INTERNATIONAL STANDARD

ISO 17268

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Compressed hydrogen surface vehicle refuelling connection devices

Dispositifs de raccordement pour le ravitaillement des véhicules terrestres en hydrogène comprimé

Reference number
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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 17268 was prepared by the Society of Automotive Engineers (SAE) as SAE J2600 and was adopted, under a special “fast-track procedure”, by Technical Committee ISO/TC 197 *Hydrogen technologies*, in parallel with its approval by the ISO member bodies.

Compressed hydrogen surface vehicle refuelling connection devices

1 Scope

1.1 This International Standard applies to design, safety and operation verification of Compressed Hydrogen Surface Vehicle (CHSV) refuelling connection devices hereinafter referred to as nozzle and receptacle. CHSV Refuelling nozzles and receptacles consist of the following components, as applicable.

— Receptacle and protective cap (mounted on vehicle);

— Nozzle.

1.2 This International Standard applies to devices which have working pressures of 25 MPa and 35 MPa, hereinafter referred to in this International Standard as the following:

— H25 - 25 MPa at 15 ℃

— H35 - 35 MPa at 15 ℃

1.3 This International Standard applies to nozzles and receptacles which (1) prevent hydrogen fuelled vehicles from being refuelled by dispenser stations with working pressures higher than the vehicle; (2) allow hydrogen vehicles to be refuelled by dispenser stations with working pressures equal to or lower than the vehicle fuel system working pressure; (3) prevent hydrogen fuelled vehicles from being refuelled by other compressed gases dispensing stations; and (4) prevent other gaseous fuelled vehicles from being refuelled by hydrogen dispensing stations.

1.4 All dimensions used in this document are in metric units [International System of Units (SI)].

1.5 For the purposes of this document, compressed hydrogen gas meeting the requirements of ISO 14687 is to be used.

1.6 All references to pressures (MPa) throughout this document are considered gauge pressures unless otherwise specified.

All test procedures listed in this document are design verification test procedures unless otherwise noted.

All products are to pass all tests to be considered to have met this design standard.

2 Normative references

The following referenced documents are indispensable for the application of this document. For date references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies. d

ISO 188, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests*

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

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

ISO 12103-1, *Road vehicles — Test dust for filter evaluation — Part 1: Arizona test dust*

ISO 12103-2, *Road vehicles — Test dust for filter evaluation — Part 2: Aluminium oxide test dust*

ISO 14687, *Hydrogen fuel — Product specification*

ISO 15501-1, *Road vehicles — Compressed natural gas (CNG) fuel systems — Part 1: Safety requirements*

ISO 15501-2, *Road Vehicles — Compressed natural gas (CNG) fuel systems — Part 2: Test methods*

SAE J2574, *Fuel Cell Vehicle Terminology*

SAE J2578, *Recommended Practice for General Fuel Cell Vehicle Safety*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in SAE J2578 and the following apply.

3.1
air, dry
air with a maximum dew point of –40 ℃

3.2
connector
a joined assembly of CHSV nozzle and receptacle which permits quick connect and disconnect of fuel supply to the vehicle or storage system

3.3
cycle
the process of a making a positive connection between the nozzle and the receptacle, pressurizing to design pressure, depressurizing and disconnecting

3.4
design pressure
the maximum pressure that a component will experience in actual service

NOTE The design pressure is 125 % of the working pressure for the purpose of design of nozzles and receptacles in this document.

3.5
helium or hydrogen, dry
helium or hydrogen with a maximum dew point of –40 ℃ and at least 99 % pure

3.6
leak test gas
dry hydrogen or helium, preferably hydrogen

NOTE Adequate safety precautions are to be taken when testing with hydrogen.

3.7
nozzle
device connected to a fuel dispensing system, which permits the transfer of fuel

3.8
positive locking means
a feature which requires actuation of an interlocking mechanism to verify proper connection of the connector before pressure is applied

3.9
protective cap
a means to prevent road dirt and other contaminants from getting into the inlet of the vehicle receptacle

3.10
receptacle
device connected to a vehicle or storage system which receives the station nozzle and permits transfer of fuel

NOTE This may also be referred to as a fuelling inlet.

3.11
working pressure
pressure at which the product is intended to be operated for a given gas temperature of 15 °C

NOTE This defines a full tank gas density.

4 General construction requirements

4.1 CHSV nozzles and receptacles made to this International Standard shall be designed in accordance with reasonable concepts of safety, durability and maintainability.

