DRAFT INTERNATIONAL STANDARD ISO/DIS 19078

ISO/TC **58**/SC **4** Secretariat: **ANSI**

Voting begins on: **2003-08-28**

Voting terminates on: **2004-01-28**

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Gas cylinders — Inspection of the cylinder installation, and requalification of high pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles

Bouteilles à gaz — Inspection de l'installation de bouteilles, et la requalification des bouteilles haute pression pour le stockage à bord des véhicules automobiles du gaz naturel utilisé comme combustible

ICS 23.020.30; 43.060.40

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/DIS 19078
https://standards.iteh.ai/catalog/standards/sist/55b182ba-106c-4721-aa5e-44d30bd0d8d9/iso-dis-19078

In accordance with the provisions of Council Resolution 15/1993 this document is circulated in the English language only.

Conformément aux dispositions de la Résolution du Conseil 15/1993, ce document est distribué en version anglaise seulement.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

© International Organization for Standardization, 2003

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/DIS 19078
https://standards.iteh.ai/catalog/standards/sist/55b182ba-106c-4721-aa5e-44d30bd0d8d9/iso-dis-19078

Copyright notice

This ISO document is a Draft International Standard and is copyright-protected by ISO. Except as permitted under the applicable laws of the user's country, neither this ISO draft nor any extract from it may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, photocopying, recording or otherwise, without prior written permission being secured.

Requests for permission to reproduce should be addressed to either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Reproduction may be subject to royalty payments or a licensing agreement.

Violators may be prosecuted.

© ISO 2003 – All rights reserved

Contents

Page

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/DIS 19078
https://standards.iteh.ai/catalog/standards/sist/55b182ba-106c-4721-aa5e-44d20b4048d9/iso-dis-19078

© ISO 2003 — All rights reserved

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 19078 was prepared by Technical Committee ISO/TC 58, *Gas cylinders*, Subcommittee SC 4, *Operational requirements for gas cylinders*.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/DIS 19078
https://standards.iteh.ai/catalog/standards/sist/55b182ba-106c-4721-aa5e-44d30bd0d8d9/iso-dis-19078

© ISO 2003 — All rights reserved

Introduction

This International Standard provides information and procedures for the periodic visual examination and inspection of natural gas fuel cylinders and the condition of the installation. These cylinders are installed in vehicles and are certified by the manufacturer to meet the requirements of ISO 11439. This International Standard may be used for the inspection of other natural gas fuel cylinders that are certified to meet other specifications and standards with the approval of the national authority of use. These cylinders are designed to store natural gas at high pressures. This International Standard requires that appropriate information, such as an installation and maintenance manual from the cylinder manufacturer, be reviewed and used during the inspection, together with all current cylinder manufacturer's recommendations and guidance documents.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/DIS 19078
https://standards.iteh.ai/catalog/standards/sist/55b182ba-106c-4721-aa5e-44d30bd0d8d9/iso-dis-19078

© ISO 2003 — All rights reserved

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/DIS 19078
https://standards.iteh.ai/catalog/standards/sist/55b182ba-106c-4721-aa5e-44d30bd0d8d9/iso-dis-19078

Gas cylinders — Inspection of the cylinder installation, and requalification of high pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles

1 Scope

This International Standard specifies the requirements for the inspection of the installation and requalification of high pressure cylinders designed and manufactured to ISO 11439 or other equivalent national standards for the on-board storage of natural gas as a fuel for automotive vehicles. The purpose of this document is to provide guidance for the inspection of these cylinders in accordance with manufacturer's recommendations and to provide criteria for the acceptance or rejection in the absence of guidance from the manufacturer with subsequent disposition as necessary.

2 Normative references

iTeh STANDARD PREVIEW

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.

(standards.iteh.ai)

ISO 11439:2000, *Gas cylinders — High pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles*

ISO/DIS 19078
https://standards.iteh.ai/catalog/standards/sist/55b182ba-106c-4721-aa5e-44d30bd0d8d9/iso-dis-19078

3 Terms and definitions

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

3.1
abrasion
damage to cylinder or equipment caused by wearing, grinding or rubbing away of material by friction

NOTE Abrasion may be the result of many cycles of something rubbing lightly on the surface of the cylinder or equipment or due to a few cycles, perhaps only one, of heavy rubbing.

