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Road vehicles — Blended fuels refuelling connector

Véhicules routiers — Pistolet de remplissage pour les mélanges de carburants gazeux

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Foreword

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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).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

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The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 25, *Vehicles using gaseous fuel.*

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Introduction

A nozzle certified to this International Standard will be functionally compatible from a safety and performance perspective with all listed receptacles of compatible profile and system pressure. Similarly, a receptacle certified to this International Standard will be functionally compatible from a safety and performance perspective with all listed nozzles of compatible profile and system pressure.

As there can eventually be many different kinds of nozzles and receptacles available from a variety of manufacturers which, for safety reasons, shall all be compatible with each other, this International Standard specifies a series of receptacle profiles. These standard profiles incorporate the design specifications (mating materials, geometry, and tolerances) which can be considered in the certification of a submitted nozzle or receptacle.

The construction and performance of nozzles and receptacles are based on the observation that four main parameters affect user safety and system compatibility.

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Road vehicles — Blended fuels refuelling connector

1 Scope

This International Standard applies to compressed blended fuels vehicle nozzles and receptacles hereinafter referred to as devices, constructed entirely of new, unused parts and materials. Compressed blended fuels fuelling connection nozzles consist of the following components, as applicable:

a) Receptacle and protective cap (mounted on vehicle) (see Clause 7);

b) Nozzle (mounted on dispenser side) (see Clause 5).

This International Standard applies to devices which have a service pressure of 20 MPa, 25 MPa, and 35 MPa hereinafter referred to in this International Standard as [see 9.1 c)]:

— size 1: M200, M250, and M350;

— size 2: N200 and N250.

This International Standard refers to service pressures of 20 MPa, 25 MPa, and 35 MPa for size 1 and 20 MPa and 25 MPa for size 2.

This International Standard applies to devices with standardised mating components (see 5.8 and 7.7).

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This International Standard applies to connectors which

a) prevent blended fuels vehicles from being fuelled by dispenser stations with working pressures higher than the vehicle fuel system working pressure,

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b) allow blended fuels vehicles to be fuelled by dispenser stations with working pressures equal to or lower than the vehicle fuel system working pressure,

c) allow blended fuels vehicles to be fuelled by dispenser stations for compressed natural gas,

d) allow blended fuels vehicles to be fuelled by compressed natural gas dispenser stations with working pressures equal to or lower than the vehicle fuel system working pressure,

e) prevent blended fuels vehicles size 1 being refuelled on blended fuels dispenser stations equipped with a size 2 nozzle and vice versa,

f) prevent natural gas vehicles from being fuelled by blended fuels station, and dispensers, and

g) prevent pure hydrogen vehicles from being fuelled by blended fuels station dispensers.

This International Standard is applicable to mixtures of hydrogen from 2 % to 30 % in volume and compressed natural gas containing:

a) natural gas in accordance with ISO 15403-1 and ISO 15403-2;

b) pure hydrogen in accordance with ISO 14687-1 or ISO/TS 14687-2.

All references to pressures (MPa) throughout this International Standard are to be considered gauge pressures unless otherwise specified.

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2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1431-1, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 1: Static and dynamic strain testing*

ISO 1817, *Rubber, vulcanized or thermoplastic — Determination of the effect of liquids*

ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests*

ISO 11114-4, *Transportable gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 4: Test methods for selecting metallic materials resistant to hydrogen embrittlement*

ISO 14175, *Welding consumables — Gases and gas mixtures for fusion welding and allied processes*

ISO 14687-1, *Hydrogen fuel — Product specification — Part 1: All applications except proton exchange membrane (PEM) fuel cell for road vehicles*

ISO/TS 14687-2, *Hydrogen Fuel — Product Specification — Part 2: Proton exchange membrane (PEM) fuel cell applications for road vehicles*

ISO 15500-2:2012, *Compressed natural gas (CNG) fuel system components — Part 2: Performance and general test methods*

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ISO 15403-1, *Natural gas — Natural gas for use as a compressed fuel for vehicles — Part 1: Designation of the quality*