4.2 CHSV nozzles and receptacles shall be well fitted and manufactured in accordance with good engineering practice. All specifications as to construction set forth herein may be satisfied by the construction actually prescribed or such other construction as will provide at least equivalent performance.

4.3 CHSV nozzles and receptacles shall be (1) designed to minimise the possibility of incorrect assembly; (2) designed to be secure against displacement, distortion, warping or other damage; and (3) constructed to maintain operational integrity under normal and reasonable condition of handling and usage.

4.4 CHSV nozzles and receptacles shall be manufactured of materials suitable and compatible for use with compressed hydrogen at the pressure and the temperature ranges to which they will be subjected (see 3.4, 5.9 and 7.7). All pressure bearing and wetted components shall also be made from adequate material that is compatible with deionised water. The material compatibility shall be documented by the component manufacturer or an independent third party, or an independent party to a standard such as ISO 1817. Materials used in the construction of nozzles, receptacles and dust caps shall be documented as non-sparking.

4.5 CHSV connectors shall be operated to either connect or disconnect without the use of tools.

4.6 The receptacle shall be mounted on the vehicle in compliance with SAE J2578 and ISO 15501-1.

4.7 Protective caps are intended to protect the receptacle from foreign debris and shall not hold pressure. Resistance shall be appropriate to prevent inadvertent dislodging. All protective caps shall have a retainer to attach them to the receptacle or vehicle.

5 Nozzles

5.1 Nozzles shall comply with the dimensional requirements of Clause 6 to ensure proper interchangeability. Nozzles shall couple with receptacles of higher working pressures, but they shall be designed so that they will not couple with receptacles of lower working pressures.

5.2 Nozzles shall be one of three types as described hereunder.

a) TYPE A - A nozzle for use with dispensing hoses that may 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 connection is open 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 10.2.4 through 10.2.7).

b) TYPE B - A nozzle for use with dispensing hoses that may remain fully pressurized at dispenser shutdown. A separate three-way valve connected directly, or indirectly, to the inlet of the nozzle shall be used to safely vent trapped gas prior to nozzle disconnection. The nozzle shall not allow gas to flow until a positive connection has been achieved. Venting shall be achieved prior to disconnection of the nozzle (see 10.2.4 through 10.2.7). External three-way valves shall be constructed and marked so as to indicate clearly the open, shut and vent positions.

c) TYPE C - A nozzle for use with dispensing hoses which are depressurized (0,5 MPa and below) at dispenser shutdown (see 10.2.4 through 10.2.7). The nozzle shall not allow gas to flow until a positive connection has been achieved. The function of preventing flow may be controlled by the dispenser as long as it is receiving a positive connection signal from the nozzle.

In addition, nozzles shall be designed for a life of 100 000 cycles with manufacturer specified maintenance. The three-way valve used for actuating Type B nozzles shall meet the same number of cycles as the nozzle (i.e., 100 000 cycles).

5.3 The act of venting, or de-pressurising, of the connection space between all nozzle types and receptacles shall be performed prior to disconnection. A provision shall be made for the venting or de-pressurising of all nozzles types so that they shall be directed to a safe location.

5.4 The means for attaching the nozzle to the fuel dispensing system hose shall not rely on the joint between the male and female threads for sealing, such as tapered pipe threads.

5.5 A Type A nozzle shall bear integral markings, or a permanently attached marking plate indicating the direction of the ON and OFF operation of the actuating mechanism. These markings shall be embossed, cast, stamped or otherwise formed in the part or plate. This includes markings baked into an enamelled surface. Permanently attached marking plates shall be securely attached by mechanical means.

5.6 The nozzle shall fit within the envelope described in ISO 15501–2.

5.7 Nozzles shall have a means to prevent the ingress of solid matter from upstream sources. For example, the requirement shall be deemed met if the nozzle has a filter upstream of adequate size to protect its functionality.

