

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

## Part 4: Refilling interface

ICS 43.060.40

## National foreword

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A list of organizations represented on this committee can be obtained on request to its secretary.

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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

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ISO 22241-4 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 5, *Engine tests*.

ISO 22241 consists of the following parts, under the general title *Diesel engines — NO<sub>x</sub> reduction agent AUS 32*:

- *Part 1: Quality requirements*
- *Part 2: Test methods*
- *Part 3: Handling, transportation and storing*
- *Part 4: Refilling interface*

# Diesel engines — NOx reduction agent AUS 32 —

## Part 4: Refilling interface

### 1 Scope

This part of ISO 22241 specifies the refilling interface for the NOx reduction agent AUS 32 in compliance with ISO 22241-1, which is needed to operate converters with a selective catalytic reduction (SCR) exhaust treatment system.

This part of ISO 22241 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 part of ISO 22241 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 part of ISO 22241 also applies to the nozzle of stationary off-board refilling systems.

NOTE Throughout this part of ISO 22241, the term “NOx reduction agent AUS 32” is abbreviated as “AUS 32”.

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

ISO 22241-1, *Diesel engines — NOx reduction agent AUS 32 — Part 1: Quality requirements*

ISO 22241-3, *Diesel engine — NOx reduction agent AUS 32 — Part 3: Handling, transportation and storing*

### 3 Terms and definitions

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

#### 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** (3.6)

#### 3.2

##### **off-board refilling system**

stationary equipment for dispensing AUS 32 into the on-board tank of the **vehicle** (3.6), consisting typically of tank, pump, hose and **filler nozzle** (3.2.1)

### 3.2.1

#### **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

### 3.3

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

equipment of the **vehicle** (3.6) necessary for refilling AUS 32 and consisting typically of an **inlet adapter** (3.3.2), **filler neck** (3.3.1), **filler cap** (3.3.3), and tank

#### 3.3.1

##### **filler neck**

interfacing part of the **on-board refilling system** (3.3) where the opening is formed by the **inlet adapter** (3.3.2) to allow the tank to be refilled

#### 3.3.2

##### **inlet adapter**

permanently fixed part of the **filler neck** (3.3.1), having a defined interface geometry and incorporating a magnet ring for preventing misfilling of AUS 32 into the fuel tank

#### 3.3.3

##### **filler cap**

part which is fitted to the **filler neck** (3.3.1) to prevent spillage as well as to minimize contamination of AUS 32, and which is temporarily opened or removed for refilling

### 3.4

#### **open refilling system**

universal **refilling system** (3.1) for which gas tightness between the **filler nozzle** (3.2.1) and the **filler neck** (3.3.1) is not required

NOTE The open refilling system permits refilling using a small volume container, for example.

### 3.5

#### **sealed refilling system**

specific **refilling system** (3.1) where the connection between the **filler nozzle** (3.2.1) and the **filler neck** (3.3.1) is gas-tight

### 3.6

#### **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.



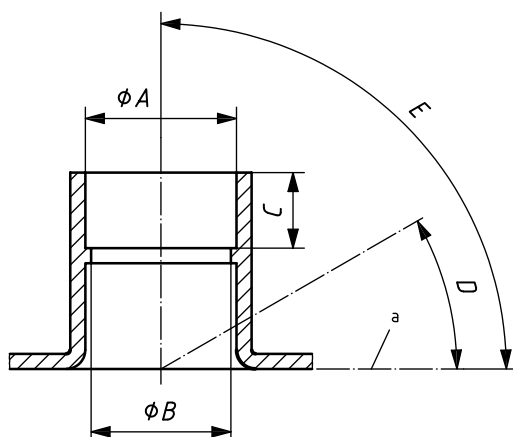
**Table 1 — Basic functional requirements**