3.2
impact
forceful blow to the surface of the cylinder that may cut, gouge or significantly indent the surface

NOTE Impact may also induce such damage as delaminations, which are not readily apparent by visual examination.

3.3
condemned
cylinder or piece of equipment no longer fit for service and for which rework is not allowed

3.4
crazing
hairline cracking of the resin giving it an opaque, "frosty" appearance

© ISO 2003 — All rights reserved

3.5
cut
damage caused by a sharp object coming into contact with a composite surface

3.6
delamination
form of composite damage in which a separation develops between layers of the composite

NOTE Delaminations usually result from excessive localized loading normal to the surface of the laminate.

3.7
destroyed
alteration of a fuel cylinder or piece of equipment to make it physically unusable

3.8
domes
curved end portions of the fuel cylinder

3.9
external coating
clear or coloured surface treatment applied to the cylinder for environmental protection and/or improved appearance

3.10
helical
winding in the longitudinal circumferential direction for both the cylindrical and dome regions of the cylinder

iTeh STANDARD PREVIEW
(standards.iteh.ai)

NOTE The strands of reinforcing fibres are oriented at an angle to the longitudinal axis of the cylinder.

3.11
hoop direction
hoop pattern
winding in the cylindrical region of the cylinder

ISO/DIS 19078
https://standards.iteh.ai/catalog/standards/sist/55b182ba-106c-4721-aa5e-44d30bd0d8d9/iso-dis-19078

NOTE The strands of reinforcing fibres are oriented at an angle of nearly 90 degrees to the longitudinal axis of the cylinder.

3.12
inspection body
individual or organization that performs the visual inspection of compressed natural gas (CNG) cylinders used in natural gas vehicles (NGVs)

3.13
inspection mark
mark, label or tag placed by an inspector on the cylinder indicating acceptance of the cylinder

3.14
Level 1 damage
Level 1 condition
minor damage that may occur during normal use

NOTE Such damage should have no adverse effects on the safety of the cylinder and its continued use. Scratched paint or nicks that have no appreciable depth in metal or similar damage in the composite, cylinder paint or resin where there are no visible frayed fibres are considered to be in this level of damage (see Table 1).

3.15
Level 2 damage
Level 2 condition
damage that is more severe than Level 1 but keeps open the possibilities of rework or the container returned to service based on the recommendations of the manufacturer

© ISO 2003 — All rights reserved

NOTE Level 2 conditions may be deeper, longer or more severe than those of Level 1, but are allowed by the manufacturer by test results (see 7.4.5). Level 2 conditions are either reworked to the manufacturer's acceptable condition or evaluated to be Level 3 and condemned (see Table 1).

3.16
Level 3 damage
Level 3 condition
damage that requires a cylinder to be condemned

NOTE A Level 3 condition is such that the cylinder must be rendered unfit for continued service and cannot be reworked (see Table 1).

3.17
liner
internal component of the cylinder that prevents leakage of gas through the composite cylinder structure

3.18
manufacturer
cylinder manufacturer, unless otherwise stated

3.19
marking(s)
cylinder marking(s) containing the information required by the appropriate standard or regulation

3.20
mounting brackets and/or straps
devices used to secure fuel cylinders in a vehicle

iTeh STANDARD PREVIEW
(standards.iteh.ai)

3.21
overpressurization
pressures exceeding those allowed during the filling procedures specified in ISO 11439

ISO/DIS 19078
https://standards.iteh.ai/catalog/standards/sist/55b182ba-106c-4721-aa5e-44d30bd0d8d9/iso-dis-19078

3.22
pressure relief device
PRD
device that will release the contained gas in specific emergency conditions

NOTE The PRD may be activated by excessive temperature, excessive internal pressure, or both.

