ISO/TC 197
Hydrogen technologies

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ISO CD 19880-5.2 - Collated comments with resolutions

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Date of document:	2018-02-13
Expected action:	INFO
Background:	Here are the collated comments from the CD2 ballot complete with the resolutions from WG 22.
Committee URL:	https://isotc.iso.org/livelink/livelink/open/tc197

Template for comments and secretariat observations

Date: 2017.11.29	Document: **ISO/CD 19880-5.2 Comment resolved by Drafter. (omit duplication)**	Project: WG 22

MB/ NC[1]	Line number	Clause/ Subclause	Paragraph/ Figure/ Table/	Type of comment[2]	Comments	Proposed change	Observations of the secretariat
FR 1 001				ge	As it is drafted, it is not clear that this standard is not compulsory (informative)		This standard has been being established to specify (normatively) specifically the requirements for Hydrogen dispensing hoses and hoses assemblies separating from ISO 16964. Therefore, the requirements are normative unless stated informative. "Hydrogen impulse test", changed to "normative".
FR 2 002		Contents		ed	List of subclauses under clause 8 are not listed	Add 8.1 General 8.2 Selection 8.3 Installation 8.4 Inspection and maintenance 8.5 safety precautions and usage	Accepted
FR 3 003	1				You have to exclude from the scope the hoses which are used to fill in station buffers from mobile tanks. Indeed, those hoses are covered by standard ISO 16964 from TC58/SC2.		Agree in principle – but these hoses are already excluded – we can make this clearer. Not accepted for high pressure hydrogen dispensing As the safety factors specified in ISO 16964: 2015 which are 3XPR (less than 480 bar) or (2XPR)+480 (greater or equal to 480 bar) are not sufficient for Hydrogen dispensing application. In this draft, it is 5 X PR up to 70 Mpa (700 bar) Therefore, we propose to delete the statement below

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							from Introduction. For assemblies connecting hydrogen supply system, (including cylinders and tube trailers) to the fueling station, see ISO 16964. Note: We need to ask TC58 to exclude hydrogen dispensing from the scope of ISO 16964. → FR18
FR 4 004	1			ed/te	The scope has been modified and now includes hose assemblies. This is better than CD1 However, the exclusions of the 3rd paragraph of the scope are new and unclear and can be understood as what is being excluded is: Either *Hose and hose assemblies with thread and seal portion of fittings* *Hoses and hoses assemblies as part of a vehicle used as part of…* Or understood as being only excluded: *Thread and seal portion of fittings used as part of a vehicle on-board fuel storage….* *Thread and seal portion of fittings used as part of a vehicle low pressure fuel….* And why exclude metal hoses which were not excluded in the first draft?	Clarify the semantics of the 3rd paragraph	Accepted. As each line is separate, add number to each line.
US 01 005		General		te	Update the terminology to match the guidance in Annex D of CD2 19880-1. NWP has no meaning on a flowing pressurized system. It characterizes the settled pressure of the full CHSS container(s) on the vehicle.	Change MAWP to Component Pressure Rating. Use the definitions in CD2 19880-1 for consistency with other documents: • Component Pressure Rating • MOP • NWP (of vehicle)	Accepted Rewrite pressure terms in accordance with ISO 19880-1 with additional expressions.

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RO 01 006	13-15		Introduction	ge	"This Standard was developed using the following document: *CSA HGV 4.2 Hoses for Compressed Hydrogen Fuel Stations, Dispensers and Vehicle Fuel Systems,* under a Copyright License Agreement between CSA and ISO. " We wonder if the use of the CSA license to develop the standard does not detract from the equality of chances for the producing companies!	It introduces an application limitation, and its future effects shall be removed accordingly.	Disagree. The CSA document was the seed document and CSA is allowing ISO the use for the development of a better document. The process to improve the draft to be more inclusive and avoid limitations has been open since the beginning of the project. The resulting draft bears little resemblance to the initial draft. The licence grants the ability to develop the IS separately from the CSA process, and avoids the concern expressed by the comment. The stated intent of CSA is to take the improved document and harmonize the document with the North American regulations.
US 02 007		Introduction	pp 7 1st bullet		Type A the general public and sunlight can come into contact with, - test 7.3	connecting the dispenser to the fueling nozzle, ~~high pressure~~ and hoses accessible to the public at the fueling site (Type A)	Accepted – deleted type B
US 03 009		Introduction	pp 7 2nd bullet		Type B the general public and sun light cannot come into contact with, no cover required.	other flexible hoses used on hydrogen dispensing equipment not accessible to the public or exposed to sun light (Type B).	Accepted – deleted type B
US 04 011		Scope	pp 3 bullets		Add "bullets" to the four items		Accepted. Follow ISO Directives
FR 5 013	2			ed	Reference to ISO 8330 is missing	Add reference to ISO 8330 which seems to be a definition standard	Accepted
JP 4 014		2	Bullet 1		"Search function isn't working after section 8	Where is 19880 - used? Delete?	Not accepted Necessary as pressure

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							terms refer to ISO 19880-1. Added reference to 4.2.
US 05 015		2	Bullet 11		"Search function isn't working after section 8	Where is 10619 - used? Delete?	Accepted
GB 017		3		Ge	Definition of fuelling nozzle missing? (See feedback from previous comments)	Use definition from ISO 19880-1? (for nozzle)	Accepted. Add "nozzle" in the term
FR 5 018	3.1 3.3			ge	What is the difference between 3.1 and 3.3 they can be grouped together		Same as US06
US 06 019		3.1			Coupling, connector, end-fitting	Settle on a term an only use that term in the document. The others can be noted in the definition as "also known as".	Partially accepted. Coupling and fitting are used as the same meaning. Connector is used as a different meaning. Separate connector with the correct explanation with additional schematic drawing.
US 07 021		3.2			dispenser hoses, fuelling hose Is a dispenser hose a Type A hose?	Settle on a term an only use that term in the document. The others can be noted in the definition as "also known as".	Accepted. Add schematic drawing to make definitions more precise.
US 08 023		3.3			How is this different than 3.1?		Partially accepted. Define correct terminology with schematic drawing.
US 09 025		3.xx			Add	Hose – semi-finished hose assembly;	Accepted. Add "Hose" However, definition may be modified to harmonize with 19880-1
US 10 027		3.4			Tweak	An assembly consisting of a length of hose with a coupling or fitting attached to both ends. The assembly ~~hose~~ may include exterior materials which cover and protect ~~cover~~ and/or user ~~from any damage~~.	Accepted However, definition may be modified to harmonize with 19880-1.