Characteristic	Requirements	Remark
Maximum flow rate	$\geq 20$ l/min. $\leq 40$ l/min.	—
Automatic shut-off of filler nozzle	Feature required in compliance with EN 13012 or equivalent Standard.	To protect against overflow.
Maximum filling level in AUS 32 on-board tank	<p>The automatic shut-off system of the nozzle shall be used to protect against filling above maximum level.</p> <p>The on-board tank shall be designed to allow for expansion of AUS 32.</p>	High volume expansion of AUS 32 during freezing (approx. 7 %).
Spillage	<p>&lt; 30 ml per refilling with filler neck angles from the horizontal between 50° and 90°.</p> <p>&lt; 50 ml per refilling with filler neck angles from the horizontal between 30° and 50°.</p>	To minimize the effects of spilt AUS 32 on the equipment.
Ventilation during refilling	Feature required on AUS 32 on-board tank.	—
Operational temperature range	-30 °C to +80 °C for components installed on the vehicle.	For specific regions, the temperature range specified may not be sufficient. In such cases, a wider temperature range, representative of that specific region, shall be considered.
	-20 °C to +40 °C for components at the service station.	For specific regions, the temperature range specified may be excessive. In such cases, a narrower temperature range, representative of that specific region, may be considered.
Misfilling of AUS 32 into the diesel fuel tank	$\leq 80$ ml per filling trial.	The filler nozzle with magnet switch as specified in 4.5, or equivalent device, will prevent misfilling.
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.
Materials	Suitable materials in accordance with ISO 22241-3 should be selected.	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.
Freezing of AUS 32	<p>Provide protection at the service station.</p> <p>Vehicle parts shall be designed to cope with freezing and thawing in accordance with operational temperature range.</p>	AUS 32 freezes at -11,5 °C and has a volume increase of approximately 7 %.
Cleanness	A high level of cleanness of all components of the on-board and off-board refilling systems shall be secured during the manufacturing, assembly and installation processes, in order to minimize contamination of AUS 32.	<p>Cleanness level for the components of the off-board refilling system shall be in accordance with ISO 22241-3.</p> <p>Cleanness level for the components of the on-board refilling system shall be agreed between vehicle and component manufacturers, in compliance with state-of-the-art.</p>
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.	—
Crystallization <sup>a</sup>	Protection recommended	Contact with air should be minimized.
Marking <sup>a</sup>	<p>Symbol as specified in ISO 2575.</p> <p>Marking as specified in ISO 22241-1.</p>	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).



<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>	$\geq 30^\circ$ <sup>b</sup>
$E$		$\leq 90^\circ$

<sup>a</sup> An angle between  $50^\circ$  and  $90^\circ$  is recommended to minimize spillage (see Table 1).

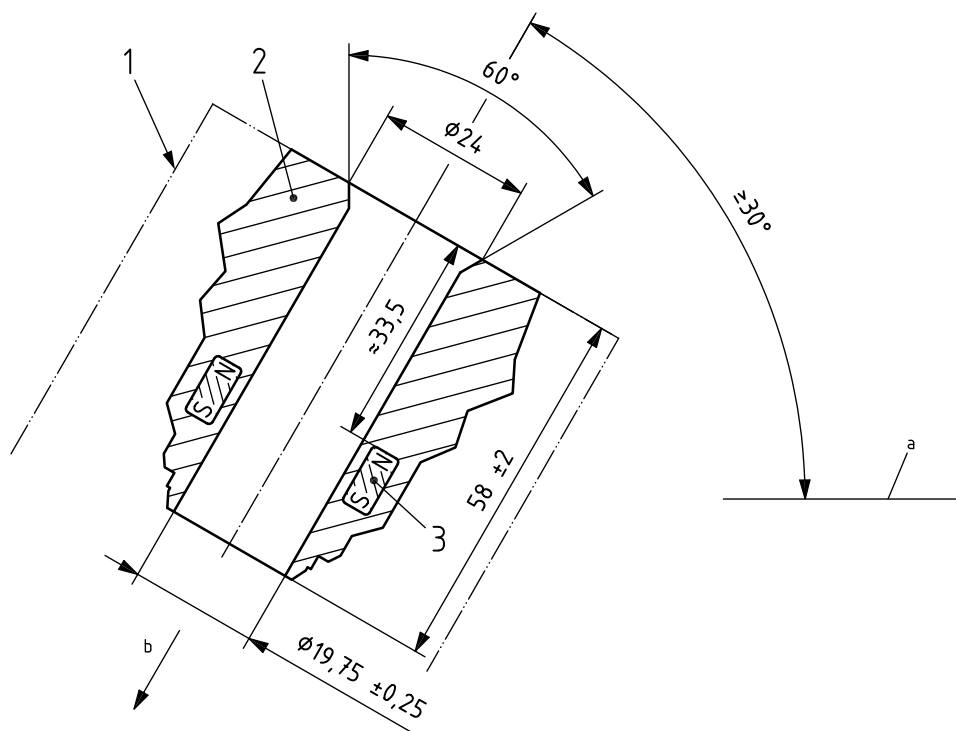
<sup>b</sup> If, due to body design restrictions, an angle smaller than  $30^\circ$  is chosen by the designer, spillage will typically be greater and may exceed the value specified in Table 1, in which case the function of the nozzle may be limited.

