



ISO/TC 197
Hydrogen technologies

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ISO DIS 19882 Collated Comments with WG Resolutions

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Background: Here are the collated comments from the DIS 19882 ballot,
complete with the WG resolutions.

See the document N 991 for the DIS 19882 Form 13 ballot results.

Committee URL: <https://isotc.iso.org/livelink/livelink/open/tc197>

Template for comments and secretariat observations

Date:2017-09-22

Document: DIS 19882

Project: WG 18

MB/ NC ¹	Line number	Clause/ Subclause	Paragraph/ Figure/Table	Type of comment ²	Comments	Proposed change	Observations of the secretariat
US 01 001				GE	It is sometimes difficult to distinguish where a note ends, or if the next paragraph is part of the note.	Put notes in a different font, size, indent, or other means to more clearly identify where they end.	Accept comment. ISO CS has corrected.
DE 002		01.01		Ge	In the introduction only ISO 14687 is mentioned. Is a reference of SAE J2719 necessary?	Please clarify	See US 03 below.
US 02 003		01.01	1		"on hydrogen fuelled vehicles". These components are not for stationary storage use. Are they suitable for material handling equipment	This International Standard establishes minimum requirements for pressure relief devices intended for use on hydrogen fuelled vehicles fuel containers that comply with ISO 19881, IEC 62282-4-101, ANSI HGV 2, CSA B51 Part 2, EC79/EU406, SAE J2579, or the UN GTR No. 13 for fuel cell vehicles.	Accept comment. Replace International Standard with "document."
US 03 004		01.01	2		Why link a component to a single grade of fuel? 14687-1,-2 & -3 are being merged. The current CD calls the -2 gaseous grade Type I Grade D (gaseous fuel for PEM road vehicles).	Pressure relief devices designed to comply with this International Standard are intended to be used with high quality hydrogen fuel such as fuel complying with SAE J2719 or ISO 14687-2-Type I Grade D.	Accept comment. <i>Add notation that 14687 is Under Development. *replace "complying with" with "in accordance to"</i>
US 04 005		01.02	1		Why isn't UN GTR 13 mentioned?	Add the reference to the UN GTR 13 if allowed as normative reference; otherwise, add to Bibliography.	Accept. Referenced in Section 1.
US 05 006		01.02	Note 3		"yard/pound" quantities – are strange units.	Use "In-pound units" or "customary units"	Accept comments. ISO CS has corrected. Paragraph deleted.
US 06 007		02		Te	Standards are continually being updated, so that specification of year of release results in not keeping up with technical changes in other standards.	Remove year of publication for at least ISO and IEC standards unless there is a specific need. If a specific requirement is needed, consider placing the requirement directly into ISO 19882.	Accept comment. ISO editorial has corrected. If specific clause is identified, the year of publication for reference is required.
US 07 008		03.01			A Webster definition	Consider deletion.	Reject comment. Deletion not necessary.
US 08 009		03.02			A Webster definition	Consider deletion.	Reject comment. Deletion not necessary.

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US 09 010		04.03			PRD MFG don't care about a bunch of system terms. They need rated pressure (> MAWT) and temperature set point. The rest adds confusion.	Rework as pressure class using terminology of GTR 13. See modified text and proposed new Table 1: 4.2 Pressure classes Each type of PRD hose assemblies shall be designated according to five pressure classes, depending on the pressure used for dispensing hydrogen distinguished by each category of pressure defined in Clause 3 as shown in Table 1.  TC 197 U.S. Proposed New Table	Reject comment. Terminology is consistent for on-board vehicle fuel systems.
US 10 011		04.04	Note		Where is MDP defined?	Delete the word "developed".	Accept comment.
DE 012		06.01		Ge	In ANSI HPRD 1-2013 a paragraph regarding documentation of the material suitability is given? Was this paragraph deliberately omitted? What is the reason?	Please clarify	Accept in principle. Reconcile 19881 similar clause (6.2) with 19882 clause (6.1).
US 11 013		06.01	pp after note 2		What does this mean? Just because a material is in contact with H2 does make it compatible. H2 release due to high permeability, and explosive decompression due to pressure cycling may be of concern. Mismatches in coefficients of thermal expansion over the -40 to 85 C range may be an issue.	Non-metallic materials normally in contact with hydrogen shall be approved or verified determined to be acceptable in hydrogen service. Consideration shall be given to the fact that hydrogen diffuses through these materials much easier than through metals, therefore the suitability of materials shall be verified.	Accept comment. Use only verified – not approved – to replace determined.
US 12 014		06.02	note		Anything that adversely impacts the robustness of the design is an issue	The pressure relief device shall should be designed to address prevent degradation of function from creep or plastic deformation. The design or manufacturing process should account for the effects that material defects, particularly casting and shrinkage voids, may have in decreasing the	Accept comment.

