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**Diesel engines — NO<sub>x</sub> reduction agent  
AUS 32 —**

**Part 4:  
Refilling interface**

*Moteurs diesel — Agent AUS 32 de réduction des NO<sub>x</sub> —*

*Partie 4: Interface de remplissage*

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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](http://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](http://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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 34, *Propulsion, powertrain and powertrain fluids*.

This second edition of ISO 22241-4 cancels and replaces the first edition (ISO 22241-4:2009) which has been technically revised. The main changes compared to the previous edition are as follows:

- the definition of AUS 32 has been deleted as it is included in ISO 22241-1 and the document is cited normatively;
- new definitions have been added;
- the status of [Annex A](#) has been changed to normative and the Annex has been revised accordingly;
- [Table 1](#) has been editorially and technically revised.

A list of all parts in the ISO 22241 series can be found on the ISO website.

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](http://www.iso.org/members.html).

# Diesel engines — NO<sub>x</sub> reduction agent AUS 32 —

## Part 4: Refilling interface

### 1 Scope

This document specifies the refilling interface for the NO<sub>x</sub> reduction agent AUS 32 in conformance with ISO 22241-1, which is needed to operate converters with a selective catalytic reduction (SCR) exhaust treatment system.

This document specifies the minimum functional and geometric requirements of an open refilling system, in order to ensure compatibility between the on-board refilling system and the off-board refilling system. Compatibility conditions for a sealed refilling system are provided in [Annex A](#).

This document applies to commercial vehicles and buses as defined in ISO 3833 and having a gross vehicle mass of more than 3,5 t, designed to use stationary off-board refilling systems. This document also applies to the nozzle of stationary off-board refilling systems.

NOTE Throughout this document, the term “NO<sub>x</sub> reduction agent AUS 32” is abbreviated to “AUS 32”.

### 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 2575, *Road vehicles — Symbols for controls, indicators and tell-tales*

ISO 22241-1, *Diesel engines — NO<sub>x</sub> reduction agent AUS 32 — Part 1: Quality requirements*

ISO 22241-3, *Diesel engines — NO<sub>x</sub> reduction agent AUS 32 — Part 3: Handling, transportation, and storage*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 22241-1 and the following apply.

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

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

#### 3.1

##### refilling system

off-board system and on-board system, including their refilling interface, for dispensing AUS 32 into the on-board tank of the *vehicle* (3.12)

#### 3.2

##### off-board refilling system

stationary equipment for dispensing AUS 32 into the on-board tank of the *vehicle* (3.12), consisting typically of tank, pump, hose and *filler nozzle* (3.3)

### 3.3

#### **filler nozzle**

interfacing part of the *off-board refilling system* (3.2), which allows the operator to control the flow of AUS 32 during the filling, consisting of a nozzle spout with a defined interface geometry and an automatic shut-off system

### 3.4

#### **on-board refilling system**

equipment of the *vehicle* (3.12) necessary for refilling AUS 32 and consisting typically of an *inlet adapter* (3.6), *filler neck* (3.5), *filler cap* (3.7) and tank

### 3.5

#### **filler neck**

interfacing part of the *on-board refilling system* (3.4) where the opening is formed by the *inlet adapter* (3.6) to allow the tank to be refilled

### 3.6

#### **inlet adapter**

permanently fixed part of the *filler neck* (3.5), having a defined interface geometry and incorporating a magnet ring for preventing misfiling of AUS 32 into the fuel tank

### 3.7

#### **filler cap**

part which is fitted to the *filler neck* (3.5) to prevent *spillage* (3.11) as well as to minimize contamination of AUS 32, and which is temporarily opened or removed for refilling

### 3.8

#### **open refilling system**

universal *refilling system* (3.1) for which gas tightness between the *filler nozzle* (3.3) and the *filler neck* (3.5) is not required

Note 1 to entry: The open refilling system permits refilling using a small volume container, for example.

### 3.9

#### **sealed refilling system**

specific *refilling system* (3.1) where the connection between the *filler nozzle* (3.3) and the *filler neck* (3.5) is gas-tight

### 3.10

#### **canister**

container of size one to ten litres capacity, with spout, used to refill the on-board tank of the *vehicle* (3.12)

### 3.11

#### **spillage**

quantity of fluid that escapes from the *filler nozzle* (3.3) to the atmosphere after the nozzle has shut off

### 3.12

#### **vehicle**

commercial vehicle or bus as defined in ISO 3833 and having a gross vehicle mass of more than 3,5 t, designed to use a stationary *off-board refilling system* (3.2)

## 4 Requirements

### 4.1 Functional requirements

The on-board refilling system and the off-board refilling system shall comply with the basic functional requirements specified in [Table 1](#). For sealed refilling system the additional requirements in [Annex A](#) shall apply.