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ISO/TR 15403-2, *Natural gas — Natural gas for use as a compressed fuel for vehicles — Part 2: Specification of the quality*

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EN 10204, *Metallic products — Types of inspection documents*

3 Terms and definitions

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

3.1
air, dry
air with moisture content such that the dew point of the air at the required test pressure is at least 11 °C below the ambient test temperature

3.2
hydrostatic pressure
pressure to which a component is tested to verify the structural strength of the component

3.3
working pressure
maximum pressure that the blended fuels refuelling connector can be expected to withstand in actual service (calculatory base: service pressure times 1,25)

3.4
service pressure
settled pressure of 20 MPa, 25 MPa, and 35 MPa at a uniform gas temperature of 15 °C

3.5
positive locking means
feature which requires actuation of an interlocking mechanism to allow connection/disconnection of the nozzle from the receptacle

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3.6
compressed blended fuels refuelling nozzle
device which permits quick connection and disconnection of fuel supply hose to the compressed blended fuels receptacle in a safe manner, hereafter referred to as compressed blended fuels nozzle

3.7
compressed blended fuels refuelling receptacle
device connected to a vehicle or storage system which receives the compressed blended fuels nozzle and permits safe transfer of fuel, hereafter referred to as receptacle

3.8
compressed blended fuels refuelling connector
joint assembly of compressed blended fuels nozzle and receptacle, hereafter referred to as connector

3.9
hydrogen embrittlement
process by which various metals, most importantly high-strength steel, become brittle and crack following exposure to hydrogen

3.10
compressed blended fuels
blended fuel is a mixture out of hydrogen from 2 % to 30 % in volume and natural gas which is used as a vehicular fuel at a specified pressure as in the Introduction point 2

3.11
leak test gas
gas used for leak testing purposes

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3.12
cycle life
connections and disconnections to a nozzle

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3.13
service life
operations of the check valve

4 General construction requirements

a) There are two different sizes of refuelling systems, size 1 and size 2.

Size 1 should suit the need of smaller vehicles with a limited tanks size. Therefore, the flow diameter is limited by the inner front diameter of the receptacle – in this case ⌀ 7,8 mm ± 0,2 mm.

Size 2 should suit the need of commercial vehicles like busses and trucks. Therefore, the flow diameter is limited by the inner front diameter of the receptacle – in this case ⌀ 12 mm ± 0 2mm.

Also, the profile of the two different sizes is so different that no cross connection between the sizes is possible.

b) Working pressure (= 1,25 times service pressure). All nozzles and receptacles are designed to have a working pressure of:

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Code	Service pressure	Working pressure
Size 1		
M200	20 MPa	25 MPa
M250	25 MPa	31,25 MPa
M350	35 MPa	43,75 MPa
Size 2		
N200	20 MPa	25 MPa
N250	25 MPa	31,25 MPa

c) Design life. Frequency of use is the second parameter to be considered. Since frequency of use will differ with the nozzle/receptacle application (i.e. public sector, fleet employee, and residential), all receptacles will be tested at 10 000 connect/disconnect cycles for compliance with this International Standard. In addition, all nozzles shall be tested according to the following frequency use classifications, as applicable.

— Class A Nozzle - This class specifies high frequency use, with a cycle life of 100 000. This equates to approximately 100 fills per day for three years.

— Class B Nozzle - This class specifies medium frequency use, with a cycle life of 20 000 cycles. This equates to approximately 10 fills per day for five years.

d) Training. Operator. Training required is in accordance with national requirements.

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4.1 Compressed blended fuels nozzles and receptacles shall be well fitted and manufactured in accordance with good engineering practice. All construction requirements can be met by either the construction specified in this International Standard or another construction that gives at least equivalent performance.

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4.2 Compressed blended fuels nozzles and receptacles shall be:

— designed to minimize the possibility of incorrect assembly;

— designed to be secure against displacement, distortion, warping, or other damage;

— constructed to maintain operational integrity under normal and reasonable conditions of handling and usage.

