat the purging operation f) - i) until purging thoroughly.

B.2.3 Filling

- a) Open V_4 .
- b) Open V_2 and V_1 fully.
- c) As soon as the liquid appears, close V_1 , then V_2 .
- d) Open drainage valve (V_1) until the liquid disappears.
- e) Close immediately drainage valve (V_1). Close V_5 and open V_3 to vent the remaining sample.
- f) Close V_4 and V_3 , then disconnect the sampling cylinder from R_2 .

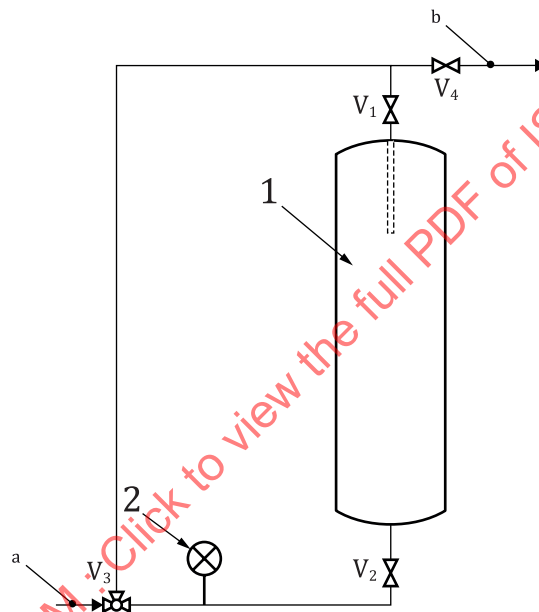
CAUTION — Do not forget to retighten the plugs.

Annex C (informative)

Sequence of operations for filling a sampling cylinder in closed sampling apparatus no.1

C.1 Figure for closed sampling apparatus no.1

[Figure C.1](#) illustrates the connecting of closed sampling apparatus no.1.



Key

1	sampling cylinder	V ₃	sampling valve
2	pressure gauge	V ₄	discharge valve
V ₁	drainage valve	a	From sample capacity.
V ₂	inlet valve	b	To low pressure system.

Figure C.1 — Example of closed sampling apparatus (closed sampling apparatus No.1)

C.2 Procedures

C.2.1 General

[C.2.2](#) and [C.2.3](#) show a condensed step-by-step version of the procedure described in [6.2.1](#), for closed sampling apparatus no.1.

C.2.2 Purging of the sampling line and sampling cylinder

- a) Connect the sampling cylinder vertically with sampling lines.
- b) Close V₁ and V₂.
- c) Switch V₃ to bypass.

- d) Open V_4 , purge through sampling line.
- e) Open V_1 and V_2 fully.
- f) Switch V_3 to sampling, purge through the sampling cylinder for a few minutes until purging thoroughly.

C.2.3 Filling

- a) Regulate V_1 , and obtain the sample in sampling cylinder.
- b) Close V_2 and V_1 .
- c) Switch V_3 to close, relieve the pressure.
- d) Close V_4 , and disconnect the sampling cylinder.

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