Table 1 — Basic functional requirements

No.	Characteristic	Requirement	Remark
1	Maximum flow rate range	$20 \text{ l/min} \leq x \leq 40 \text{ l/min}$ .	Flow rates do not apply to: — Canister filling; — Production line filling.
2	Automatic shut-off of filler nozzle	Feature to protect against overflow is required.	For example, a nozzle in conformance with EN 13012.
3	Maximum filling level in AUS 32 on-board tank	The automatic shut-off system of the nozzle shall be used to protect against filling above maximum level.  The on-board tank shall be designed to allow for expansion of AUS 32.	High volume expansion of AUS 32 during freezing (approx. 7%).
4	Spillage	< 30 ml per refilling with filler neck angles from the horizontal between 50° and 90°.  < 50 ml per refilling with filler neck angles from the horizontal between 30° and 50°.	To minimize the effects of spilled AUS 32 on the equipment.
5	Ventilation during refilling	Feature required on AUS 32 on-board tank.	—
6	Operational temperature range	–30 °C to +80 °C for on-board components  –20 °C to +40 °C for off-board components	For specific regions, the temperature range specified may not be sufficient or excessive. In such cases, a wider or more narrow temperature range, representative of that specific region, may be considered.
7	Misfilling of AUS 32 into the diesel fuel tank	≤ 80 ml per filling trial.	The filler nozzle with magnet switch as specified in 4.5, or equivalent device, will prevent misfilling.
8	Misfilling of fuel into the AUS 32 on-board tank	Feature required to prevent dispensing of diesel fuel or petrol in AUS 32 on-board tank.	The inlet adapter diameter specified in 4.3 does not allow a diesel fuel or petrol nozzle to enter.
9	Materials	Materials in contact with AUS 32 shall be compatible with AUS 32 to avoid contamination of AUS 32 as well as corrosion of the devices used.	Suitable materials in accordance with ISO 22241-3 should be selected.
10	Freezing of AUS 32	Provide protection at the service station in accordance with operational temperature range.  Vehicle parts shall be designed to cope with freezing and thawing in accordance with operational temperature range.	AUS 32 freezes at –11,5 °C and has a volume increase of approximately 7%.
11	Cleanliness	All surfaces of on-board and off-board equipment in direct contact with AUS 32 shall be free of foreign matter (e.g. fuel, oil, grease, detergent, dust, and any other substance) in accordance with ISO 22241-3.  Cleanliness level for the components of the on-board refilling system shall be agreed between vehicle and component manufacturers, in conformance with state-of-the-art.	—

<sup>a</sup> Recommendations only.

**Table 1** (continued)

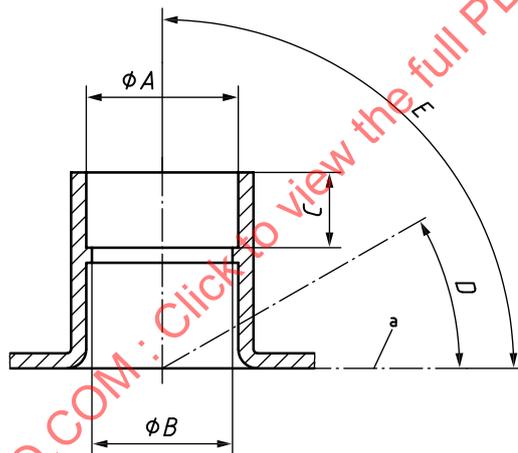
No.	Characteristic	Requirement	Remark
12	Reliability and durability	The filler neck, inlet adapter and filler cap shall be designed and manufactured to be fully functional during the vehicle lifetime without any service, adjustment or replacement.	—
13	Crystallization <sup>a</sup>	Protection recommended	Contact with air should be minimized.
14	Marking <sup>a</sup>	Symbol as specified in ISO 2575 or equivalent national standard.	Blue is the recommended colour for filler caps.

<sup>a</sup> Recommendations only.