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US 11 029		3.5			Harmonize terminology with approved CD2 version of ISO 19880-1. Change MAWP to component pressure rating.	*Change the term and use this term where MAWP is used:* **component pressure rating** maximum allowable pressure at which it is permissible to operate a component as specified by the manufacturer at a specified temperature. Note 1 to entry: Components designed to the Maximum Allowable Pressure per the European PED represent the component ratings by the manufacturer that as indicated by the value of "PS". Note 2 to entry: Further guidance on dispenser pressure terminology is included as **Erreur ! Source du renvoi introuvable.**.	Not accepted Disagree to use "component pressure rating" instead of "maximum allowable working pressure". The reason is;"component pressure rating" is varied depending on manufacturer's spec. Each pressure term should be equal among manufacturers and the users of the standard. Consequently, decided to use HSL with the relationship between NWP, MOP and MAWP
GB 030		3.5 & 4.2 (and throughout)			MAWP Check for consistency with draft of ISO 19880-1 and consider use of "component rating" (MAWP is for a system in WG24)	Please reconsider definition based on WG24 discussion	Accepted in principle to be consistent with ISO 19880-1 for the terms. Will revise to match with ISO 19880-1. Same as US11
US 12 031		3.6	Note	te	The note makes no sense on the dispenser or anywhere else in the filling station. It is valid only for the CHSS container on vehicle.	Delete.	Consequently, decided to use HSL with the relationship between NWP, MOP and MAWP
GB 032		3.6 & 4.2			MOP Check for consistency with draft of ISO 19880-1	Please reconsider definition based on WG24 discussion and use of term – is this term actually needed in Table 1? (Could a reference to ISO 19880-1 suffice?	Accepted in principle – updated table. However, Table 1 is necessary to understand the relationship among pressure terms. Revise

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							table using HSL with the relationship among NWP, MOP and MAWP.
JP 11 033		3.7			As for pressure terms, rearrange to integrate all pressure terms.	Move all pressure terms together at one place. Confirm the pressure terms match with those in ISO 19880-1	Accepted
US 13 034		3.8			Definition is not correct. NWP relates to the vehicle and not the dispenser system or the hose. Harmonize terminology with approved CD2 version of ISO 19880-1.	*Replace definition and notes as follow:* **nominal working pressure** **NWP** pressure of a full vehicle CHSS at a gas temperature of 15 ºC Note: The NWP characterizes the service level for determination of dispenser MOP and component pressure rating.	Accepted in principle Revise as applicable. Consequently, decided to use HSL with the relationship between NWP, MOP and MAWP
GB 035		3.8 & 4.2			NWP Unless these hoses are for use in vehicles, NWP is not needed here. WG24 is using “Hydrogen service level”	Please reconsider definition based on WG24 discussion and use of term. This may be better replaced in Table 1 with Hydrogen service level, HSL, and then a reference to see ISO 19880-1?	Partially accepted However, just using HSL is not appropriate expression for hose industry. We want to use NWP with the expression of relationship between HSL.
JP 12 036		‘3.10			Proof pressure is not defined in ISO 19880-1 and it is just used as “Proof pressure test”.	Change “Proof pressure” to “Proof pressure test”	Not accepted Decided to define “proof pressure”.
US 14 037		4.1	Bullet 1			Type A: A ~~dispenser~~ hose~~s~~ assembly connecting the dispenser to the fueling nozzle, accessible to the public.	Accepted
US 15 039		4.1	Bullet 2			Type B: Other flexible hose assemblies used on hydrogen dispensing equipment, not accessible to the public.	Decided to remove “Type B”
US 16 041		4.1	Note		The note is confusing.	*Change the note (or delete it):* Depending on the specific dispenser design, the MOP and component pressure rating may be less than that of the dispensed fuel.	Consequently, decided to use HSL with the relationship between NWP, MOP and MAWP

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FR 7 042	4.1		note	ed	The term “nozzle vent hose” is used but it is not defined. This term is unclear and needs to be defined		Accepted Define nozzle vent hose and added in the text.
Add JP N01		4.1			The safety factors for the hose specified in ISO16964 are not sufficient for the hose used Hydrogen dispenser.	Delete ISO 16964 from clause 2. Also, delete the statement after the note which is “For hose assemblies connecting hydrogen supply systems, (including cylinders and tube trailers) to the fueling station, see ISO 16964”	Not accepted. Decided to refer and included in the text.
FR 8 043	4.2		note table 1	ed	Lack of “**to”** in sentence “may not be limited classes shown.”	"may not be limited **to** classes shown..”	Accepted
Add JP N02	4.2		Table 1	Te	H11 is no longer listed in ISO 19880-1, delete H11	Delete H11 from Table 1.	Disagree - Discussed with TC 197 WG 24 – not in -1; it is in the nozzle doc. Hydride storage on the vehicle. Decided to keep H11 in 19880-5

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US 17 044		4.2	Table 1	te	MOP is only defined for the dispenser system. There is no specific target system application for Type B hoses, and therefore MOP is not defined. Typical practice is to assume MOP could be as high as component pressure rating. Component pressure ratings can be greater than or equal to the system MAWP and therefore the values in the table.	*Harmonize the terminology with CD2 19880-1:* Change title of row 2 from “NWP” to “Dispenser Service Level for Type A Hoses”. Modify note A to “Equal to the maximum Nominal Working Pressure (NWP) of vehicles to be fuelled”. Modify note B to indicate that the values for MOP for Type A hoses and Component Pressure Ratings for Type A and B hoses are based on ISO 19880-1l. Modify note C to indicate that Type B hoses are assumed to have a MOP equal to the Component Pressure Rating to be conservative. Update the table to show MOP values for both Type A and B hoses. The MOP of Type A hoses is as indicated on the current table. The MOP of Type B hoses should point to Note C (as modified). Replace MAWP with Component Pressure Rating and show each value as” ≥”. Also change from note reference from “C” to “B”.	Partially accepted. However, we are establishing the standard for Hydrogen hoses and hose assembly. In the hose standard, normally performance tests are specified in accordance with the basic pressure and all the relating terms include a word of “pressure”. In this standard, these are “NWP”, “MOP” and “MAWP”. These terms having “pressure” are common and easier to understand than using “Dispenser Service Level”, Component Pressure Rating” However, in order to harmonize terms between ISO 19880-1, we agree to use HSL for basic pressure and define relationships among NWP, MOP and MAWP.
GB 045		4.2	All	Ge	Unnecessarily complicated – just say that these pressures are for Type A hoses	Change to: “Type A hose assemblies shall be designated according to five pressure classes….” And remove the Note	Decided to remove references to“Type A” and “Type B”..
GB 046		4.3	All	Ge	Is the intention for all dispenser hoses to meet T1? If so, this could be as a minimum a useful note, if not a requirement for fuelling hoses?	NOTE: Fuelling hoses should be designed to be T1.	Partially Accepted Decided to remove temperature rating and defined “-40 to 65℃”.