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						resistance to the failure modes that adversely impact the robustness of the design.	
US 13 015		06.03			clarity	The flow capacity shall be indicated in the manufacturers published literature and verified by the flow capacity test under 7.13. The flow capacity shall be determined by the flow capacity test under Clause 7.13 and published by the manufacturer	Accept comment.
US 14 016		06.04			How do you retest a fusible link?	New pressure relief devices that are found to be non-compliant with this International Standard may be reworked or repaired as long as they comply with all requirements, and are retested, as required, to confirm that they satisfy the requirements of this International Standard.	Accept comment. Replace International Standard with "document"
DE 017		07.01		Ed	No line break between number and unit	Please correct	Editorial. Corrected
NZ 018		07.01		te	The tolerance for pressures of 2 MPa or less of +0/-1 MPa seems high. i.e. a 50% reduction is permissible.	As there are relatively few pressures stated in the text delete the words: <i>"Unless stated otherwise, the tests specified herein shall be conducted with the following tolerances on specified pressures: Pressures 2 MPa or less: +0 / -1 MPa Pressures 125% NWP or greater: +2 MPa / -0 MPa"</i> Specify tolerances for all individual pressures in the text.	Reject comment. Mandated to follow UN GTR 13.
CA 019		07.01	9	te	Hydrogen used for testing shall comply with SAE J2719 or ISO 14687-2 In many tests in the document it does not specify what medium should be used for the tests.	Unless otherwise specified all tests in this document shall be performed with hydrogen that shall comply with SAE J2719 or ISO 14687-2	Reject comment. See US 16.
US 16 020		07.01	Last line		See comments on clause 1.1 pp 2	Hydrogen used for testing shall comply with SAE J2719 or ISO 14687-2 be high quality hydrogen fuel such as fuel complying with SAE J2719 or ISO 14687-2-Type I Grade D.	Accept comment. Add notation that 14687 is Under Development. *replace "complying with" with "in accordance to"

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US 15 021		07.01	new		Need a temperature test tolerance	Unless stated otherwise, the tests specified herein shall be conducted with the following tolerances on specified <u>temperatures ± 5 °C.</u>	Accept comment.
DE 022		07.02.2	Table 2	Te	Please provide rationale for the 2750 pressure cycles at a sample temperature not more than -40°C. Pressure cycling conditions should be harmonized with ANSI HPRD 1-2013 in order to prevent additional testing	Please harmonize standards	Reject comment. Mandated to follow UN GTR 13. Suggest to CSA to harmonize HPRD 1 with ISO 19882.
CA 023		07.03		te	Include a provision for long trigger devices.	The longest and shortest for each design type for long trigger devices shall be tested.	Accept in principle. Modify to: Pressure relief devices employing a glass bulb (thermobulb) <u>or shape memory alloys (or other materials that do not exhibit creep rupture phenomena)</u> for activation are exempted from this Clause.
GB			7.1 and Table 1	Tech	There is a need to include a test to ensure designs of Thermally Activated Pressure Relief Devices do not fail in service due to creep of the eutectic alloy which is commonly used to trigger pressure release. This is a common problem with such devices used on gas cylinders.	Add a new test into section 7 and Table 1 detailing a specific test to reveal a propensity to fail due to creep.	Accept comment. This test is identified in the Accelerated Life Test (7.3). No modification to Table 1.
US 17 024		07.03.1		Ed	Making the requirements into a bulleted list would improve understanding	a) Five finished pressure... b) Three pressure relief...	Accept comment.
CA 025		07.03.1	1 & 2	te	Clarify if the same components are to be used for the 500 hour test and then for the 10 hour test or should new samples be used.	Clarify and consider splitting the test into two distinct parts.	Accept comment. Three additional finished pressure relief devices shall ... (in 2 nd paragraph)
US 18 026		07.03.2		Te	The equation in this section is technically incorrect. While it may give reasonable answers, the units don't balance, indicating short-cuts were taken. That is, the units on the left side are °C to the first	Put a technically correct equation into this section. Note that the equation in the original CSA PRD1 was correct and appropriate for determining the 10-hour test temperature (noting that PRD1 used 1	Reject comment. Equation is based on UN GTR 13, which is based on CSA HPRD 1.