**4.2 Filler neck**

The filler neck allows the vehicle manufacturer or any authorized person to install or remove an inlet adapter that can accommodate an open refilling system. For dimensional details of the filler neck, see [Figure 1](#) and [Table 2](#).

The geometric location and orientation of the filler neck on the vehicle should be specified by the vehicle manufacturer, taking into account the free space required for the proper application of the filler nozzle (see [4.6](#)).



**Key**  
<sup>a</sup> Horizontal.

**Figure 1 — Filler neck**

**Table 2 — Dimensions of the filler neck**

Symbol	Parameter	Dimension
$\phi A$	Diameter inlet or upper stop	$\geq 39,5$ mm
$\phi B$	Diameter upper support	$\geq 37$ mm
$C$	Height upper stop	$\leq 48$ mm
$D$	Filler neck angle from horizontal <sup>a</sup>	$\geq 30^{\circ b}$
$E$		$\leq 90^{\circ}$

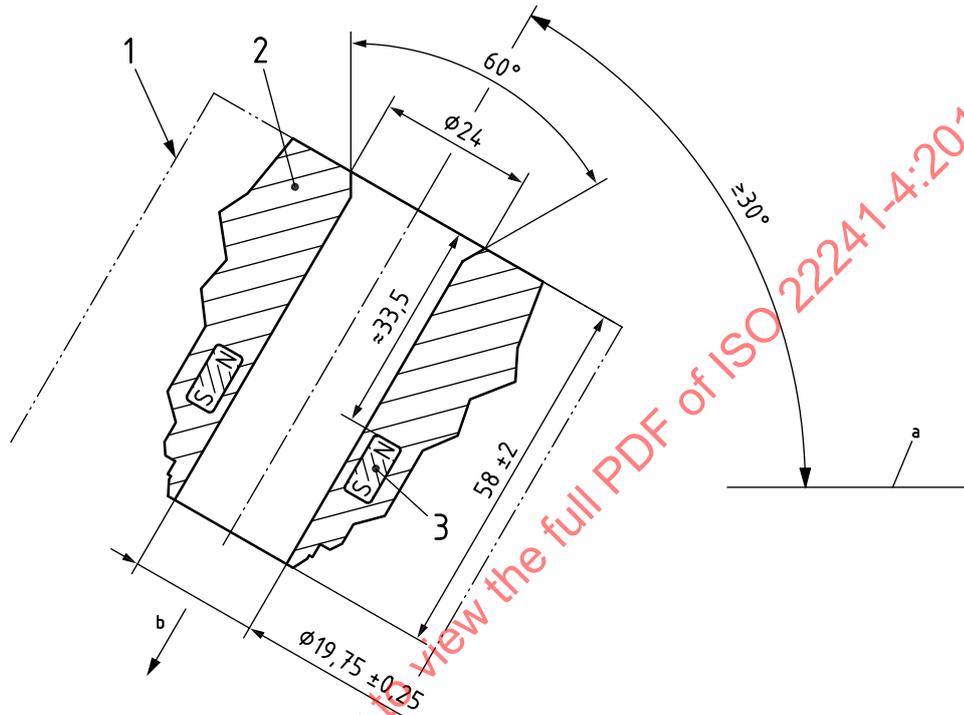
<sup>a</sup> An angle between  $50^{\circ}$  and  $90^{\circ}$  is recommended to minimize spillage (see [Table 1](#)).  
<sup>b</sup> If, due to body design restrictions, an angle smaller than  $30^{\circ}$  is chosen by the designer, spillage will typically be greater and may exceed the value specified in [Table 1](#), in which case the function of the nozzle may be limited.

### 4.3 Inlet adapter

The inlet adapter shall be designed to fit inside the filler neck. The internal diameter of the inlet adapter shall prevent a filler nozzle spout greater than 20,0 mm in diameter from entering the inlet adapter.

The inlet adapter shall be equipped with a magnet ring having the characteristics specified in [Table 3](#), as shown in [Figure 2](#).

Dimensions in millimetres



**Key**

- 1 filler neck
- 2 inlet adapter
- 3 magnet ring

- a Horizontal.
- b Flow direction.

