INTERNATIONAL STANDARD

ISO 14469-2

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Road vehicles — Compressed natural gas (CNG) refuelling connector —

Part 2:
20 MPa (200 bar) connector, size 2

Véhicules routiers — Connecteur de remplissage en gaz naturel comprimé (GNC) —
Partie 2: Connecteur 20 MPa (200 bar), taille 2

Reference number
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Contents

Page

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 14469-2 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 25, *Vehicles using gaseous fuels*.

ISO 14469 consists of the following parts, under the general title *Road vehicles — Compressed natural gas (CNG) refuelling connector*:

— *Part 1: 20 MPa (200 bar) connector*

— *Part 2: 20 MPa (200 bar) connector, size 2*

— *Part 3: 25 MPa (250 bar) connector*

Introduction

This part of ISO 14469 was developed for use in the examination, testing and certification of newly produced compressed natural gas (CNG) vehicle fuelling nozzles and receptacles. As such, it applies only to the nozzles and receptacles used in CNG fuelling systems, and not to the system itself.

A nozzle certified to this part of ISO 14469 will be functionally compatible from a safety and performance perspective with all listed receptacles of compatible profile and system pressure. Similarly, a certified receptacle will be functionally compatible from a safety and performance perspective with all listed nozzles of compatible profile and system pressure.

As there may eventually be many different kinds of nozzles and receptacles available from a variety of manufacturers which, for safety reasons, all need to be compatible with one another, this part of ISO 14469 specifies a series of receptacle profiles. These standard profiles incorporate the design specifications (mating materials, geometry and tolerances) that may be considered in the certification of a submitted nozzle or receptacle. This part of ISO 14469 refers only to one working pressure and one application. Other working pressures and applications are under consideration for the future.

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

a) Working pressure: all nozzles and receptacles are designed to have a working pressure of 25 MPa[1].

b) Design life: since frequency of use will differ with the nozzle/receptacle application (i.e. public sector, fleet employment and residential), all receptacles will be tested at 10 000 connect/disconnect cycles for compliance with this part of ISO 14469. In addition, all nozzles will be tested according to the following frequency use classifications, as applicable:

   1) class A nozzle, specifying high frequency use, with a cycle life of 100 000 and equating to approximately 100 fills per day for three years;

   2) class B nozzle, specifying medium frequency use, with a cycle life of 20 000 and equating to approximately 10 fills per day for five years.

c) Training: operator training required is in accordance with national requirements.

1) 1 MPa = 10 bar.

Road vehicles — Compressed natural gas (CNG) refuelling connector —

Part 2: 20 MPa (200 bar) connector, size 2

1 Scope

This part of ISO 14469 applies to compressed natural gas (CNG) vehicle nozzles and receptacles, constructed entirely of new, unused parts and materials for which there is a demand, in particular for large CNG urban buses of refuelling times equivalent to those of urban buses driven by conventional diesel engines. The proposed connector, size 2, offers a larger cross section than the connector in accordance with ISO 14469-1 and, therefore, permits refuelling of the vehicles within significantly shorter time periods. Studies have shown that the proposed connector, size 2, offers more than twice the mass flow of the connectors specified in ISO 14469-1. CNG fuelling connection nozzles consist of the following components, as applicable:

— receptacle and protective cap (mounted on vehicle) (see Clause 7);

— nozzle (see Clause 5).

This part of ISO 14469 applies only to devices which have a service pressure of 20 MPa [referred to as C200 receptacle, see 9.2 c)].

This part of ISO 14469 applies to devices with standardized mating components (see 5.8 and 7.7).

This part of ISO 14469 applies to connectors that

— prevent natural gas vehicles from being fuelled by dispenser stations with service pressures higher than the vehicle, and

— allow natural gas vehicles to be fuelled by dispenser stations with service pressures equal to or lower than the vehicle fuel system service pressure.

This part of ISO 14469 is applicable to compressed natural gas in accordance with ISO 15403.

All references to pressures throughout this part of ISO 14469 are considered to be gauge pressures unless otherwise specified. The selection of the appropriate standardized connector is agreed between the vehicle manufacturer and the customer.