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					power, and the units on the right side are °C to the 0.503 power. This is something like saying the volume of a region is equal to the length to the 1.2 power.	<p>year at 82°C, vs. this document using 3 years at 85°C) (also note that this equation works regardless of using C, K, F, or R):</p> <p>7.5.3 Long-Term Test Temperature. It is assumed that time-to-activation of fusible alloys is a rate process governed by the power law relationship of the form:</p> $t = A T^B \quad (7.5.3-1)$ <p>where</p> <ul style="list-style-type: none"> T is temperature t is the time to activation A and B are constants which depend upon fusible alloy and pressure relief device design <p>The calculated time-to-activation for pressure relief devices must be greater than 1 year at +82°C (+180°F) and at least 20 years at +57°C (+135°F). Device assemblies must exceed 500 hours at their long-term test temperature. Mathematical manipulation results in the following requirement for long-term test temperature:</p> $T_L = T (0.057)^{(0.34(\log(T/T_f))} \quad (7.5.3-2)$ <p>where</p> <ul style="list-style-type: none"> T_L is the long-term test temperature, °C (°F) T_f is the fusible material melt temperature, °C (°F) T is +82°C (+180°F) log is base 10 	
CA 027		07.03.2	1	ed	Pressure cycling shall be performed – Wrong test is being referenced.	“Accelerated life test shall be performed...	Accept comment.
CA 028		07.03.2	2	ed	..., each pressure connection should include a check valve to prevent pressure depletion of the system when one specimen fails.	...”, each pressure connection should include a check valve to prevent pressure depletion of the system should one specimen fails.”	Reject comment. Delete sentence because if one sample fails, the test fails.

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							If a manifold system is utilized, each pressure connection should include a check valve to prevent pressure depletion of the system when one specimen fails.
US 19 029		07.03.3		Ed	It would be clearer if the criteria were bulleted, and clarified that it is “the” 5 and 3, rather than “any” 5 and 3.	a) The five pressure relief devices ... b) The three pressure relief devices...	Accept comment.
CA 030		07.03.3	1	te	Clarify if a leakage rate is allowed. If so, the leak rate shall not exceed 10 Ncc/hour	Five pressure relief devices tested at their accelerated life test temperature shall not activate in less than 500 hours. The TPRDs shall not have a leakage rate that exceeds 10 Ncc/hour.	Accept. Modify to Five pressure relief devices tested at their accelerated life test temperature shall not activate in less than 500 hours, <u>and shall meet the requirements of 7.10.</u>
US 20 031		07.03.3	2		Average car fire is 20 min to 1 hr. At 10 hrs, no point in having a TPRD. A note is needed here to explain the 10-hour value.	NOTE—The 10-hour time is to confirm conformance for the basis for the equation in 7.3.2 [equations should be numbered for cross referencing].	Accept comment. <i>Follow ISO rules on numbering</i>
DE 032		07.05.3		Te	“The tested samples shall then be subjected to Clause 7.10, 7.11 and 7.12.” Necessity to perform Flow Capacity Test (7.12) on test sample is not comprehensible.	Delete 7.12: “The tested samples shall then be subjected to Clause 7.10 and 7.11.”	Reject comment. Need to stay consistent with UN GTR 13.
US 21 033		07.06.2		Te	The fluids chosen originally were not intended to be “specific”, rather they are representative of “worst case” selections, with reasonable likelihood of exposure, from different chemical classes. It is possible for PRDs to be exposed to the chemical classes represented by sodium hydroxide and ammonium nitrate. Specifically, car wash and bus wash cleaning solutions have a pH that is basic, and would be represented by the sodium hydroxide.	Add exposure to sodium hydroxide and ammonium nitrate. Adjust coverage in B.1.5 accordingly	Reject comment. Need to stay consistent with UN GTR 13. <i>CSA may have to consider following suit.</i>