**Figure 2 — Inlet adapter**

**Table 3 — Magnet ring characteristics**

Parameter		Requirements
<b>Dimensions</b>	outer diameter	34 mm
	inner diameter	24 mm
	height	10 mm
<b>Material</b>		Neodymium-Iron-Boron (NdFeB)
<b>Magnet parameter</b>	remanence	1,2 T to 1,3 T
	coercivity	800 kA/m to 900 kA/m
<b>Orientation</b>		North pole pointing outwards from the tank

### 4.4 Filler cap

Closed filler caps shall be tight for AUS 32.

Marking and colouring of the filler cap should be as recommended in [Table 1](#).

#### 4.5 Filler nozzle

The nozzle spout shall be cylindrical with an outer diameter of  $(19 \pm 0,25)$  mm and a length of  $(70 \pm 2)$  mm (see [Figure 3](#)).

The nozzle spout shall be equipped with a magnet switch, which interacts with the magnet ring of the inlet adapter (see [Figure 4](#)). If the nozzle is inserted accidentally into a fuel tank or another liquid container, the magnet switch prevents misfilling.

Dimensions in millimetres

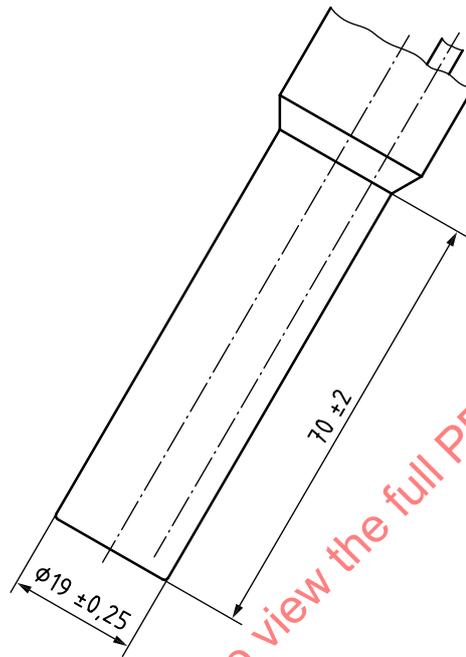
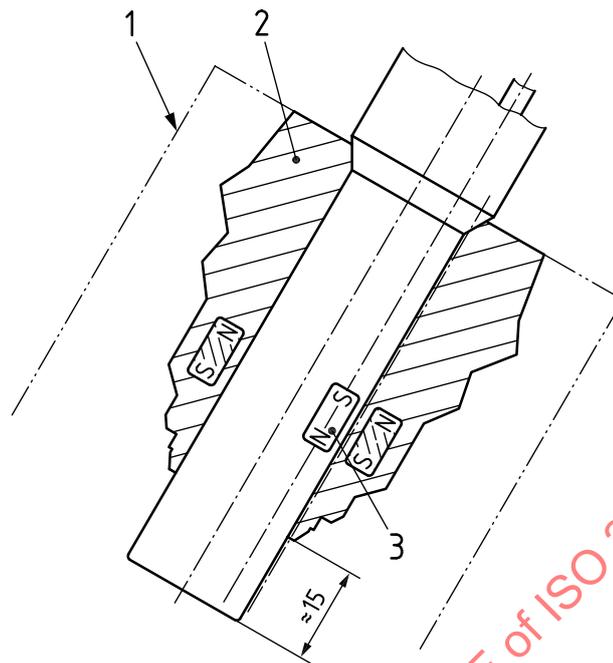


Figure 3 — Nozzle spout

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Dimensions in millimetres

**Key**

- 1 filler pipe (neck)
- 2 magnet adapter
- 3 magnet switch

**Figure 4 — Position of nozzle spout with magnet switch inserted into inlet adapter**

#### 4.6 Minimum free space for refilling

Vehicle and body manufacturers shall ensure that the space illustrated in [Figure 5](#) and defined in [Figure 6](#) is available and not obstructed by any components, in order to permit unrestricted access to the filler neck for insertion of the nozzle spout and for the subsequent removal from the filler neck. The dimensions specified in [Figure 6](#) take into account the following parameters:

- different filler nozzle designs;
- the minimum space required for manual insertion and removal of the filler nozzle (72 mm movement); and
- the minimum space required for the hand of the operator.

Filler nozzle manufacturers shall take care to ensure that the space needed for insertion and removal of the nozzle does not exceed the space illustrated in [Figure 5](#) and defined in [Figure 6](#).