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 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 atmospheres — Salt spray tests*

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

3 Terms and definitions

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

3.1
dry air
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 taken to verify the structural strength of the component

3.3
working pressure
maximum pressure that a CNG refuelling connector can be expected to withstand in actual service

3.4
service pressure
settled pressure of 20 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

3.6
CNG refuelling nozzle
CNG nozzle
device which permits quick connection and disconnection of fuel supply hose to the CNG receptacle in a safe manner

3.7
CNG refuelling receptacle
receptacle
device connected to a vehicle or storage system which receives the CNG refuelling nozzle and permits safe transfer of fuel

3.8
CNG refuelling connector
connector
joined assembly of CNG refuelling nozzle and receptacle

4 General construction requirements

4.1 CNG nozzles and receptacles manufactured in accordance with this part of ISO 14469 shall be designed in accordance with reasonable concepts of safety, durability and maintainability.

NOTE Nozzles and receptacles are both referred to as devices in this part of ISO 14469.

4.2 CNG nozzles and receptacles shall be well fitted and manufactured in accordance with good engineering practice. All construction requirements may be met by either the construction specified in this part of ISO 14469 or another construction that gives at least equivalent performance.

4.3 CNG nozzles and receptacles shall be

— designed to minimize the possibility of incorrect assembly,

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

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

4.4 CNG nozzles and receptacles shall be manufactured of materials suitable and compatible for use with compressed natural gas at the pressure and the temperature ranges to which they will be subjected.

The minimum temperature range shall be selected by the manufacturer between the following ranges:

— −40 °C to 85 °C;

— −20 °C to 120 °C.

4.5 CNG nozzles and receptacles constructed of brass shall use brass alloys with a copper mass content $\leqslant$ 70 %. This ensures proper material compatibility with all the constituents of natural gas.

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

4.7 CNG nozzles and receptacles shall be operated either to connect or disconnect without the use of tools.

4.8 The receptacle shall be mounted on the vehicle in compliance with ISO 15501-1.

4.9 Jointing components shall provide gas-tight sealing performance.

4.10 For quick fuelling, the cross-sections of all piping and fittings on both the vehicle and the filling station shall be optimized in order to make optimum use of the larger coupling specified in this part of ISO 14469.

5 Nozzles

5.1 Nozzles shall be in accordance with one of the two types listed below (see also Annex A).

a) Type 1 nozzle, for use with dispensing hoses that remain fully pressurized at dispenser shut-down: 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).

b) Type 2 nozzle, for use with dispensing hoses that remain fully pressurized at dispenser shut-down: 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 allow gas to flow until a positive connection has been achieved. The operator shall not be able to operate the three-way valve if the positive lock of the nozzle is not achieved. Venting is required prior to disconnection of the nozzle (see 10.2).

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

— class A, specifying high frequency use, with a cycle life of 100 000;

— class B, specifying low frequency use, with a cycle life of 20 000.

5.2 Venting or depressurization of all nozzle types is required prior to disconnection. It shall be possible to disconnect all nozzles 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 (e.g. conical threads).

5.4 The three-way valve exhaust 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.

5.5 The portions of a nozzle that are held by the user for connection or disconnection may be thermally insulated.

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).

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.

6 Standard receptacle dimensions

A receptacle shall comply with the design specifications detailed in Figure 1.

7 Receptacles

7.1 Receptacles shall comply with this part of ISO 14469 and shall be evaluated using at least two different test nozzles, each nozzle representing a different locking technology.

The failure of any test conducted with the receptacle and nozzle test samples shall constitute a failure of the submitted receptacle, unless the manufacturer can prove the problem was caused by the test nozzle.

7.2 Receptacle designs that employ means on the back diameter as specified in Figure 1 to accommodate mounting, or for mounting accessories or marking purposes, shall not have such means extend beyond the back diameter dimensions of the profile as specified in Figure 1, as applicable. Acceptable means include wrench flats, dust cap anchoring grooves, use of hex stock, undercutting for marking, and threads for pressure-tight caps. Receptacle designs shall not compromise the interchangeability requirements specified in Annex C.

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 method 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 conical threads.

7.5 The interfacing surface of the receptacle 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).

The exposed surfaces of devices shall be made of non-sparking materials (see 10.11.5).

