International Standard

ISO 19882

Gaseous hydrogen — Thermally activated pressure relief devices for compressed hydrogen vehicle fuel containers

Hydrogène gazeux — Dispositifs limiteurs de pression thermiquement activés pour les conteneurs de carburant de véhicules à hydrogène comprimé

Second edition
2025-02

Reference number
ISO 19882:2025(en)

© ISO 2025



COPYRIGHT PROTECTED DOCUMENT

© ISO 2025
All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword ..... **vi**
Introduction ..... **vii**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **2**
4 Service conditions **3**
4.1 General 3
4.2 Design service life 3
4.3 Nominal working pressure 4
4.4 Durability test cycles 4
4.5 Temperature range 4
5 Quality assurance **4**
6 General requirements **4**
6.1 Material requirements 4
6.1.1 General 4
6.1.2 Metallic materials 4
6.1.3 Non-metallic materials 5
6.2 Design requirements 5
6.3 Flow capacity 5
6.4 Failure modes and effects analysis (FMEA) 6
7 Design qualification testing **6**
7.1 Test requirements 6
7.1.1 General 6
7.1.2 Test gases 8
7.2 Pressure cycling 8
7.2.1 Sampling 8
7.2.2 Procedure 8
7.2.3 Acceptable results 9
7.3 Accelerated life 9
7.3.1 Sampling 9
7.3.2 Procedure 9
7.3.3 Acceptable results 9
7.4 Thermal cycling 10
7.4.1 Sampling 10
7.4.2 Procedure 10
7.4.3 Acceptable results 10
7.5 Accelerated cyclic corrosion 10
7.5.1 Sampling 10
7.5.2 Procedure 10
7.5.3 Acceptable results 12
7.6 Automotive fluids exposure 12
7.6.1 Sampling 12
7.6.2 Procedure 12
7.6.3 Acceptable results 12
7.7 Atmospheric exposure 13
7.7.1 General 13
7.7.2 Oxygen aging 13
7.7.3 Ozone 13
7.8 Stress corrosion cracking resistance 13
7.8.1 Sampling 13
7.8.2 Procedure 13
7.8.3 Acceptable results 14

© ISO 2025 – All rights reserved

7.9 Impact due to drop and vibration 14
7.9.1 Impact due to drop 14
7.9.2 Vibration 14
7.10 Leakage 15
7.10.1 Sampling 15
7.10.2 Procedure 15
7.10.3 Acceptable results 15
7.11 Bench top activation 15
7.11.1 Direct-acting TPRD 15
7.11.2 Pilot-activated PRDs 16
7.12 Flow capacity 17
7.12.1 Sampling 17
7.12.2 Procedure 17
7.12.3 Acceptable results 17
7.13 High pressure activation and flow 18
7.13.1 Sampling 18
7.13.2 Procedure 18
7.13.3 Acceptable results 18
7.14 Excess torque resistance 18
7.14.1 Sampling 18
7.14.2 Procedure 18
7.14.3 Acceptable results 18
7.15 Hydrostatic strength 19
7.15.1 Sampling 19
7.15.2 Procedure 19
7.15.3 Acceptable results 19
7.16 Water jet protection 19
7.16.1 Sampling 19
7.16.2 Procedure 19
7.16.3 Acceptable results 20

8 Inspection and acceptance testing 20
8.1 Inspection and acceptance testing plan 20
8.2 Inspector's responsibilities 20
8.3 Inspection of system critical components 20
8.4 Leak testing 20

9 Production batch testing 20
9.1 General 20
9.2 Production batch sizes 21
9.2.1 General 21
9.2.2 Fusible materials 21
9.2.3 Pressure relief devices 21
9.3 Pressure relief device components 21
9.4 Pressure cycle verification 21
9.4.1 General 21
9.4.2 Procedure 21
9.4.3 Acceptable results 21
9.5 Bench top activation 21
9.5.1 General 21
9.5.2 Procedure 21
9.5.3 Acceptable results 22

10 Marking 22
10.1 Required information 22
10.2 Marking methods 22

11 Component literature 22
11.1 General 22
11.2 Component literature recommendations for pilot-activated PRD valves 23

© ISO 2025 – All rights reserved

Annex A (informative) **Subsystem and vehicle level considerations** **24**
Annex B (informative) **Design qualification test rationale** **28**
Bibliography **31**

© ISO 2025 – 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.

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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 197, *Hydrogen technologies*.

This second edition cancels and replaces the first edition (ISO 19882:2018), which has been technically revised.