4.3 Nozzles and receptacles shall be manufactured of materials suitable and compatible for use with compressed blended fuels at the pressure and the temperature ranges to which it will be subjected.

4.3.1 The temperature ranges shall be:

Table 1 — Temperature ranges

	Location on board	
	Location a	Location b
Cold	−40 °C to 120 °C	−40 °C to 85 °C
Moderate	−20 °C to 120 °C	−20 °C to 85 °C

Location a — Inside the engine compartment in case of internal combustion engine vehicle. The receptacle shall be installed far from either heat or sparking sources and in a vented area.

Location b — Elsewhere in case of internal combustion engine vehicle.

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4.4 Compressed blended fuels nozzles and receptacles shall be constructed out of materials which have to be proven for the intent of withstanding a blended fuels mixture at the given pressures, temperatures, and contents of the fuel that can be expected in this system.

4.5 Separate external three-way valves shall be constructed and marked so as to indicate clearly the open, shut, and vent positions.

4.6 Compressed blended fuels nozzles and receptacles shall be operated either to connect or disconnect without the use of tools.

4.7 Jointing components shall provide gas tight sealing performance.

Unless otherwise specified, all tests shall be conducted using dry hydrogen, helium, or blends of nitrogen with a minimum 5 % of hydrogen. Test shall be performed by qualified personnel and appropriate safety measures shall be taken. The dew point of the test gas at the test pressure shall be at the temperature at which there is no icing, or hydrate or liquid formation. The dew point of the test gas at the test pressure shall be at the temperature at which there is no icing, or hydrate or liquid formation.

5 Nozzles

5.1 Nozzles shall be one of three types as described in a) to c). (See also Annex A)

a) Type 1, which is a nozzle for use with dispensing hoses that remain fully pressurized at dispenser shutdown. The nozzle shall not allow gas to flow until a positive connection has been achieved. The nozzle shall be equipped with an integral valve or valves, incorporating an operating mechanism which first stops the supply of gas and safely vents the trapped gas before allowing the disconnection of the nozzle from the receptacle. The operating mechanism shall ensure the vent valve is in the open position before the release mechanism can be operated and the gas located between the nozzle shut-off valve and the receptacle check valve is safely vented prior to nozzle disconnection (see 10.2).

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b) Type 2, which is a nozzle for use with dispensing hoses that remain fully pressurized at dispenser shutdown. A separate three-way valve connected directly, or indirectly, to the inlet of the nozzle is required to safely vent trapped gas prior to nozzle disconnection. The nozzle shall not permit the flow of gas if unconnected. Venting is required prior to disconnection of the nozzle (see 10.2).

c) Type 3, which is a nozzle for use with dispensing hoses which are automatically depressurised (0,5 MPa and below) at dispenser shutdown (see 10.2).

In addition, nozzles shall be classified in terms of cycle life as follows:

— Class A - This class specifies high frequency use, with a cycle life of 100 000.

— Class B - This class specifies low frequency use, with a cycle life of 20 000.

5.2 Venting or de-pressurization of all nozzle types is required prior to disconnection. Disconnection of all nozzles shall be capable of being accomplished in accordance with 10.2.

5.3 The method for attaching the nozzle to the fuel dispensing system hose shall not rely on the joint threads between the male and female threads for sealing, such as conical threads.

5.4 The three-way valve vent port of Type 1 and Type 2 nozzles shall be protected from the ingress of foreign particles and fluid which would hamper the operation of the valve. It has to be considered that the vented gas has to be lead into a safe direction.

5.5 The portions of a nozzle which are held by the user for connection or disconnection can be thermally insulated or it shall be ensured that no abnormal dangerous temperatures can be transferred to the user.

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5.6 A Type 1 nozzle shall bear a marking in accordance with Clause 9, indicating the direction of the open and shut operation of the actuating mechanism, if necessary.