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US 22 034		07.08			Testing is only copper based alloys in contact with ammonia (season cracking). Where is the test for stainless steel in contact with halides (halide attack)?	Add testing with halides to address halide attack of stainless steel.	Agree in principle, however no test has been suggested. Possible revision for next edition.
CA 035		07.09.1.2		te	There is a need to clarify how the TPRDs are to be dropped. In their pre-assembled mode or after the assembly. If the TPRD is made up of many different components, should all the parts be dropped & should they be assembled or not.	Clarify how the TPRDs are to be dropped.	Reject comment. Drop test procedure is clear and consistent with UN GR 13.
US 23 036		07.09.1.3		Te	The criteria for acceptance are a bit subjective. Rather than making a visual assessment, why not subject the PRD to burst, cycle, and/or benchtop activation?	Change criteria to cycle XXX times, followed by benchtop activation test.	Reject comment. Purpose of test is to see visible damage. Modify last sentence: In this case, the samples have failed <u>met the requirements of</u> the test.
DE 037		07.09.2.2		Te	Please provide rationale for the 40 Hz test frequency. ANSI HPRD 1-2013 requires a test frequency of 500 Hz. Frequency should be harmonized in order to prevent additional testing	Please harmonize standards	Agree in principle, however mandated to follow UN GTR 13. Suggest to CSA to revise HPRD 1.
CA 038		07.10.02	4	te	The text reads that the component is conditioned to -40C. It does not mention for how long.	The component shall be conditioned to -40C or lower until thermal stability is attained.	Accept comment.
CA 039		07.10.02	4	te	The text says that it pressurized at both 100 percent and 5 percent of NWP. This leaves it up to the testing agency of which one they test first.	It should read “.. and pressurized at 100 percent and then at 5 percent of NWP”	Accept comment.
CA 040		07.10.02	5	te	The text says that it pressurized at both 5 percent and 150 percent of NWP. This leaves it up to the testing agency of which one they test first.	It should read “.. and pressurized at 5 percent and then at 150 percent of NWP”	Accept comment with modification of high value first, then low value.

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CA 041		07.10.02	5	te	Conditioning at room temperature does not mention for how long.	Specify "until thermal stability is attained".	Accept comment
CA 042		07.10.02	6	te	The text says that it pressurized at both 5 percent and 150 percent of NWP. This leaves it up to the testing agency of which one they test first.	It should read ".. and pressurized at 5 percent and then at 150 percent of NWP"	Accept comment with modification of high value first, then low value.
CA 043		07.10.02	6	te	Conditioning at 85C or higher does not mention for how.	Specify "until thermal stability is attained".	Accept comment.
US 24 044		07.11		ge	What is the criteria or how is the result recorded for this test?	WG is asked to consider adding the range of activation times to 7.11.3.	Agree in principle, however criteria is provided in 1 st paragraph.
DE 045		07.11.02		Te	The specified air surrounding temperature is different compared to ANSI HPRD 1-2013 chapter 7.11.2: ISO 19882:2017: 600°C ± 10°C ANSI HPRD 1-2013: 593°C ± 11°C This results in a temperature corridor of only 14°C (590°C...604°C) to achieve the requirements of ISO and HPRD 1. To avoid unnecessary testing the temperature ranges of both standards should be harmonized with a tolerance of at least ±10°C	Please harmonize standards	Agree in principle, however mandate is to harmonize with UN GTR 13. Suggest to CSA to revise HPRD 1 to align with ISO 19882.
CA 046		07.12.02	4	te	Add flow rate shall be recorded	The inlet temperature, pressure and flow rate shall be recorded.	Accept comment.
DE 047		07.13.02		Te	Same comment as for clause 7.11.2	Please harmonize standards	Agree in principle, however mandate is to harmonize temperature with UN GTR 13. Suggest to CSA to