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							Added the expression “dispensing with Precooling system” to the scope.
FR 9 047	5.1		3rd par.	te	The third paragraph should be deleted. A standard cannot decide that all existing hoses on the market are correct according to this new standard and that the new products must prove their equivalent performance. The standard should clearly defined all the expected requirements with the corresponding tests.	It is not possible to write such assertions in an ISO standard. Delete or change the requirement	Accepted Delete
US 18 048		5.2	pp 1		Clarity	The lining shall be of uniform thickness and free from defects. Defects <u>are defined as</u> ~~may include~~ but not limited to bubbles, thinning, gouging or discoloration,	Accepted
FR 10 050	5.2		2nd par.	te	There is no test to measure the dielectric breakdown voltage of the liner thickness. A test should be added or the requirement should be deleted.		Accepted Add test for Electric properties in clause 7. See at the bottom of the table.
US 19 051		5.2	pp 2		Clarity	~~1015 Ωcm~~ <u>10^{15} Ωcm</u>	Accepted
DE 053	3	5.2	Paragraph	editorial	NuDEer should be 10^15, otherwise not consistent with background;	Change NuDEer to 10^15	Accepted Change to 10^{15} KQ homework to address the ISO Directives for SI unit and clarity – the ISO template is making changes.
US 20 054		5.5			Static electricity dissipation	<u>The hose assembly shall be constructed so that the liner provides and adequate internal layer of prevention to avoid generating an electrical charge in the fluid during normal use.</u>	Accepted

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GB 056		5.5 (&7.4)	All	Ge	Isn't there a minimum requirement missing here? In 7.4 this is written in a test as 1MΩ per meter for Type A hoses? Is this consistent with the current need in ISO 19880-1 to ensure: "The total electrical resistance between the (vehicle) end of the fueling nozzle to the station electrical ground should be a maximum of 1000Ω."	Consider in light of ISO 19880-1 statement, and either include minimum requirement here, or change 7.4 requirement. Please advise WG24 of the outcome.	Finally agreed with WG24 and decided to specify "Electric conductivity of hose assembly" as no greater than 1 kΩ
US 21 057		5.x			Electrical bonding	The hose assembly ~~Hose assemblies~~ shall be constructed so as to provide an external, electrically conductive, bonding path between the couplings to dissipate external static electricity charges.	Accepted
RO 02 059				ge	In the mail sent on May 12 by NTC Scheduler <applications@iso.org> we note the following note: "Notes on ESD for CD2 19880-5 2017-05", where are mentioned some operational safety issues that need to be taken into account within the development of this draft. Moreover, the procedures for homologation tests are complex and lasting. Therefore, the relevant safety requirements in the above-mentioned note shall be taken into consideration.	Complete the next draft of standard with relevant safety requirements according to those mentioned in NOTE.	Accepted Will add test to verify ESD
US 22 060		6.1			This is non-normative. Is it needed?		For hose, it is necessary to specify concentricity. Will add "Typical" before concentricity. Revised Table 2 to include ID, OD and concentricity in one table
US 23 061		6.2			This is normative. It is needed.		Same as above
JP		6.2			As dimension of ID and OD are typical,	Add typical before concentricity	Accepted

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19 062					concentricity also should be typical		
FR 11 063	6.3			te	the new requirement does neither refers to any temperature nor to any endurance for the test. I think it is not acceptable for the intended use.	The test must be really relevant to the intended use.	Partially Accepted Move clause 6.3 to clause 7 Performance. As for the test relating to low temperature, it is specified in clause 7.6. When temperature is not specified, it is ambient.
US 24 064		6.3	pp 1		Are we going to reject an eight mm H35 hose because the MBR is 220 mm? We will reject something that does not validate the manufacturer's literature.	Use a test piece having a length at least four times the minimum bend radius. Measure the hose outside diameter with calipers in the straight-lay position before bending the hose. Bend the hose through 180° to the minimum bend radius (see manufacturer's literature ~~Table 4~~) and measure the flatness with the calipers. Typical values are shown in table 4.	Accepted. Add "Typical" to Table 4.
US 25 066		6.3	pp 2		Enable, do not limit.	When the hose is bent to the minimum bend radius given in manufacturer's literature ~~Table 4~~, measured on the inside of the bend, the flatness shall not exceed 10 % of the original outside diameter.	Accepted
Add JP N03		6.3			H11 is no longer necessary as it is not specified in ISO 19880-1.	Delete H11 from Table 1	Disagree – after discussion with WG 24, decided to leave H11.
FR 12 068	7			te	The performance paragraph is mixing type testing and production testing. This should be changed and a specific paragraph for production (or routine ?) testing should be written.	Reorganize the CD to include a separated paragraph for production tests if needed.	Accepted It is listed in Annex A,B Rearrange order of testing sequence as RECOMMENDED order.
GB 069		7	Chapter title	Ed	Is "Performance" the correct title? Many of these a safety related.	Consider, and replace if appropriate	Accepted Change to "Performance

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					Minor point, but should this be called “Tests” or “Testing”?		requirements and testing”
JP 22 070		7.		te	Regarding the test which is conducted continuously a long period of time, need to consider not to throw the previous successful data when a failure occurs or false data are collected at the end of the test,	To be considered	It is a normal practice to continue testing as long as the interruption does not affect the test result. It is not necessary to include in the text. The test can be interrupted before reaching the target number of cycles and then restarted, as long as the interruption does not affect the test piece or the test conditions. Replacement with tooling for test continuation of other samples is permitted.
JP 23 071		7.x			ESD This matches 5.6 in the comments	See Below.	Accepted
FR 13 072	7.1			te	The hose to be tested shall be the final hose, not one with cover allowed to be perforated if the actual and distributed product is not so.		Accepted Delete “The hose cover with perforated holes may be used as a sample.”
F14 073	7.1.1		1st par.	ed	The ISO unit is Ncm3 not cm3N		Not accepted In ISO, “N” as “Normal” comes to the end to avoid confusion with “Newton” Same as DE076 KQ to confirm from ISO Directives SI units
FR	7.1.1		2nd par.	ed	The sentence is not right: "Test can be done at room temperature. The amount shall be	The sentence should be: "Test can be done at room temperature. The amount shall be	Accepted

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15 074					converted to 15 ℃ using equation listed clause **8.12**."	converted to 15 ℃ using equation listed clause **7.12**."	Change to 7.12.(3)
US 26 075		7.1.1			Didn't we agree to hourly permeation (diffuse) of less than 500 ml/hr-m and local leakage of 200 ml/hr within a 1 sqcm point on the hose assembly?	Use values that were previously agreed to: • less than 500 ml/hr-m and • less than of 200 ml/hr local leakage within a 1 sqcm point on the hose assembly.	Yes. We agreed to hourly permeation of less than 500 ml/hr-m. However, this requirement is for "Leakage" from hose assembly including local leakage. As we explained in the Tokyo meeting, we should separate "Permeation" and "Leakage" What USA call "local leakage" should be defined as a form of the leakage not a permeation. Based on the theory that "Leakage" should appear at the beginning of pressurization. And we decided to confirm no local leakage for every assembly manufactured by Routine test. For routine test, leakage is checked visually or by a gas leak detector and snoop liquid for no bubbles. On the other hand, we also decided to perform leakage test as a type test and production test to measure the amount of leakage. We agreed to specify the value as "detectable limit" of measuring instrument. Finally, we found 20 ml/hr is suitable for detectable