3.23
regulatory authority
national entity or entities that have jurisdiction to specify requirements for the cylinders and equipment addressed in this International Standard

3.24
reinforcing fibres
continuous fibrous strands such as carbon, aramid and glass in the composite that withstand loads caused by pressurization

3.25
rejected cylinder
cylinder or equipment that shall be removed from service (i.e. de-installed from the vehicle)

NOTE For Level 2 damage, the cylinder is evaluated further before reworking or condemning. For Level 3 damage, the cylinder or equipment is subsequently condemned.

3.26
resin
material that is used to bind and hold the fibres in place

© ISO 2003 — All rights reserved

NOTE It is usually a thermoplastic or thermosetting resin.

3.27
working pressure
settled pressure at a uniform temperature of 15 °C marked on the cylinder

3.28
stress corrosion cracking
SCC
phenomenon resulting in a split or rift in the materials caused by a combination of load and aggressive environment

NOTE Such cracks in composite materials are typically sharply defined and perpendicular to the fibre direction. They may appear as a family of cracks or as a single crack.

3.29
valve
device installed in one of the threaded openings of the cylinder that is used to regulate gas flow into or from the cylinder

NOTE A manual valve is turned on or off with a handle. A solenoid valve is turned on or off electronically. Some solenoid valves may be operated manually with special tools.

3.30
vent line
high pressure line used to conduct gas from a pressure relief device to a location outside the vehicle where gas may be discharged safely

iTeh STANDARD PREVIEW
(standards.iteh.ai)

4 Background information

ISO/DIS 19078
https://standards.iteh.ai/catalog/standards/sist/55b182ba-106c-4721-aa5e-44d30bd0d8d9/iso-dis-19078

4.1 General

NGV fuel cylinders may be designed and qualified to one of a number of appropriate specifications or standards. This includes, but is not limited to, ISO 11439. These cylinders have markings that identify the standards to which they are built and identify the type of construction used.

4.2 Cylinder types and descriptions

4.2.1 CNG-1 metal

CNG-1 cylinders are all metallic and can be of any alloy of steel or aluminium that meets qualification requirements outlined in the appropriate design standard.

4.2.2 CNG-2 metal liner partially reinforced with resin impregnated continuous filament (hoop-wrapped)

CNG-2 cylinders have a metallic liner with sufficient strength and thickness to carry the entire longitudinal load at the required burst pressure and to withstand the standard-specified factor of the nominal working pressure without rupture. Metal liner materials are those identified under CNG-1 cylinders (see 4.2.1). They are reinforced with fibres wound only in the hoop (circumferential) direction. Reinforcing fibres are carbon, aramid, glass or combinations thereof.

4.2.3 CNG-3 metal liner totally reinforced with resin impregnated continuous filament (fully wrapped)

CNG-3 cylinders have a metallic liner that is generally load-carrying but they do not have sufficient strength and thickness to carry the longitudinal load at the burst pressure. They are reinforced with fibres wound in both a helical (polar) and hoop pattern. Reinforcing fibres are carbon, aramid, glass or combinations thereof. Metal liner materials are those identified under CNG-1 cylinders (see 4.2.1).

© ISO 2003 — All rights reserved

4.2.4 CNG-4 non-metallic liner totally reinforced with resin impregnated continuous filament (all composite)

CNG-4 cylinders have a non-metallic liner that does not carry load. The liner is typically a thermoplastic material. Reinforcing fibres are carbon, aramid, glass or combinations thereof. They are reinforced with fibres wound in both a helical (polar) pattern and hoop direction. Metallic bosses are used to accept valves or PRDs. Boss materials are typically aluminium or stainless steel.

4.3 Required marking information

The appropriate standard shall be reviewed for exact wording required and the requirements for letter sizes.