## 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

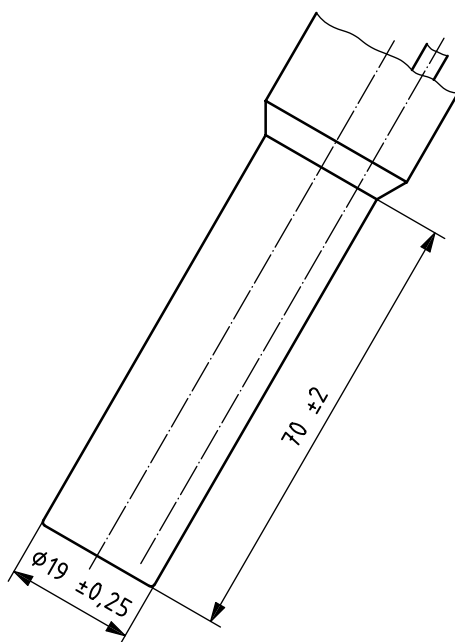
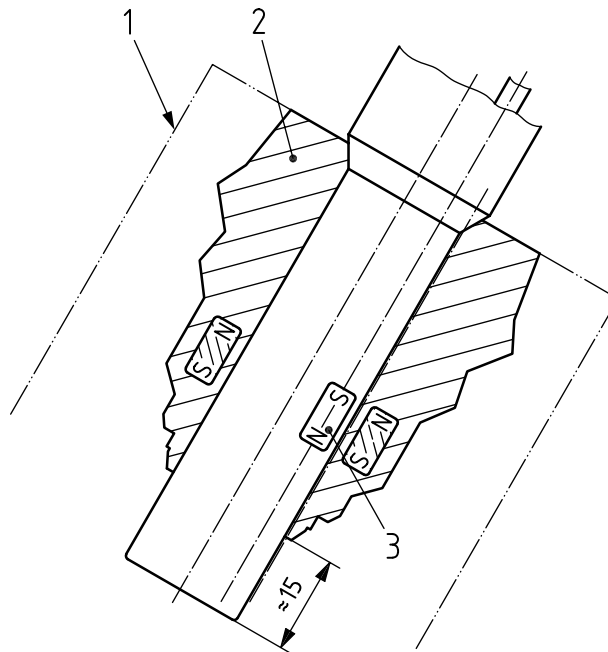