5.7 The interface surface of the nozzle shall be constructed of material having a hardness > 75 Rockwell B (HRB 75) and shall be non-sparking and conductive (see 10.11.5 and 10.15).

A proof for adequate hardness shall be either a Mill Sheet or an EN 10204-3.1 certificate or a similar acceptable certificate if hardness is mentioned on there.

The exposed surfaces of the nozzles shall be made of non-sparking materials (see 10.11.5 and 10.15).

5.8 Nozzles shall comply with the performance requirements of Clause 10 to ensure interchangeability.

5.9 The vent line of Type 1 and Type 2 nozzles must withstand the maximum working pressure at full flow conditions.

6 Standard receptacle dimensions

6.1 Standard receptacle dimensions Size 1 (M200, M250, M350)

A receptacle size 1 shall comply with the design specifications detailed in Figures 1 to 3.

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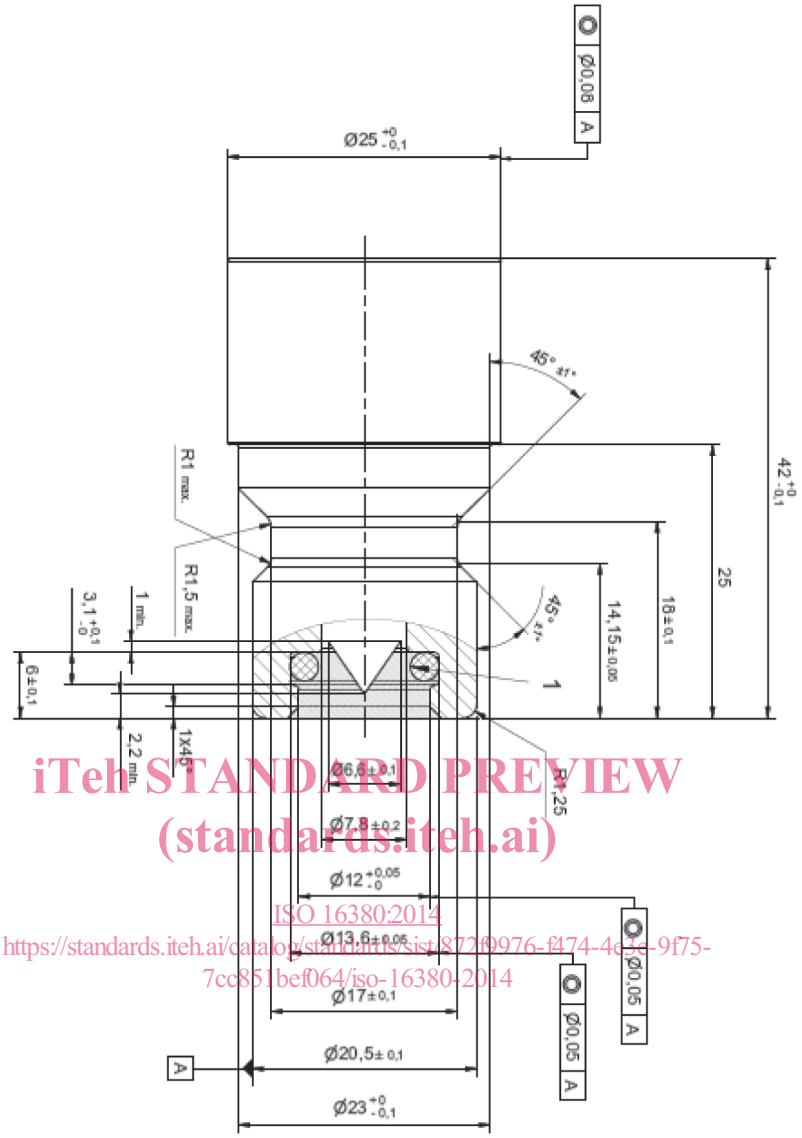

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Key

	this area shall be kept free of all components
1	sealing surface equivalent to No. 110 O-ring of dimensions: 9,19 mm ± 0, 127 mm ID 2,62 mm ± 0, 076 mm width
sealing surface finish	0,8 µm to 0, 05 µm
material hardness	75 Rockwell B (HRB 75) minimum