7.6 Receptacles shall have a means to prevent the ingress of fluids and foreign matter.

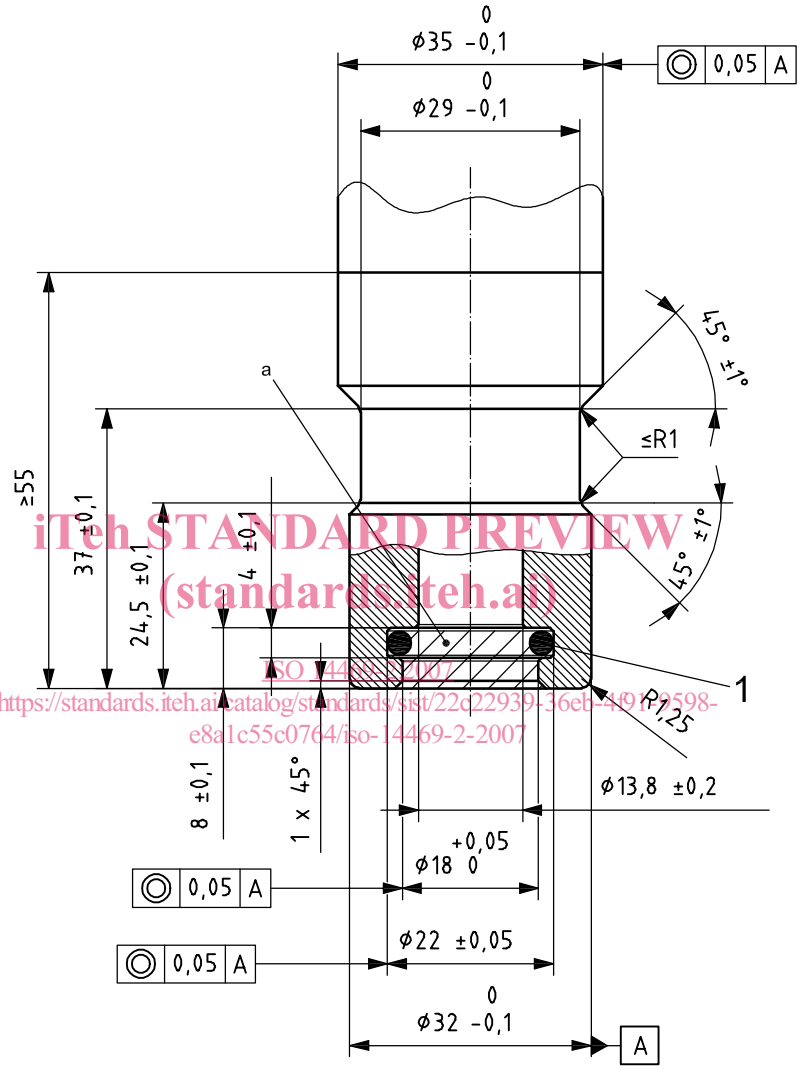
7.7 The function described in 7.6 may also be met by either a protective cap (see 10.4) or a pressure-tight protective cap (see 10.16).

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

7.9 The receptacle shall not be installed in an area in which the temperature exceeds 85 °C.

7.10 Receptacles shall have a cycle life of > 10 000.

Dimensions in millimetres



Key

1 sealing ID = ∅15,47 ± 0,1 width = ∅3,53 ± 0,2

a This area shall be kept free of all components

Surface roughness < Ra 3,2 µm.

Sealing surface finish: 0,8 µm to 0,05 µm.

Material hardness: 75 Rockwell B (HRB 75) minimum.

Figure 1 — C200 receptacle

8 Instructions

The information required by this clause for instructions and specified provisions shall be in a form that is easily understood.

Special tools required for the connection of receptacles to tubing and for the assembly and disassembly of three-way valve parts shall be clearly identified in the instructions.

Manufacturers of receptacles, nozzles and three-way valves shall provide clear and concise printed instructions and diagrams in a form that can be easily understood, and that is adequate for

a) proper field assembly,

b) installation,

c) maintenance,

d) replacement of components, as appropriate,

e) safe operation by all users,

f) suitability and use, and

g) storage and handling.

9 Marking

9.1 The information required by this clause for instructions and specified provisions shall be in a form that is easily understood. Marking should be embossed, cast, stamped or otherwise formed in the part. This includes markings baked into an enamelled surface.

9.2 Nozzles and receptacles shall bear the following information:

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

b) model designation;

c) C200;

d) applicable type and class (see 5.1).

9.3 Nozzles and receptacles shall each bear a date code marking.

The four-digit date code marking shall consist of at least four adjacent digits, determined as indicated below.

a) The first and second digits shall indicate the calendar year in which the nozzle, receptacle or three-way valve was manufactured (e.g. “96” for 1996 and “00” for 2000).

b) The third and fourth digits shall indicate the week in which the nozzle, receptacle or three-way valve was manufactured (e.g. “03” for the third week of the year). For the purpose of this marking, a week shall begin at 00:01 on Sunday and end at 24:00 on Saturday.

A date code may be used for more than one week; however, it shall not be used for more than four consecutive weeks, or for more than two weeks into the next calendar year.