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							revise HPRD 1 to align with ISO 19882.
DE 048		08.04		Te	According to our knowledge the leak test at higher pressure is more critical. Therefore the leakage should be tested at a minimum of 125 percent of manufacturer's specified NWP and not at both 5 percent and 125 percent. Limit the test effort to the necessary.	Please delete one pressure level and keep the more critical pressure level	Reject comment. Design of the materials of the seals must be confirmed at low pressure. It is not automatically assumed high pressure is the most difficult.
US 25 049		09.04.2			Clarify wording of the requirement.	The pressure relief device shall be immersed in a liquid bath that is maintained at a temperature from 0°C to 5.6°C 5.6°C - 0°C lower than the manufacturer's specified activation temperature. The pressure relief device shall be pressurized to 1.38 MPa. The temperature and pressure shall be maintained for at least 24 hours. The pressure relief device shall not activate within this time.	Accept in principle, however change 5.6 C to 5 C.
NZ 050		09.04.2		te	A tolerance for the quoted pressure of 1.38 MPa should be specified to avoid application of 7.1 that has default tolerance for pressures of 2 MPa or less of +0/-1 MPa. If no tolerance is specified a test pressure of 0.38 MPa will be acceptable.	The pressure relief device shall be pressurized to 1.38 MPa +/- ??.	Accept comment. Include ±0.2 Mpa
US 26 051		09.04.3		Ed	"Must" in not standard wording, change to "shall" in the last sentence.	The pressure relief device must <u>shall</u> activate...	Accept comment.
US 27 052		09.04.3			Clarify wording of the requirement.	The temperature of the fluid bath shall be increased to a level from 0°C to 5.6°C 5.6°C + 0°C higher than the manufacturers specified activation temperature. The pressure relief device must activate within four hours of reaching the target temperature range.	Accept in principle, however change 5.6 C to 5 C.
DE 053		09.05		Te	Production of TPRDs is a well-established process without effect on pressure cycling stability. If FMEA identifies critical components regarding pressure cycling a pressure cycle verification is acceptable but a general need for batch pressure cycle verification is not comprehensible. Therefore the chapter should be deleted.	Delete chapters 9.5, 9.5.1, 9.5.2 and 9.5.3	Reject comment. Prior industry experience suggests that batch testing is critical to ensure conformance of quality.

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US 28 054		10.01			Clarify wording of the requirement.	Pressure relief devices shall be marked with the name and year of this International Standard (ISO 19882), type of gas (H2), the manufacturer's specified nominal working pressure or pressure class (H25, H35, etc.), the manufacturer's identification, part number, and traceability code.	Accept comment.
US 29 055		A.1			The TPRD is installed at the vessel manufacturer not at the TPRD manufacturer.	The purpose of this informative annex is to recognize that proper operation of the TPRD(s) for protection of the fuel container, fuel storage subsystem, and vehicle level requirements. While the installation of the TPRD(s) is beyond of the scope of this document, system integrators should be advised of this information. One possibility is by inclusion of appropriate notes in the manufacturer's literature under Clause 11.	<i>Accept in principle. Look at SAE J2579 rationale Appendix G. While the installation of the TPRD(s) is beyond of the scope of this document, system integrators should be advised of this information.</i>
** 056		General		ed	Please use the simple template as a model for the format and structure as well as the model texts for this document. Simple template: https://www.iso.org/drafting-standards.html		Accept comment
** 057		General		Ed	1.2 does not belong in the Scope. See the comments made directly on the text.		Accept comment
** 058		General: conformity assessment issue		ed	The CASCO conformity assessment department at ISO/CS is reviewing the document for conformity assessment issues. We will send you their review and comments as soon as we receive them and it may entail some redrafting of the following clauses: Clause 5 quality assurance 7.1 design qualification testing Clause 8 inspection and acceptance testing Clause 9 product batch testing A.1		Accept comment.

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Collation of files was successful. Number of collated files: 5

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