Figure 1 — Size 1 — M200 Receptacle

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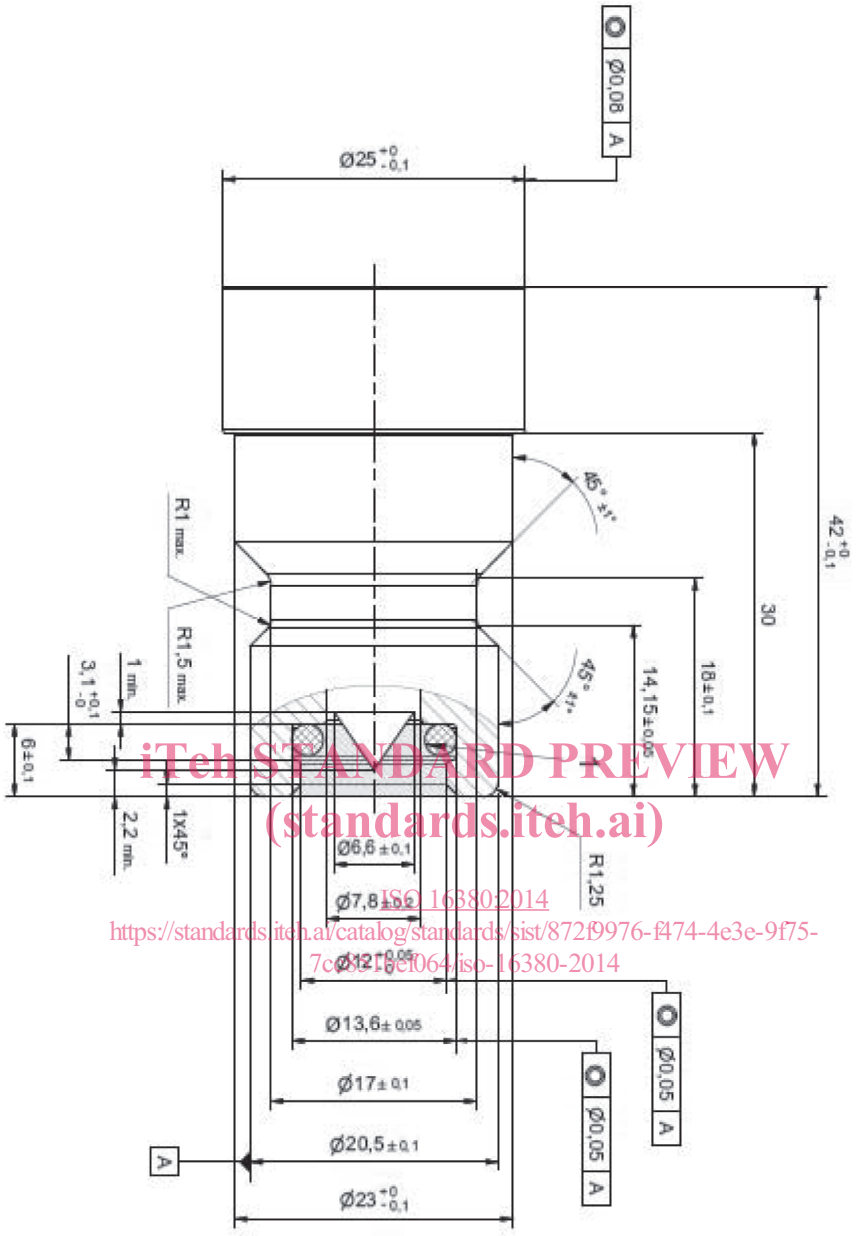

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Key

	this area shall be kept free of all components
1	sealing surface equivalent to No. 110 O-ring of dimensions: 9,19 mm ± 0, 127 mm ID 2,62 mm ± 0, 076 mm width
sealing surface finish	0,8 µm to 0, 05 µm
material hardness	75 Rockwell B (HRB 75) minimum