Figure 3 — Nozzle spout

Dimensions in millimetres



**Key**

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

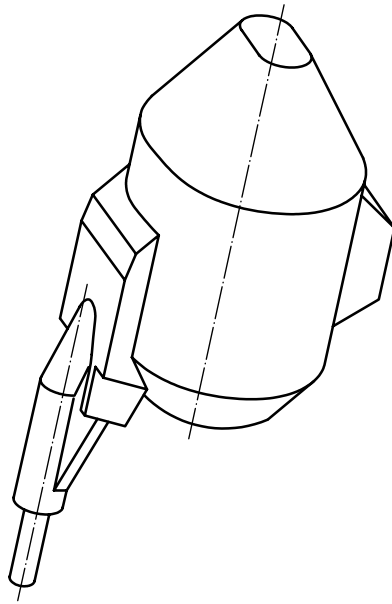
**Figure 4 — Position of nozzle spout with magnet switch inserted into inlet adapter**

#### 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:

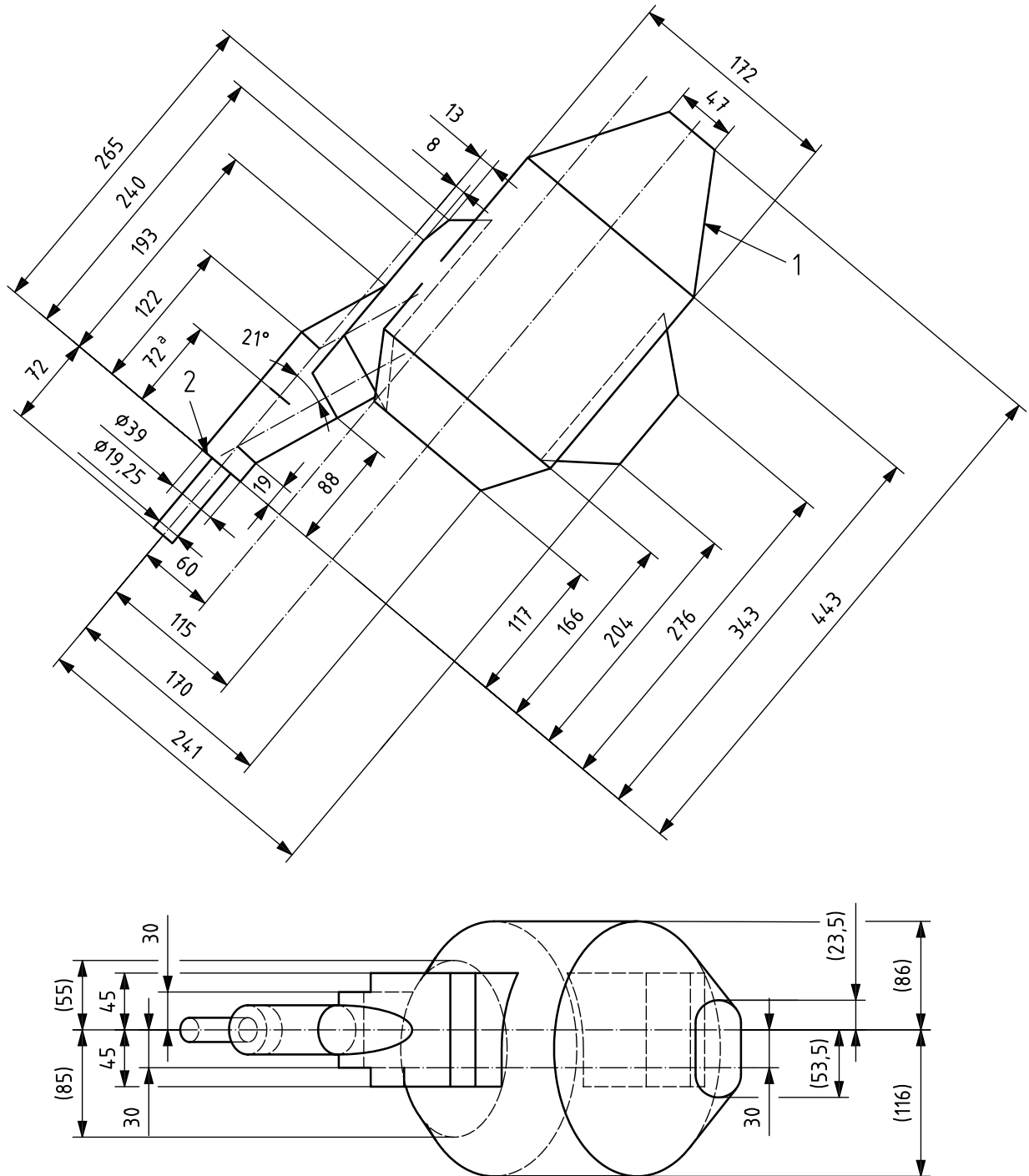
- different filler nozzle designs;
- the minimum space required for manual insertion and removal of the filler nozzle (72 mm movement);
- the minimum space required for the hand of the operator.