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							limit.
DE 076	2	7.1.1	Paragraph	editorial	The Unit should be Ncm³/(h*m), The “N” must be in front of the cm³.	Change the Position of the “N” and add the “m” in the denominator. For this the NuDEer of 20 must be changed to 40, because the free length of the test piece is defined to 0.5m.	Not accepted. The unit should be cm3N/h. It is a common practice to avoid “N” as “Newton”. As for the latter comment, since the leakage is not related to the length of the hose, the unit of length is unnecessary.
JP 24 077		7.1.1			Leakage is not an hourly rate. Take “/h” from the requirement	Change clause 7.1.1 not to length of hose.	Not Accepted. Took out /m, as intended by submitter.
Add JP N04		7.1.1		Te	Air trapped in the reinforcement layer affects the result of Leakage test. It is necessary to include the method to avoid this influence.	Change as below; Apply the gas pressure of MAWP and maintain it for 10 minutes. This is the time for releasing trapped air to outside through perforated holes. Then, during the next five minutes collect the gas and measure the amount while maintaining the pressure. Also, move NOTE 1 under 7.1.1 by replacing 5 minutes with 15 minutes.	Accepted
FR 16 078	7.1.1 7.1.2				The § 7.1.1 and 7.1.2 are incoherent: for a type test of 5min the requirement is 20 Ncm3/h at MAWP and for a routine test during an undefined number of minutes the requirement is no leakage without any specification for the applied pressure. This lack of details is not acceptable for this standard at this stage.	The tests should be better described.	Accepted Change as below; Apply the gas pressure of 1.375xHSL (MAWP) and maintain it for 10 minutes. This is the time for releasing trapped air to outside through perforated holes And apply the gas pressure of 1.375 x HSL (MAWP) and maintain it for 10 minutes to purge the trapped air.

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							Then, still maintaining the pressure, the leakage shall be checked visually for any bubbles from hose body and both coupling ends. This check is performed under water by immersing test piece in the water bath. Also, a gas ……
US 27 079		7.1.2			Why are the type A and type B hose tests different? The differences between the hose types is the degree of contact with people during normal use (this is zero for the type B).		We think USA probably mistook as Method A for Type A hose and Method B for Type B hose. Method A is used for Leakage test at Type test and Production test. Method B is used for Routine test. As Leakage test shall apply for both Type A and Type B. hose assembly, we will add this statement at the beginning of clause 7.1. Reference to Type A&B have been removed.
DE 080	6	7.1.2	Paragraph	technical	For the Method B with the gas leak detector or the snoop liquid leak detector, there is no time how long the pressure should be applied, and how long is the observation	Insert the comment “should be observed for 5 min.”	Accepted in principle – went with 10 minutes. Same as RF16
FR 17 081	7.2				Delete “this is a non-destructive test” since it is described to be so.		Not Accepted. 7.2 does not have such a line. 7.2.1 is a non-destructive test; whereas 7.2.2 is destructive.
FR 18	7.2.2				It is not possible to require 4 times MOP and then add that the test shall be performed according to a national standard. This		Not accepted. It is necessary for the Hydrogen hose to have the

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082					document is an ISO document, hence international. It should specify a minimum requirement meeting an adequate safety level that both manufacturers and users have agreed. Also I am not sure that a hose will pass 3500 bar.		burst pressure (ultimate strength) of at least 5 x HSL to secure the safety as an international standard. Hose assembly. shall be designed to have burst pressure of 5 times of HSL. Same as FR3 This document will only apply to the high-pressure hydrogen dispensing hose. As we've decided to use HSL as the base pressure, it should be HSL x 5.
US 28 083		7.2.2			Let's simplify, MAWP (the system requirement) and rated pressure (the component requirement). Rated pressure <u>></u> MAWP	Following the oven aging, when tested in accordance with ISO 1402, a hose assembly shall withstand without bursting or visible loss of fluid <u>a minimum</u> ~~with the~~ pressure of ~~4 times of MOP~~ <u>3.6 times Component Pressure Rating</u> for 5 min.	Not accepted. Actually, 4XMOP and 3.6XMAWP are almost equivalent. As 4XMOP is slightly larger than 3.6XMAWP, we decided to use 4XMOP in the Tokyo meeting. However, as we've decided to use HSL as the base pressure, it should be HSL x 5.
US 30 084		7.4			Electrical Conductivity This matches 5.x in the comments	Type B hoses are expected to be relatively short. Test for hoses longer than 1 meter? And either connect to bond surfaces, or intentionally not connected to bonded surfaces (electrical dielectrics).	Not accepted. The requirement is per meter of hose. Test can be done less than 1 meter. ex. 300mm. Is this test applicable to Type B as well? If so, we will apply for both.
CA 085		7.4 Electrical Conductivity		Ed	*"When determined in accordance with clause 4. 8 of ISO 8031:2009, electrical resistance between couplings at each end of a dispenser hose shall*	"<u>For Type A hoses</u>, when determined in accordance….."	Accepted Decided to remove references to Type A and

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					not exceed 1MΩ per meter, in order to dissipate static electricity. This test shall be conducted with the hose un-pressurized. *For Type B Hose: TBD"* Do the requirements in para A only apply to Type A hoses? If so, then state this. At least it should be stated until it is known if Type B hoses are to have separate requirements.		Type B.
Add JP N05		7.4			Requirements for Type B should be specified by the time of the next step. Otherwise, it is recommendable to separate Type A and Type B into Part 1 and Part 2 with the same ISO number.	Requirements for Type B should be presented by the next step.	Accepted Discussion was made and decided to delete Type B hose. Removed reference to Type A & B.
DE 086	0	7.5	Paragraph	technical	The Test 7.7 Test of hose assembly includes this test. Same Test with more load and more specifications.	Delete the Paragraph	Not Accepted Direction of tensile force is different from 7.7 Tensile test. Discussion was made and decided to leave 7.5 as it is the test for the resistance for the bending force instead of test for the tensile force.
DE 087	2	7.6	Paragraph	editorial	The ISO 6802 missing the year	Insert the year of the ISO 6802:2008	Partially accepted Add ":2005 However, as ISO 6802 is currently waiting publication of the revision, it should be changed to the new year of publication once published.
CA 088		7.6 Torsion Strength	1st para	Ed	Hanging paragraph. Needs a subheading. This also means current "7.6.1 Test Conditions" must become 7.6.2	7.6.1 Applicability	Accepted. Change as applicable.