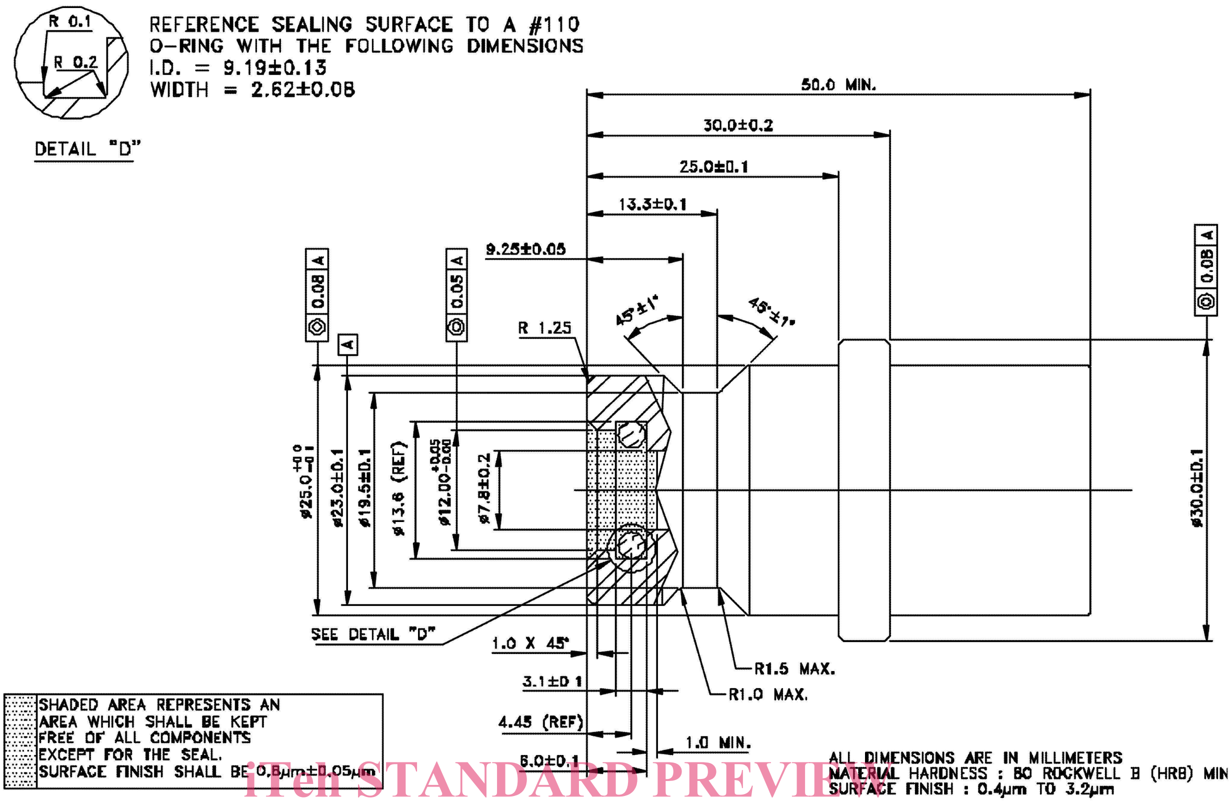
5.8 It shall not be possible to remove a nozzle when the contained pressure is greater than 0,7 MPa.