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**

Dimensions in millimetres



**Key**

- 1 free space for operator's hand
- 2 top surface of adapter
- <sup>a</sup> Movement in millimetres.

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

## Annex A (informative)

### 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.

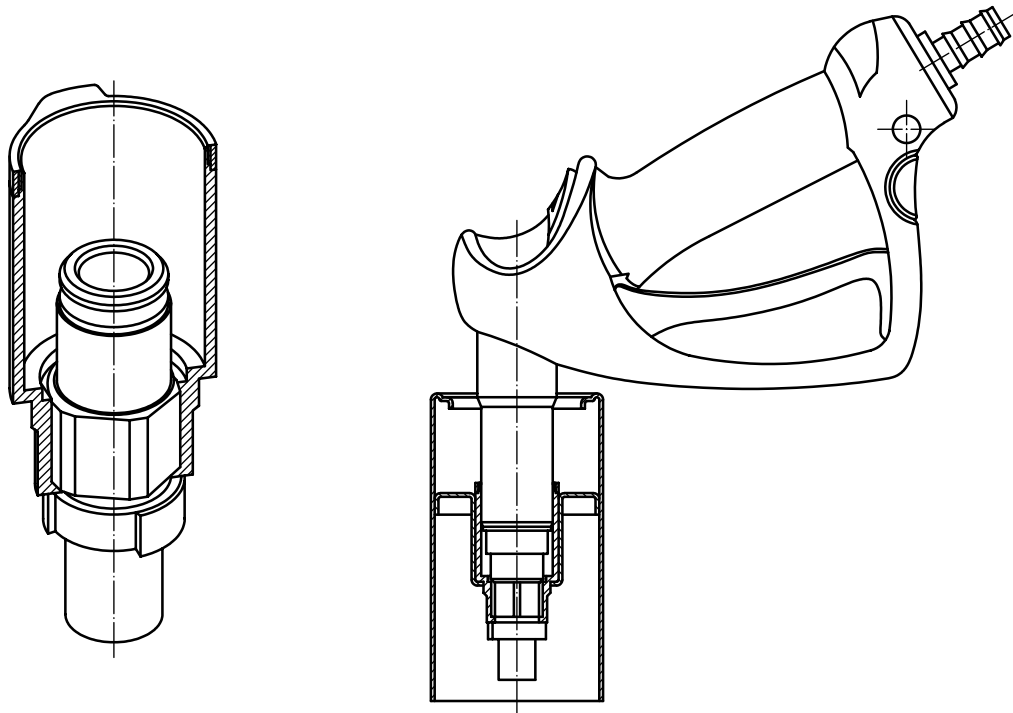


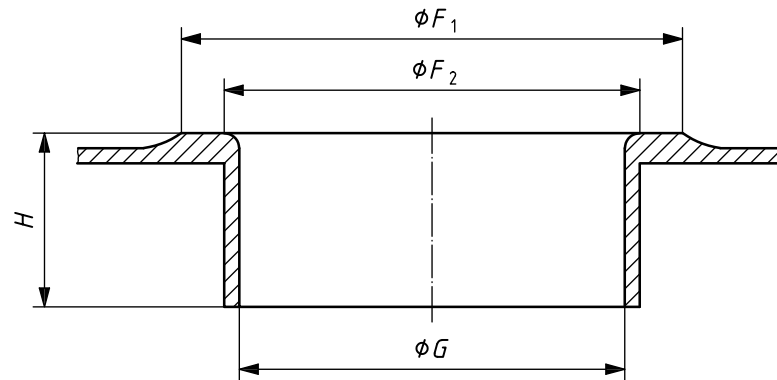
Figure A.1 — Example of a sealed refilling system