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CA 089		7.7 Tensile Test of Hose Assembly	1st para	Ed	Hanging paragraph. Needs a subheading. This also means current "7.7.1 Test Methods" must become 7.7.2	7.7.1 Applicability	Accepted. Change as applicable. Same as CA088
US 31 90		7.7	pp 2		Verify that the nozzle/receptacle requirements in ISO 17268 are to definitely disconnect at less 3000 N.	A hose assembly shall withstand a longitudinal pull force of 3 000N without structural damage or leakage after being subjected to accelerated air oven aging. The hose must comply with Section 7.2.1 Hydrostatic Proof Test and Section7.5 Electrical Conductivity after the tensile test.	According to ISO/DIS 17268 clause 7.10 Abnormal load, it is specified as 2000 N. Therefore, 3000 N is acceptable
CA 091		7.7.1 Test Methods	2nd para	Te	"*Following the oven aging, the hose assembly shall be maintained at room temperature for 2 h prior to the conduct of the tensile test*." Is the 2 hour hold at room temperature for the purpose of having the hose at room temperature for the tensile test, or is it to have the hose cool to some temperature higher than room temperature for the tensile test? If the former, then delete the 2 hours, and simply state the test is performed at room temperature. If the latter, then specify the temperature range the hose should be tensile tested at. There is no guarantee that 2 hours of cooling is going to provide the desired temperature for testing – with undefined cooling conditions, every test lab would have a different amount of cooling for a 2 hour period.	*"Following the oven aging, the hose assembly shall be maintained at room temperature ~~for 2 h prior to the conduct of~~ during the tensile test*."	Partially accepted This is the latter case. Change as below; The hose assembly shall be cool down to the room temperature of 20±10℃ for at least 2 h prior ro " Add "Then test shall be conducted at room temperature" Note that in the event the test room has not reached the desired temperature, the test conditions will in fact be more severe than required.
Add JP N06		7.1.1		Te	The third sentence should be placed after the first sentence. Also, "The hose end fittings shall then be assembled ……. And tightened." Is not necessary as the test sample which is oven aged should be already assembled. As the sample for this test should be "hose assembly", change "hose" to "hose assembly"	Bring the third sentence after the first sentence. Delete "The hose end fittings shall …… and tightened." change "hose" to "hose assembly	Accepted Delete "The hose end fittings shall then ….. and tightened." Change "The hose is then to be …." To "The hose assembly …."

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US 32 092		7.8	New pp 1		Missing requirement	This test shall be applied to Type A and Type B hose assemblies.	Not Accepted. Deleted Type B Removed reference to Type A&B
CA 094		7.8	1st para	Te	It says…." *When tested in accordance with method 1 of ISO 7326: 2006, depending on the nominal size of the hose, a hose outer cover shall show no visible signs of cracking…".* What does "depending on the size of the hose" mean? This is not explained in 7.8. If it is not explained, it is meaningless.	Delete "~~depending on the nominal size of the hose,~~"	Accepted
US 33 095		7.9			clarity	This test shall be applied to Type A and Type B hose assemblies.	Not Accepted. Deleted Type B Removed reference to Type A&B
CA 097		7.9 Corrosion Test	1st para	Ed	Hanging paragraph. Needs a subheading. This also means current "7.9.1 Test Conditions" must become 7.9.2	7.9.1 Applicability	Accepted. Same as CA088, CA089

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US 34 098		7.10	Para 1 and 3	TE	Many of the issues associated with hoses are due to low temperature operation and thermal cycling between -40C and ambient. The cycle test should be done at both high and low temperature. I believe that the cycle test should be alternate between highest and lowest temperature but would be open to other options if there is a lower cost method to achieve thermal cycling.	When tested in accordance with ISO 6803, the test fluid temperature shall be at the highest and lowest temperature of the hose being rated. The pressure rise shall be contained within the wave form envelope as shown in Figure4. The test fluid for this test is water or mixture of water and glycol or oil. When tested at impulse pressure equal to 100 % of the maximum operating pressure, the hose shall withstand a minimum of ~~10~~50 000 impulse cycles alternating between the highest and lowest temperature rating.	Not accepted. The purpose of this test is to confirm the durability against the pressure and the sealability at the coupling area. For this performance, the influence of high temperature is much greater than the lower temperature. Therefore, it is not necessary to evaluate this test with low side of the temperature such as - 30 ℃. As the lower side of the temperature does affect the brittleness of the inner plastic liner, Hydrogen impulse is specified.
US 35 099		7.10	New pp 1		Missing requirement	This test shall be applied to Type A and Type B hose assemblies.	Not Accepted. Deleted Type B Removed reference to Type A&B
DE 101	1	7.10	Paragraph	editorial	The ISO 6803 missing the year	Insert the year of the ISO 6803:2010	Accepted ISO 6803:2017 as it is just published
CA 102		7.10 Pressure Cycle Test (Impulse Test)	1st para	Te	"*The pressurization shall be stopped and the impulse test unit shall be allowed to cool down the temperature of the test fluid to room temperature at every 30 000 cycles of impulse cycles.*" The test does not state a maximum temperature for the test fluid. It does not state what "room temperature" is. This means the results between test labs will have different test conditions. One needs to specify the test temperature conditions.	Add the statement, "*During pressure cycling the fluid temperature shall be monitored, and shall range between 25°C and 65°C. The pressurization shall be stopped and the impulse test unit shall be allowed to cool down the temperature of the test fluid to between 15°C and 25°C ~~room temperature at~~ after every 30 000 ~~cycles of~~ impulse cycles."*	Partially accepted As for the former comment, Impulse test shall be conducted at the highest temperature which is 65 ℃ as we removed temperature rating. In addition, ISO 6803 states fluid temperature tolerance is ±3℃.

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							Accept the latter comment. Change to Cool down to the room temperature of 20℃± 5℃"
CA 103		7.10 Pressure Cycle Test (Impulse Test)	6th para	Ed	"*At every cool down, check test assemblies to ensure they are clean and dry. With oil heater turned off…..*" In para 2 it allows; "*The test fluid for this test is water or mixture of water and glycol or oil.*" So the term "oil heater" is inappropriate.	*"At every cool down, check test assemblies to ensure they are clean and dry. With ~~oil~~ fluid heater turned off…*	Accepted
US 36 104		7.10	Para 8	TE	The hose should be required to pass the leakage test to ensure there are no failures using hydrogen as the working fluid	There shall be no leakage or other malfunction before reaching the specified number of cycles. The hose shall comply with Section 7.1 Leakage Test at the end of the cycles	Not accepted Same as US034 This test is conducted with the test liquid (oil or water with mixture of glycol) and the sealability is confirmed by Proof test.
DE 105	2	7.10	Figure	technical	Key a of the Figure 1 is defined in ISO 6803:2010, use the definition of this standard.	Change it to accordance of the ISO 6803:2010: The rate of pressure rise is the slope of the secant pressure rise, expressed in MPa/s. The nominal rate of pressure rise shall be equal to that given by Equation (1): R = f(10p – k) where: R is the rate of pressure rise, in MPa/s; f is the frequency, in Hz; p is the nominal test pressure, in MPa; k = 5 MPa The tolerance is +-10% of the calculated nominal	Partially accepted. However, as the impulse test pressure is extremely high, the wave envelope cannot be the same as stated in ISO 8603. Therefore, describe the detailed test procedure in the text by modifying ISO 6803.