5.9 The nozzle shall be designed to operate properly from –40 °C to 85 °C.

5.10 The nozzle shall not have any mechanical means of opening the receptacle check valve.

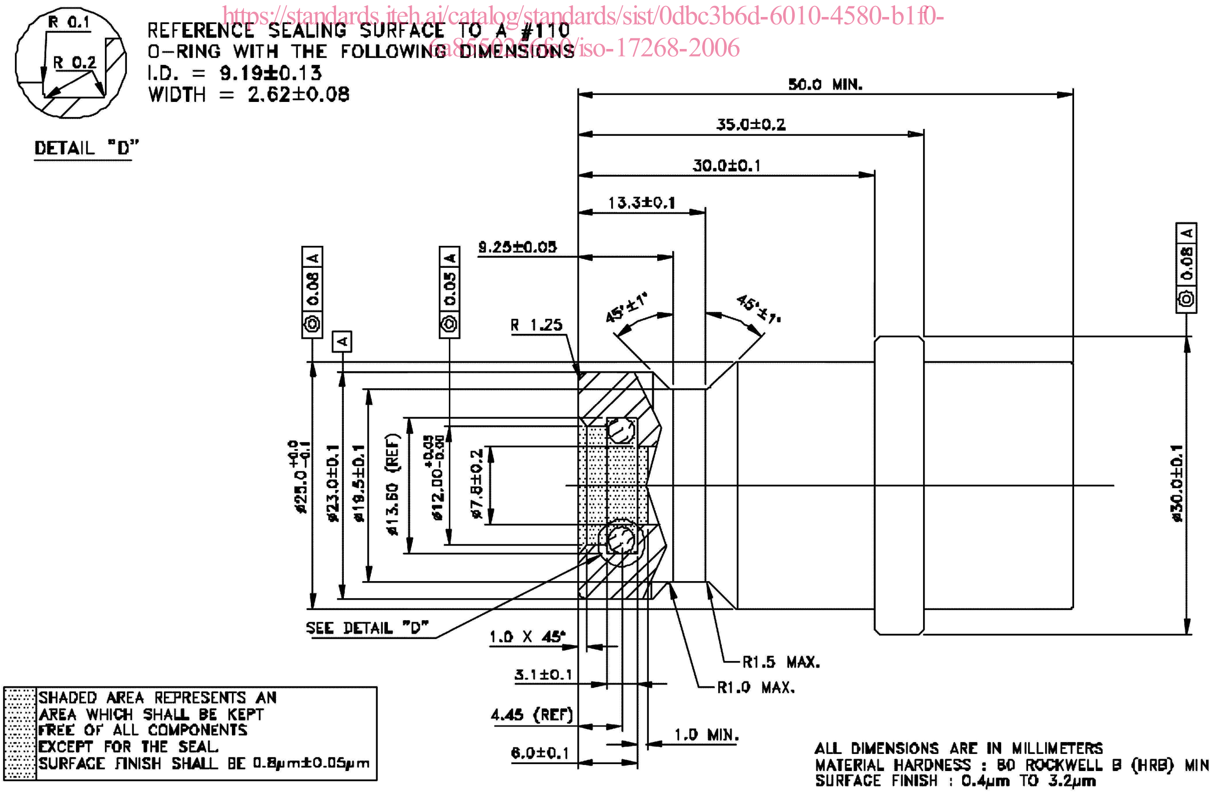
6 Standard receptacle dimensions

A receptacle shall comply with the design specifications detailed in Figures 1 and 2.



DETAIL "D"
R 0.1
R 0.2
REFERENCE SEALING SURFACE TO A #110
O-RING WITH THE FOLLOWING DIMENSIONS
I.D. = 9.19±0.13
WIDTH = 2.62±0.08
50.0 MIN.
30.0±0.2
25.0±0.1
13.3±0.1
9.25±0.05
R 1.25
45°±1°
45°±1°
SEE DETAIL "D"
1.0 X 45°
3.1±0.1
4.45 (REF)
6.0±0.1
1.0 MIN.
R1.5 MAX.
R1.0 MAX.
SHADED AREA REPRESENTS AN
AREA WHICH SHALL BE KEPT
FREE OF ALL COMPONENTS
EXCEPT FOR THE SEAL.
SURFACE FINISH SHALL BE 0.8μm±0.05μm
ALL DIMENSIONS ARE IN MILLIMETERS
MATERIAL HARDNESS : 80 ROCKWELL B (HRB) MIN
SURFACE FINISH : 0.4μm TO 3.2μm

Figure 1 — H25 hydrogen receptacle



DETAIL "D"
R 0.1
R 0.2
REFERENCE SEALING SURFACE TO A #110
O-RING WITH THE FOLLOWING DIMENSIONS
I.D. = 9.19±0.13
WIDTH = 2.62±0.08
50.0 MIN.
35.0±0.2
30.0±0.1
13.3±0.1
9.25±0.05
R 1.25
45°±1°
45°±1°
SEE DETAIL "D"
1.0 X 45°
3.1±0.1
4.45 (REF)
6.0±0.1
1.0 MIN.
R1.5 MAX.
R1.0 MAX.
SHADED AREA REPRESENTS AN
AREA WHICH SHALL BE KEPT
FREE OF ALL COMPONENTS
EXCEPT FOR THE SEAL.
SURFACE FINISH SHALL BE 0.8μm±0.05μm
ALL DIMENSIONS ARE IN MILLIMETERS
MATERIAL HARDNESS : 80 ROCKWELL B (HRB) MIN
SURFACE FINISH : 0.4μm TO 3.2μm

Figure 2 — H35 hydrogen receptacle

7 Receptacles

7.1 Receptacles shall comply with all sections of this document.

The failure of any test conducted with the receptacle and nozzle test samples shall constitute a failure of the receptacle design.

In addition, receptacles shall be designed for a life of 15 000 cycles and 15 years with manufacturer specified maintenance.

7.2 Receptacle designs which employ means on the back diameter to accommodate mounting, or for mounting accessories or marking purposes, shall not have such means extend beyond the back diameter dimensions of the profile specified in Figures 1 and 2, as applicable. Acceptable means shall include wrench flats, protective cap anchoring grooves, use of hex stock, undercutting for marking, and threads for protective caps. Such receptacle designs shall not compromise proper nozzle interchangeability.