#### 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.





**Figure A.2 — Filler neck**

**Table A.1 — Dimensions of the filler neck**

Dimensions in millimetres

Symbol	Parameter	Dimension
$\phi F_1$	Flat area outer restriction	$\geq 117$
$\phi F_2$	Flat area inner restriction	$\leq 97$
$\phi G$	Inlet diameter	88 to 90
$H$	Height	Not defined

### A.3 Inlet adapter

The inlet adapter shall be designed to fit inside the filler neck. The inlet adapter shall include the sealed filling system coupling. The sealed system coupling shall have an outer diameter of 19,25 mm.

### A.4 Filler cap

The filler cap is needed for dust protection only.

### A.5 Filler nozzle

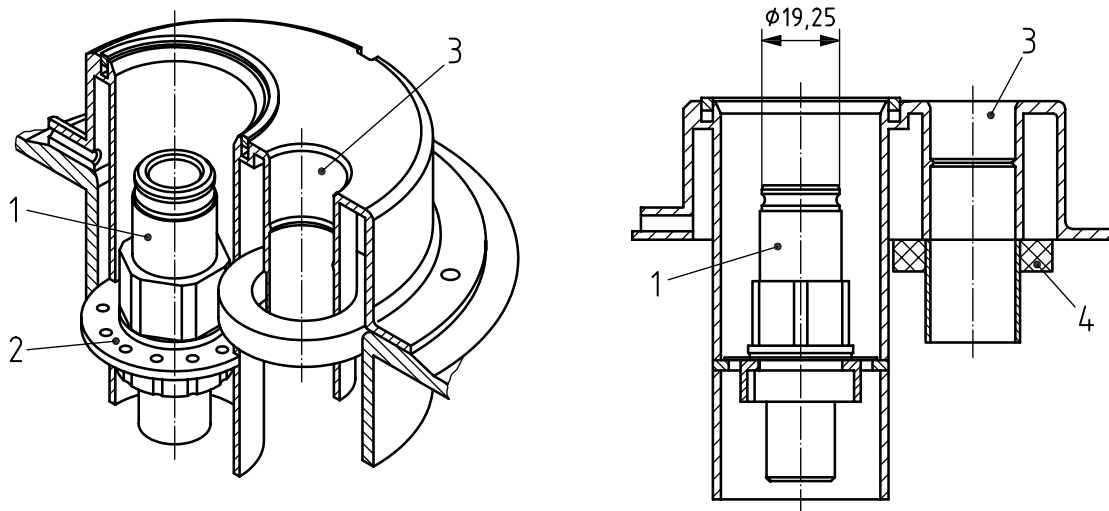
The nozzle shall be compatible with the sealed system inlet adapter.

If the nozzle is inserted into a tank different from the AUS 32 on-board tank, it shall not be possible to feed AUS 32 into that tank.

### A.6 Minimum free space for refilling

The minimum space for refilling shall be in compliance with 4.6 except for the geometry below the top surface of the adapter [diameter (19,25 × 72) mm], as this geometry defines the filler pipe of an open system.

Dimensions in millimetres



**Key**

- 1 sealed refilling coupling
- 2 sealed refilling ventilation valve
- 3 open (emergency) refilling inlet, with dimensions as specified in 4.3
- 4 magnet for open refilling nozzle, as specified in Table 3

**Figure A.3 — Example of a filler neck with inlet adapters for both open and sealed system**

## Bibliography

- [1] ISO 3833, *Road vehicles — Types — Terms and definitions*
- [2] EN 13012, *Petrol filling stations — Construction and performance of automatic nozzles for use on fuel dispensers*

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