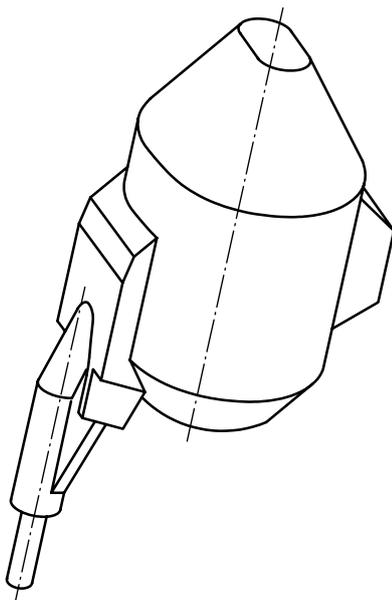
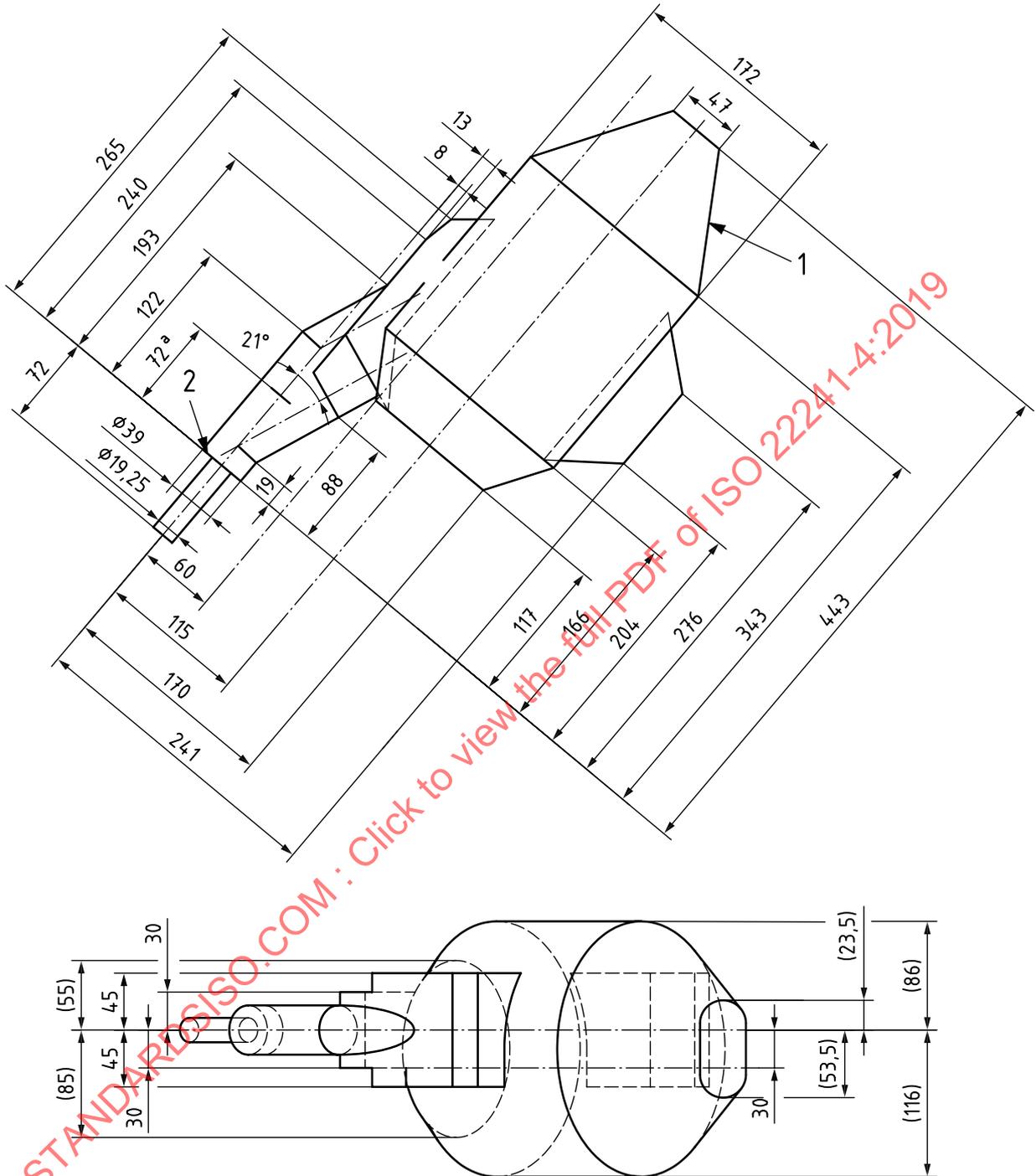


Figure 5 — Three-dimensional view of free space required for refilling

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Dimensions in millimetres



**Key**

- 1 free space for operator's hand
- 2 top surface of adapter
- a Movement of filler nozzle.