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						value.	
DE 106	2	7.10	Figure	technical	Key c of the Figure 1 is defined in ISO6803:2010 for high pressure hoses (more than 3 MPa) between 0.5 Hz and 1.3 Hz. (see 6803:2010 Paragraph 8.2 Line1)	Change in accordance to the ISO 6803:2010: 8.2: "…apply a pulsating pressure internally to the hose assemblies at a uniform rate between 0.5 Hz and 1.3 Hz for the high-pressure test …"	Partially accepted Same as DE105 Because the test pressure is ultra-high pressure, pressurization cycle is 0.1 Hz to 0.4 Hz.
JP 28 107		7.10	Fig.1	te	"P±5%" is wrong. Should be "±5%"	Change to "±5%"	Accepted
DE 108	14	7.10	Paragraph	technical	Malfunction should be limited to the test piece	…malfunction of the test piece… There shall be no leakage or other malfunction of the test piece before reaching the specified number of cycles. of the test piece 追加	Accepted
US 37 109		7.12			We believe the WG came to the conclusion that permeation is diffuse leakage and should be in ml/hr-m and leakage is local and should be in ml/hr. For safety reasons, we agreed total leakage should not exceed 500 ml/hr-m and local leakage should not exceed 200 ml/hr (below the point of a sustained flame.		Partially accepted. Change clause 7.1.1 not to length of hose. However, we've agreed to specify detectable limit as 20 cm3/hr.
JP 29 110		7.12.1		te	"Repeat the measurement a further two times" is not sufficient. Need to specify when the next measurement is conducted	Add "the next measurement shall be conducted within 24 hours"	Accepted
JP 30 111		7.12.1		ed	7.12.1 Test Method B should be 7.12.2	Change to 7.12.2	Accepted
NZ 112		7.12.1		ed	flaw	flow	Accepted

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Template for comments and secretariat observations

Date: 2017.11.29	Document: **ISO/CD 19880-5.2 Comment resolved by Drafter. (omit duplication)**	Project: WG 22

MB/ NC[1]	Line number	Clause/ Subclause	Paragraph/ Figure/ Table/	Type of comment[2]	Comments	Proposed change	Observations of the secretariat
CA 113		7.12 Hose Permeation	1st para	Ed	Hanging paragraph. Needs a subheading. This also means current "7.12.1 Test Method A" must become 7.12.2, etc.	7.12.1 Overview	Accepted Same as CA088, CA089
DE 114	2	7.12	Paragraph	editorial	The Unit should be Ncm³/h*m, the "N" must be in front of the cm³.	Change the Position of the "N" and add the "h" in the denominator.	Partially accepted. Not accepted for the first comment as "N" shall be placed at the last to avoid confusion with "Newton". Accepted for the latter comment. Add "h"
NZ 115		7.12		te	500 cm³N/m	500 Ncm³/m	Not accepted Same as the above DE114
JP 31 116		7.12.2		ed	7.12.2 Description of the result should be 7.12.3	Change to 7.12.3	Accepted
NZ 117		7.12.2		ed	Covert, ammount, Satulated	Convert, amount, Saturated	Accepted.
DE 118	0	7.13	Paragraph	general	The Paragraph is only informative A Standard should be describe only the state of the Art and no informal things.	Delete the complete paragraph, because it is informative.	Not accepted Change "Informative" to "Normative" by modifying the requirement.

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US 38 119		7.14	Para 1	TE	The crush test should be mandatory even for regions that have requirements that prevent the hose from touching the ground. The likelihood of a hose being damaged by crush is high. The severity of a crush damage on the hose is very high because there is no method of flow control and the leak could affect the user and public in surrounding area. In addition, car doors, collisions are other sources of "crush" damage. Because the station operator is unlikely to know the difference between a hose which passed the crush test versus one which has not, the default should be to require the crush test, unless it is specifically excluded.	**7.14 ~~Optional~~ Crush Test** This provision applies to a single Type A hose only. ~~If required based on regional dispenser design,~~ A dispenser hose assembly shall withstand a force of 8900 N applied externally without incurring structural damage or leakage.	Accepted
US 39 120		7.14	Para 1	TE	The hose should be required to pass the leakage test to ensure there are no failures using hydrogen as the working fluid	The weight shall then be removed and the hose subjected to and shall comply with Sections 7.1 Leakage Test 7.2.1 Hydrostatic Proof Test and 7.4 Electrical Conductivity.	Not accepted. Coupling areas of hose assembly are not damaged by this test. Therefore, Proof test and Electric conductivity are only necessary.
US 40 121		7.14			Crush shouldn't be an issue if the hose isn't laying on the ground away from the plinth. A 3 meter hose connected to a 2.3 meter high breakaway, as is currently done with petroleum dispensers should see a lot of crushing, if any.	<u>This requirement only applies to a Type A hose assembly of more than 3 m or for applications where crushing is a credible failure mode (special order).</u>	NOT Accepted – need to do tests on all hoses as we don't know where it might be used. Make it a required type test – not optional, and not production tests.
US 41 123		7.15			Abrasion shouldn't be an issue if the hose isn't dragged. A 3 meter hose connected to a 2.3 meter high breakaway, as is currently done with petroleum dispensers should see a lot of dragging, if any.	~~This provision applies to a single Type A hose only~~ <u>This requirement only applies to a Type A hose assembly of more than 3 m or for applications where abrasion is a credible failure mode (special order).</u>	NOT Accepted – need to do tests on all hoses as we don't know where it might be used. Make it a required type test – not optional, and not production tests.
CA 125		7.15 Optional Abrasion	1st para	Ed	"*When requested by customer or where regional dispenser designs warrant, Dispenser hoses must meet ISO….*". Is "Dispenser hose" the	*When requested by customer or where regional dispenser designs warrant, <u>Type A</u> ~~Dispenser~~ hoses…."*	Accepted

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		Resistance Test			same as Type A hose? If so, make a global change of Dispenser hose to Type A hose throughout the document.		
US 29 126		7.x			ESD This matches 5.6 in the comments	See Below.	See below Suggestion of 7.16
US 29 127					Electrical Conductivity This matches 5.x in the comments	Type B hoses are expected to be relatively short. Test for hoses longer than 1 meter? And either connect to bond surfaces, or intentionally not connected to bonded surfaces (electrical dielectrics).	Same as US30 Not accepted. The requirement is per meter of hose. Test can be done less than 1 meter. ex. 300mm.
JP 34 128		7.X			There is no test to determine the material electrostatic dissipative property	Add test. See the statement at the bottom of the table	Accepted Suggestion of 7.16
GB 129		8.2	b	Ge	Is it impossible for a hose built to ISO 19880-5 to be appropriate for use in a vehicle if the other vehicle specific requirements are met? Is there something fundamental about this document, other than this statement, that precludes such a hose being used in a vehicle?	Please clarify what prevents it from being used, and if nothing other than this statement, either remove, or amend to something like: "The hose shall not be used in a vehicle, unless other relevant requirements for vehicle hoses are also met"	resolved This standard is specific to Hydrogen dispensing and do not consider vehicle application.
US 42 130		8.3	a		The hose needs to tolerate a failure where the MAWP is reached. This is the dispenser manufacturer and station owners' responsibility. The hose manufacturers' need to be clear on what are the rated pressure and operating temperature ranges of the hose assemblies.	Include warning in instructions: "Operation above the component pressure rating and temperature rating is not permitted." ~~MAWP must not be exceeded; the user must provide overpressure protection to prevent operation of the hose at pressures greater than the MAWP;~~	Accepted
GB 131		8.3	a	Ge	The rated pressure of the hose must not be exceeded (nor any other parts of a pressure system, but that is out of scope of this document) – the system MAWP shall not exceed the hose rated pressure. Also, is the user the correct term? For a	Clarify with appropriate language, for instance: The rated pressure of the hose must not be exceeded; the installer of the hose assembly into a pressure system must ensure that overpressure protection is appropriate to prevent operation of the hose at pressure higher than the rated	Accepted