Figure 2 — Size 1 — M250 Receptacle

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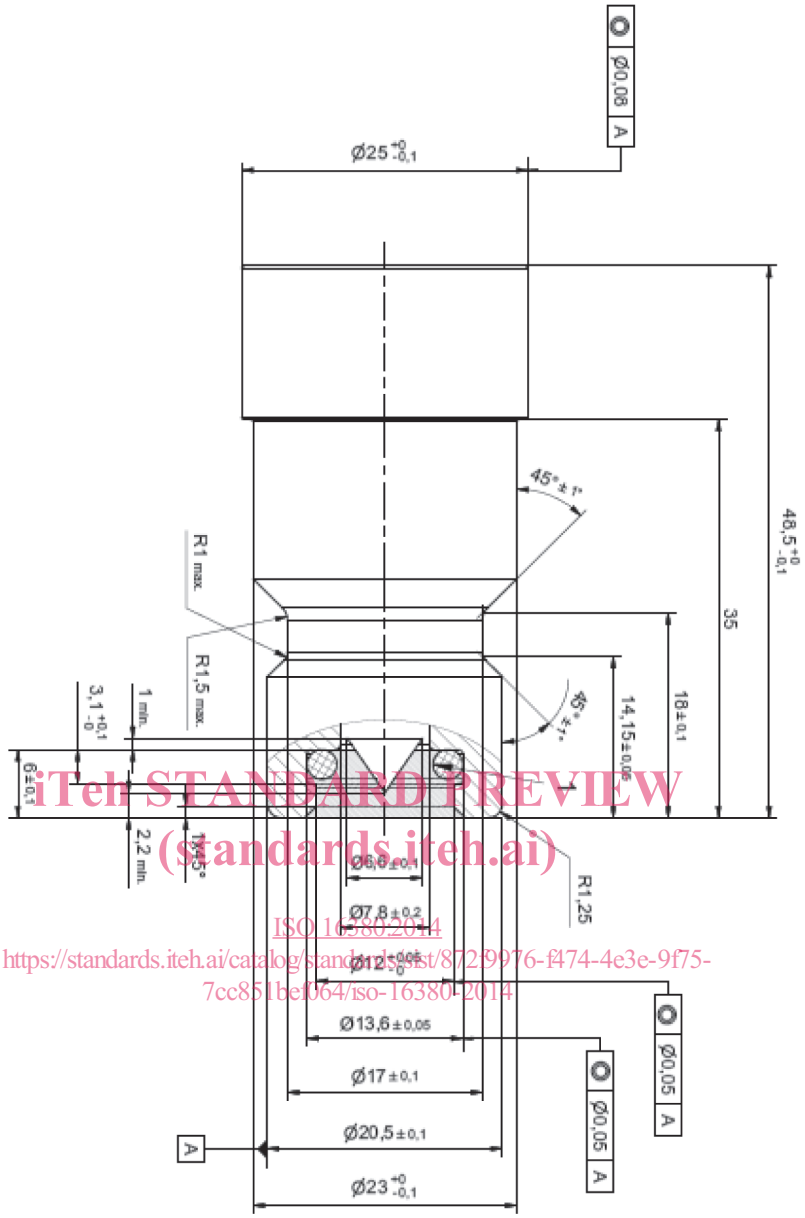

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Key

	this area shall be kept free of all components
1	sealing surface equivalent to No. 110 O-ring of dimensions: 9,19 mm ± 0, 127 mm ID 2,62 mm ± 0, 076 mm width
sealing surface finish	0,8 µm to 0, 05 µm
material hardness	75 Rockwell B (HRB 75) minimum

Figure 3 — Size 1 — M350 Receptacle

Depending on the pressure range, M200 and M250 receptacles have to have a minimum length of 42 mm and M350, 48,5 mm which is clear of provisions for attachment of receptacle or protective caps.

NOTE This space can be used from nozzle manufacturers for coding purposes.

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