The main changes are as follows:

— addition of pilot TPRDs and PRD valve coverage;

— updates to design qualification test procedures;

— additional test requirements for excess torque resistance, hydrostatic strength and waterjet protection.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

© ISO 2025 – All rights reserved

Introduction

The purpose of this document is to promote the implementation of hydrogen powered land vehicles through the creation of performance-based testing requirements for thermally activated pressure relief devices for compressed hydrogen fuel containers. The successful commercialization of hydrogen land vehicle technologies requires standards pertaining vehicle fuel system components and the global homologation of standards requirements for technologies with the same end use. This will allow manufacturers to achieve economies of scale in production through the ability to manufacture one product for global use.

Documents which apply to hydrogen fuel vehicles and hydrogen fuel subsystems include IEC 62282- 4-101, SAE J2578, SAE J2579, UN ECE R134, or UN GTR No. 13.

Annex A presents an informative record of recommended fuel container, fuel storage subsystem and vehicle level requirements. The statements in Annex A are intended as recommendations for consideration of inclusion by the organizations and committees developing standards on these sub-system and vehicle level standards.

Annex B presents a rationale for the design qualification tests in this document.

This document is based on the CSA Standard CSA/ANSI HPRD 1:21.

© ISO 2025 – All rights reserved

Gaseous hydrogen — Thermally activated pressure relief devices for compressed hydrogen vehicle fuel containers

1 Scope

This document specifies minimum requirements for pressure relief devices intended for use on hydrogen fuelled vehicle fuel containers that comply with ISO 19881, IEC 62282-4-101, CSA/ANSI HGV 2, EC79/EU406, SAE J2579, UN ECE R134, or the UN GTR No. 13.

The applicability of this document is limited to thermally activated pressure relief devices installed on fuel containers containing gaseous hydrogen according to ISO 14687 for fuel cell and internal combustion land vehicles. This document specifies requirements for thermally activated pressure relief devices acceptable for use on-board the following types of land vehicles:

— light-duty vehicles;

— heavy-duty vehicles;

— industrial powered trucks, such as forklifts and other material handling vehicles.

Requirements for other types of land vehicles such as rail, off-road, etc., can be derived with due consideration of appropriate service conditions.

This document does not apply to reseating, resealing, or pressure-activated devices.

Pressure relief devices can be of any design or manufacturing method that meets the requirements of this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1431-1, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 1: Static and dynamic strain testing*

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

ISO 6270-2, *Paints and varnishes — Determination of resistance to humidity — Part 2: Condensation (in-cabinet exposure with heated water reservoir)*

ISO 14687, *Hydrogen fuel quality — Product specification*

ISO 19881, *Gaseous hydrogen — Land vehicle fuel containers*

ASTM D572, *Standard Test Method for Rubber — Deterioration by Heat and Oxygen*

ASTM D1149, *Standard Test Methods for Rubber Deterioration — Cracking in an Ozone Controlled Environment*

ASTM D1193, *Standard Specification for Reagent Water*

CSA/ANSI HGV 2, *Compressed hydrogen gas vehicle fuel containers*

UN GTR No. 13, *UN Global Technical Regulation on Hydrogen and Fuel Cell Vehicles*

© ISO 2025 – All rights reserved

SAE J2579, *Standard for Fuel Systems in Fuel Cell and Other Hydrogen Vehicles*

SAE J2719, *Hydrogen Fuel Quality for Fuel Cell Vehicles*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
flow capacity
<pressure relief device> capacity in volume per unit time at specified conditions

3.2
fusible material
metal, alloy, or other material capable of being melted by heat where the melting is integral to the function of the *pressure relief device* (3.7)

3.3
manufacturer's specified activation temperature
temperature, as specified by the pressure relief device manufacturer, at which the *pressure relief device* (3.7) is designed to release pressure

3.4
manufacturer's specified nominal working pressure
highest settled pressure at a uniform gas temperature of 15 °C of the container or container assembly with which the *pressure relief device* (3.7) may be used, as specified by the pressure relief device manufacturer

3.5
normal cubic centimetre
Ncm^3
dry gas that occupies a volume of 1 cm^3 at a temperature of 293,15 K (20 °C) and an absolute pressure of 101,325 kPa

3.6
pilot-activating device
valve or device designed to be used as a trigger for pilot-activated *pressure relief device* (3.7) valves, other than pilot TPRDs

3.7
pressure relief device
PRD
device that, when activated under specified performance conditions, is used to vent the container contents

Note 1 to entry: Reseating and resealing devices are not addressed by this document.

3.8
thermally activated pressure relief device
TPRD
pressure relief device (3.7) activated by temperature

3.8.1
direct-acting TPRD
TPRD (3.8) having a heat-reactive element that acts directly with the gas control portion of the *PRD* (3.7)

© ISO 2025 – All rights reserved