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					dispenser, this is a member of the public filling their vehicle?...	pressure.	
US 43 132		8.3	c		Clarity	The hose shall not be <u>used if bent tighter</u> ~~less~~ than the manufacturers' specified minimum bend radius for the hose. ~~a~~. The hose shall not be stretched, kinked, twisted ~~or~~ torqued <u>or damaged in anyway</u>;	Accepted
GB 134		8.3	c	Ed	Language is confusing. Also, is the "a." half way through a typo?	Please clarify what is meant	Accepted
DE 135	5	8.3	Paragraph	editorial	In the listing "c" starts a new point a, "a" is already defined.	Take this point to the end of the listing and define it to f	Accepted f. The hose shall not be stretched, kinked, twisted or torqued;
US 44 136		8.3	d		Clarity	The hose assembly shall provide protection for the user from contact ~~damage~~ <u>injury (thermal)</u>	Accepted
US 45 138		8.3	e		The hose manufacturers' need to be clear on what the rated pressure and operating temperature ranges of the hose assemblies are	<u>Include warning in instructions:</u> <u>"The hose shall not be subjected to temperatures outside the temperature limits"</u>	Accepted
US 46 140		8.3	e		Miss one	<u>Include warning in instructions:</u> <u>"The hose assembly shall be removed from service and destroyed (or returned to the manufacturer) in the event of mechanical, chemical or environmental damage"</u>	Accepted – also consider an expiration date, based on appropriate storage conditions. ISO 8331 for storage. Recommendation. Preservation of product clause.
GB 142		8.3	all	Ed	Inconsistent use of ; and . at the end of each item in the list.	Correct typo	Accepted Change ";" to "." N/A No such usage of "of
JP 39 143		8.3		ed	a. The hose shall not be stretched, kinked, twisted or torqued; should be separated as "d." the current	Rearrange the numbering	Accepted Same as GB134 and DE135.

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					"d." and "e" should be changed accordingly		
US 47 144		8.4	b		Add	Include warning in instructions: "The hose assembly shall be removed from service and destroyed (or returned to the manufacturer) in the event of mechanical, chemical or environmental damage"	Accepted. However, delete "(or returned to the manufacturer)". As manufacturer will be in trouble when sold hose assembly is returned.
US 48 146		8.5	c		Add	Include warning in instructions: "The hose assembly shall be removed from service and destroyed (or returned to the manufacturer) in the event of mechanical, chemical or environmental damage"	Accepted. However, delete "(or returned to the manufacturer)". As manufacturer will be in trouble when sold hose assembly is returned.
GB 148		8 & 9	all	Ed	Should marking and documentation be the other way around?	Correct if appropriate	Accepted. Change clause 8 for Marking
DE 149	9	9.2	Paragraph	general	In the NOTE is named f, but "f" is not defined in the Paragraph	Delete it Or define it	Accepted Replace f) with e)
US 49 150		10	pp 2 2nd sentence		Typo	(The tests shall be repeated at a maximum of five-year intervals, or whenever a change in the method of manufacture ~~or materials~~ or materials used occurs).	Accepted
DE 152	4	10	Paragraph	general	Why have to be repeated the qualification to ISO 19880-5 every five years, if there is no change in the method of manufacture or materials used occurs?	Delete the Requalification for every five years.	Accepted Delete "repeated at a maximum of five-year intervals, or" and change to "The test shall be conducted whenever a change in the method of manufacturer, materials or construction occurs, in consultation with the third party certification body" Change Production

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							acceptance tests as below; Production acceptance tests are tests specified in Annex B, which should preferably be repeated at a maximum of five-year interval
GB 153		10 & 11	all	Ed	These include requirements relating to testing?	Move further forward to ensure this is clear.	Accepted. Restructuring will help make this clearer. In clause 7, bring the content of clause 10 and delete clause 10.
GB 154		10 & Annex B		Ge	Regarding routine testing: • ISO 19880-5 has it as an informative (optional) Annex for hoses for a very small number of hoses • ISO 17268 has nothing at all as far as I'm aware • It was suggested in comments about ISO 19880-3 that routine testing is required for valves. There is a really large inconsistency currently between these three critical dispenser component standards…	Can this be made consistent across all HRS component standards?	We don't think it is not necessary to be consistent as this is specific to hydrogen dispensing hose. These requirements are considered strictly for hose used for Hydrogen dispensing. The restructuring may help solve this.
GB 155		11	Para 1	Ed	Change to manufacturer. Also, this should be "shall" rather than "will"?	Correct typo	Accepted
DE 156	12	Annex A 7.5	Table	editorial	Delete the Row, because the test 7.7 is the same, but more critically test.	Delete the Row	Not accepted Same as DE086 Tests are different and are modelling different failure modes. Adding a brief

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							description of the purpose of the test for each.
DE 157	20	Annex A 7.13	Table	editorial	Why there is a cross in the row, if 7.14 is only for information? 7.13 Hydrogen Impulse Test (Informative)	Delete the cross and the min. of 3	Not accepted We decided Hydrogen impulse test is normative as it is the most important test for dispenser hose. Change 7.13 to Normative
DE 158	21	Annex A 7.14	Table	editorial	Why there is a cross in the row, if it's only optional? 7.14 Optional Crush Test ｵﾌﾟｼｮﾅﾙ試験なのになぜ実施の X なのか？	Delete the cross and the min. of 2	Not accepted No longer optional, this test is recommended to conduct with the listed number of sample.
DE 159	22	Annex A 7.15	Table	editorial	Why there is a cross in the row, if it's only optional? 7.15 Optional Abrasion Resistance Test	Delete the cross and the min. of 3	Not accepted Same as DE158
DE 160	14	Annex B 7.5	Table	editorial	Delete the Row, because the test 7.7 is the same, but more critically test.	Delete the Row	Not accepted Same as DE086
DE 161	14	Annex B 7.7	Table	editorial	With the Ultimate strength test it's possible to describe the behaviour of lengthening / shortening of the hose. If there are no differences here, it is guaranteed that the behaviour of the hose is constant	Delete the cross and the min. 2	Not accepted Production acceptance test is for periodical test to verify the manufactured hose is consistent even without change in manufacture or materials occur for quality control reason. Elongation during that test is indicative of material properties. However, it is informative.