The following marking information required in ISO 11439 shall be verified:

a) "CNG ONLY";

b) "DO NOT USE AFTER XX/XXXX", (providing the month and year of expiry);

c) manufacturer's identification;

d) cylinder identification (a serial number unique for every cylinder);

e) working pressure at temperature;

f) ISO standard, along with cylinder type and certification registration number (if applicable);

iTeh STANDARD PREVIEW
(standards.iteh.ai)

g) approved PRD type;

h) date of manufacture (month and year);

ISO/DIS 19078
https://standards.iteh.ai/catalog/standards/sist/55b182bb-106a-4721-ae2e-44d30bd0d8d9/iso-dis-19078

i) any additional markings as required by the regulatory authority of the country(ies) of use.

When labels are used, all cylinders shall have a unique identification number and the manufacturer's name stamped on an exposed metal surface to permit tracing in the event that the label is destroyed.

4.4 Additional marking

The following additional information may be included:

a) specific PRDs and valves approved for use with the cylinder;

b) operating temperature range;

c) nominal water capacity;

d) initial pressure test date;

e) inspector's mark.

5 Inspection body and inspectors

The inspection body shall be certified in the country of use. See Annex A for an example of minimum inspector qualifications.

In order to assure all concerned that the cylinders are fit for continued safe use, the inspection shall be carried out only by persons who are competent in the subject (see Annex A). The inspector shall have the equipment described in Clause 6 and documentation referenced in 7.3.2 available and within easy access during the

© ISO 2003 — All rights reserved

inspection. The vehicle to be inspected shall be positioned such that access to the surface of the cylinder is unimpeded to the inspector or positioned according to the vehicle manufacturer (see 7.4.2). If the inspector finds areas as described in Clause 7 that require additional inspection or testing, the cylinder shall be depressurized following recommendations in Annex B and the manufacturer's instructions, then removed from the vehicle. If the inspector determines that the cylinder necessitates permanent removal from service, it shall be carried out in accordance with Clause 9.

6 Inspection equipment

6.1 Adequate light, capable of brightly illuminating all surfaces shall be used, to properly examine the external surfaces of cylinders, mounting brackets, valves, vent lines, etc.

CAUTION — To avoid combustion or fire, use explosion-proof lights or be sure the area is well ventilated.

6.2 Inspection mirrors, angled, or other suitable devices to aid in the examination of cylinder surfaces that are partially concealed by the installation.

6.3 Hand tools, various, necessary for the removal of covers, shields or other installed equipment so that the external cylinder surfaces, brackets, valves, PRDs and other components can be viewed.

6.4 Torque wrench, to verify that the mounting bracket bolts are tightened properly.

6.5 Depth gauge, to determine the depth of cuts, pits and abrasions. It is recommended that a commercial type pit or depth gauge be used for this purpose. Alternatively, equipment to estimate imperfection depths is acceptable.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

6.6 Rule and straightedge, in combination, for evaluating indentations and bulges.

6.7 Rule or tape measure, for determining the length of noted cuts and the general area of abrasion.

ISO/DIS 19078
https://standards.iteh.ai/catalog/standards/sist/...
Downloaded from iTeh STANDARDS.iteh.ai

6.8 Commercial-type leak test fluid (NOT containing ammonia, harsh corrosives or chemicals incompatible with the system materials) or a **methane gas detector,** to test for leakage. The fluid is usually a mild soap solution that meets the above criteria. Additional information is provided in 7.4.8.

7 Cylinder and equipment inspection

7.1 Inspection interval

CAUTION — Failure to perform diligent and accurate inspections on a regular basis or promptly (in the case of a potentially damaging incident or unusual behaviour) may result in a serious accident causing severe damage or injury or both.

NGV fuel storage systems shall be visually inspected by a qualified inspection body (see Clause 5) at intervals of 36 months or less (see Annex C). The country of use may require more frequent visual inspections.

7.2 Conditions requiring immediate inspection

An inspection shall be performed prior to filling or returning a CNG cylinder to service if:

a) the fuel cylinder or vehicle in which it is installed is involved in a fire;

b) the fuel cylinder is exposed to excessive heat;

c) the fuel cylinder is dropped or subjected to impact;

d) the NGV is in a collision;

© ISO 2003 — All rights reserved