7.3 The receptacle shall be equipped with an internal check valve to prevent the escape of gas. The check valve shall be of the non-contact type, opening by differential pressure only.

7.4 The means for attaching the receptacle to the vehicle fuel system shall not rely on the joint between the male and female threads for sealing, such as tapered pipe threads.

7.5 Receptacles shall be designed so that they are either tolerant of solid contamination, or have a means to protect themselves from said contamination when connected or disconnected. For example, the requirement shall be deemed met if the receptacle has a filter upstream of adequate size to protect the functionality of the check valve. A receptacle shall have a means to prevent the ingress of fluids and foreign matter when disconnected.

7.6 The receptacle shall have provisions to be firmly attached to the vehicle and shall comply with applicable abnormal load tests (see 10.7).

7.7 The receptacle shall be designed to operate properly from –40 ℃ to 85 ℃.

8 Instructions

Instructions and provisions required by this Clause are to be in an easily understandable form.

Special tools required for connection of receptacles to tubing shall be clearly identified in the instructions.

Manufacturers of receptacles and nozzles shall provide clear and concise printed instructions and diagrams in a form that can be easily understood and are adequate for (1) proper field assembly, (2) installation, (3) maintenance, (4) replacement of components as appropriate (may include expected lifetime, i.e., 100 000 cycles), (5) safe operation by all users (6) suitability and use, and (7) transport, storage and handling.

9 Marking

Markings required by this Clause shall be in a legible and easily understandable form. These markings shall be embossed, cast, stamped or otherwise formed in the part or a plate. This includes markings baked into an enamelled surface. Permanently attached marking plates shall be securely attached by mechanical means. All markings shall be at least 2,5 mm high.

9.1 Nozzles and receptacles shall bear the following information:

a) The manufacturer's or dealer's name, trademark or symbol;

b) The model designation;

c) The appropriate standard designation, H25 or H35;

d) The applicable Type A, B or C (Nozzles only);

e) Marking for traceability of receptacles in suitable lots. Nozzles shall carry individual serial numbers.

9.2 A marking to identify this International Standard shall be provided for all components. This marking may be located on the package or on a notice placed inside the package in which the device is shipped.

10 Design verification test procedures

10.1 General requirements

10.1.1 A nozzle and receptacle shall meet the requirements of all Clauses of this International Standard.

10.1.2 Unless otherwise stated:

a) Tests shall be conducted at 20 °C ± 5 °C;

b) All pressure tests shall be conducted with leak test gas unless otherwise noted;

c) All leak tests shall be conducted with leak test gas;

d) Test fluids and devices shall be at equilibrium conditions with the test environment at the beginning of all tests.

10.1.3 Nozzle tests shall be done with the test fixtures, identified under Figures 5, 6, 9 and 10 as applicable. A new receptacle test sample shall be used for each nozzle test. The failure of any test conducted with the nozzle and receptacle test sample shall constitute a failure of the nozzle design.

10.1.4 Receptacles shall be evaluated with any other manufacturer's nozzle(s) which have been certified to this document. The failure of any test conducted with the receptacle and nozzle test samples shall constitute a failure of the receptacle design.

10.2 User - Machine interface

10.2.1 The appearance of the nozzle and receptacle shall be such as to clearly suggest the proper method of use.

10.2.2 It shall not be possible to deliver gas using all types of nozzles unless the nozzle and receptacle are connected properly and positively locked.

10.2.3 Upon disconnection all types of nozzles shall stop the flow of gas. No hazardous condition shall result from disconnection. Type C nozzles shall be at 0,5 MPa during this test.

10.2.4 When the contained pressure is less than or equal to 0,5 MPa, Type A and B nozzles shall be capable of being disconnected from the wear pattern test fixture (Figure 7 or Figure 8) with forces less than 22,2 N and torques less than 7 N•m.

10.2.4.1 *Test method* — The disconnection forces and torques shall be applied in a direction that tends to unhook and release the nozzle. The torque shall be applied to the unhooking/release actuator or three way valve. For example, if there is a handle, the torque shall be applied through axis rotation of the nozzle handle equal to the exterior handling surface of the nozzle mechanism and in such a direction that tends to unhook and release the nozzle.

10.2.5 On unpressurized devices the axial force to connect and lock or unlock and disconnect the device from the wear pattern test fixture (Figure 7 or Figure 8) shall be less than or equal to 90 N.