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DE 162	14	Annex B 7.10	Table	editorial	With the Ultimate strength test it's possible to describe the behaviour of lengthening / shortening of the hose. If there are no differences, it is guaranteed that the behaviour of the hose is constant	Delete the cross and the min. 2	Not accepted Same as above DE161 Another consideration is that while a company can do the tests described by the comment, this document does not require the proprietary data generated by such tests to the third party certification body.
GB 163		?		Ge	Feedback/response to the note on ESD associated with ISO/TC 197/WG 22 N38: There is always a risk of static electricity and bonding and grounding are particularly important in hydrogen applications, but I expect that this static electricity would be from surroundings and not from hydrogen gas itself. Theoretically it could be from particles within the hydrogen gas, like rust or dust particles. However, there are no particles in the gas stream delivered to the car (as far as I am aware). So this static electricity does not explain to me how material degradation of the liner inside the dispenser can occur.		Not accepted There is no guarantee that the materials selected produce no static electricity. In reality, there will be (sub-micron) particles in the gas stream delivered to the car. It is considered that rapid flow of hydrogen gas or liquid inside the liner generates static electricity. There is a chance of dielectric breakdown of the liner depending on the lining material. That is why we specify the property of material to prevent from dielectric breakdown.
					See figure below – will WG 24 adopt?		Agree in principle – WG 22 worked with Chair of WG 24 on a harmonized figure.

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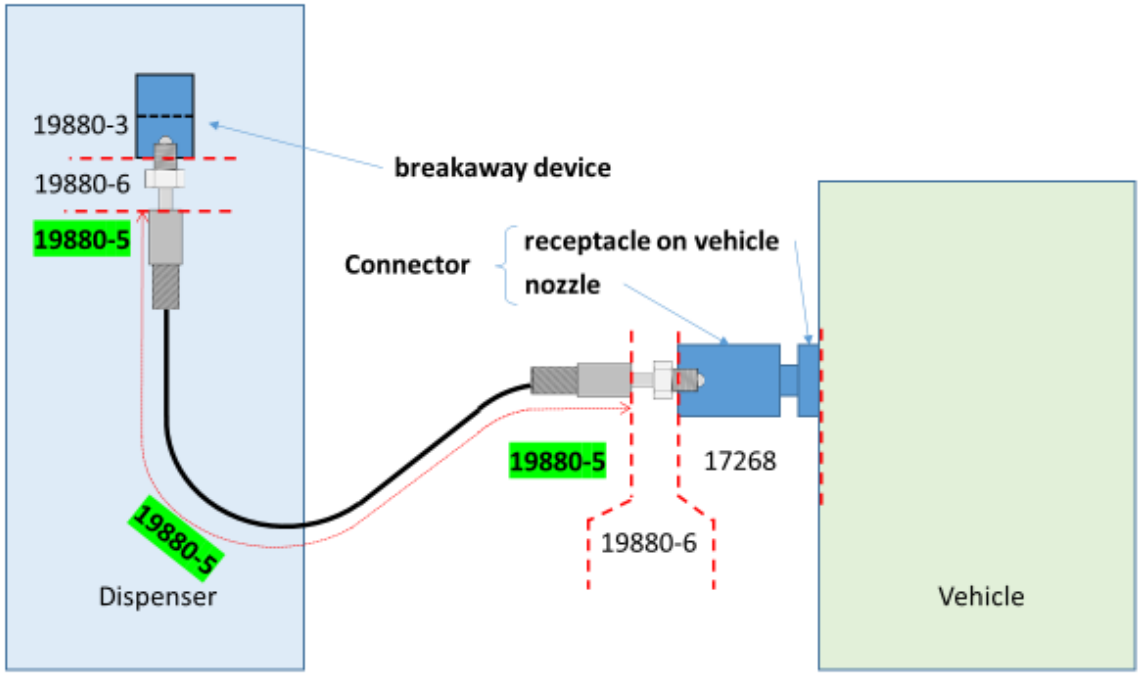

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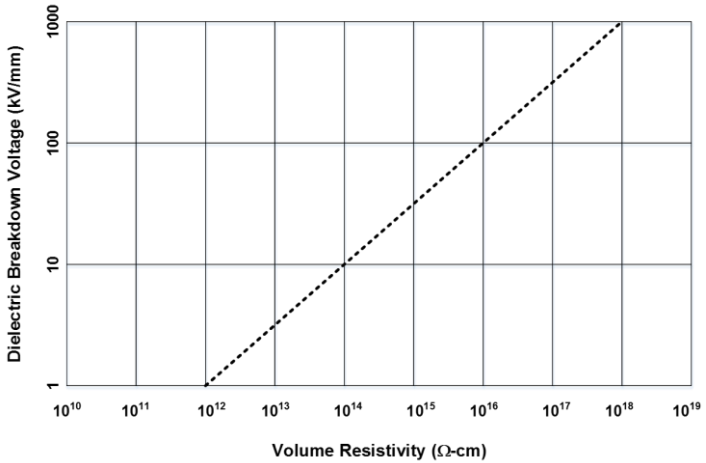

7.x Electrostatic Dissipative Properties of the hose liner

Determine the volume Resistivity of the hose liner per ASTM D257 or equivalent and the Dielectric breakdown strength of the hose liner per ASTM D 149 or equivalent and plot in the figure above. Hose liner material data to the left of the dotted line is acceptable. Hose liner material data to the right of the dotted line is questionable.

For questionable materials, determine the surface resistivity of the hose liner per ASTM D257 or equivalent, and calculate the applications parameters (maximum gas flow, the “liner path length” and the “wetted perimeter”). Based on these properties and parameters, is generating a potential charge that would exceed the dielectric breakdown strength of the hose liner previously determined a credible failure.

Please verify IEC 60993 and JIS K6911 are equivalent to ASTM D257.
Please verify IEC 60243 and JIS K6249 are equivalent to ASTM D149.
If they are equivalent, can we reference all of them?

Comment of Japan on 7.X

Methods for measurement shall be written in the clause 7. IEC standards are suitable for describing the methods for electric properties measurement. IEC 60093 for the method of volume resistivity and surface resistivity have changed to IEC 62631-3-1:2016 for volume resistivity and IEC 62631-3-2:2015 for surface resistivity. IEC60243 can be IEC60243-1 for dielectric breakdown voltage. Section 7.16 shall be written as follows;

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7.16 Electric properties

This test shall be applied to Type A and Type B hose lining materials, unless otherwise the electric properties are not available from the material manufacturers.

7.16.1 Dielectric breakdown voltage

When determined dielectric breakdown voltage of liner material in accordance with IEC60243-1, the product of dielectric breakdown voltage of liner material and liner thickness shall exceed 10kV, in order to be proof against the potential arose by static electricity.

7.16.2 Volume resistivity

When determined in accordance with IEC60243-1, volume resistivity of liner material shall not exceed $10^{15}\Omega$cm, in order to avoid charging static electricity.

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