**Figure 6 — Minimum free space required for refilling**

## Annex A (normative)

### Compatibility conditions for sealed refilling systems

#### A.1 Functional conditions

The sealed refilling system shall comply with the basic functional requirements specified in [Table 1](#), except that the maximum spillage rate shall not be more than 20 ml. [Figure A.1](#) provides an example of a sealed refilling system.

Misfilling of AUS 32 into the diesel fuel tank is rendered impossible by the use of a sealed system. Misfilling of diesel fuel into the AUS 32 on-board tank is not possible either. Emergency refilling (e.g. by small volume container) shall be possible, as illustrated, for example, in [Figure A.3](#). A feedback system for establishing appropriate shut-off shall be provided.

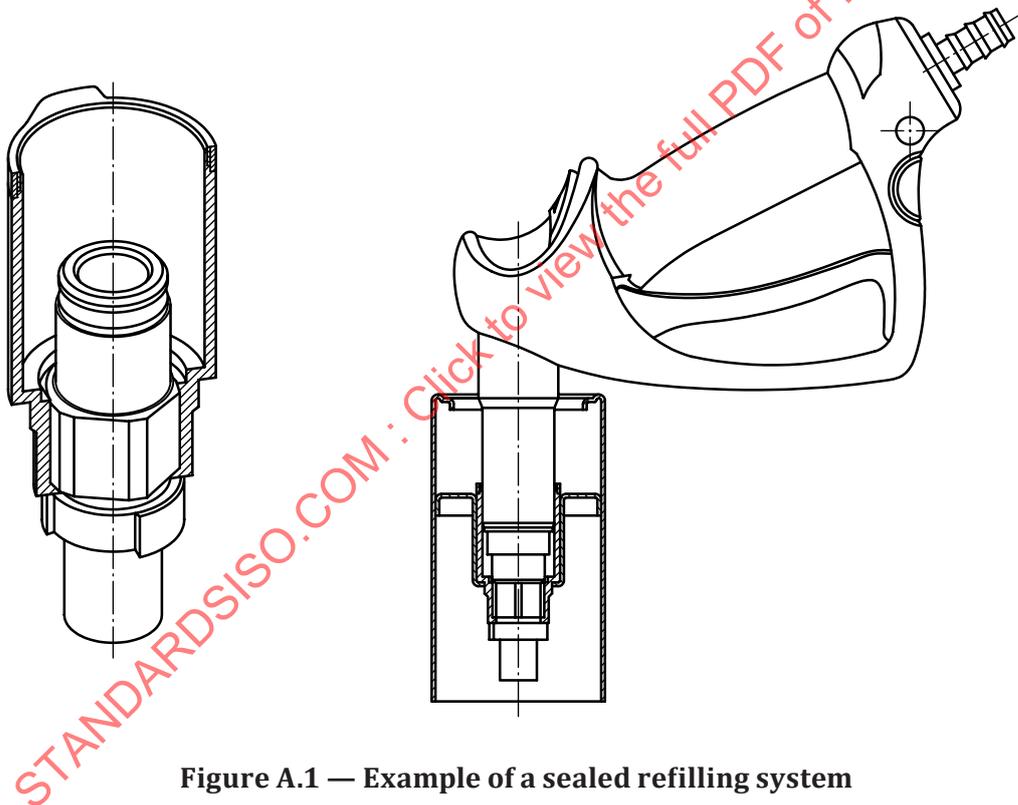


Figure A.1 — Example of a sealed refilling system

#### A.2 Filler neck

The filler neck in accordance with [4.2](#), or as specified in [Figure A.2](#) and [Table A.1](#), shall be used for a sealed refilling system. The filler neck in accordance with [Figure A.2](#) permits installation of the flange-mounted inlet adapter, which permits emergency refilling using a small volume container.

No requirements are specified regarding the filler neck angle for sealed refilling systems. The sealed refilling system allows for flexible positioning of the filler neck.