



ISO/TC 197
Hydrogen technologies

Email of secretary: jim.ferrero@bnq.qc.ca
Secretariat: SCC (Canada)

ISO DIS 16111 (Ed 2) Collated Comments wuth resolutions

Document type: Other committee document

Date of document: 2018-02-13

Expected action: INFO

Background: Here are the collated comments from the DIS ballot complete with the resolutions from the WG 25 meeting in October 2017.

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

Template for comments and secretariat observations

Date:2018-01-27

Document: WG 25

Project: ISO 16111

MB/ NC ¹	Line number	Clause/ Subclause	Paragraph/ Figure/Table	Type of comment ²	Comments	Proposed change	Observations of the secretariat
US 001				ge	The flammability of the metal hydride should be considered	Please include text to address the flammability issues of metal hydrides and what safety steps should be considered to mitigate this concern	General information is already required in "7 Labelling" We propose to add in "8.1 Safety data sheet" the following sentence " Particular attention should be provided by the manufacturer about the flammability of hydride materials and must provide safety recommendation in case of metal hydride fire"
US 002				ge	Explosion Severity of Dust Cloud test could be performed to evaluate the material	The standard should include the following test for the metal hydride material: Explosion Severity of Dust Cloud test could be performed according to ASTM E 1226	The use of explosive hydride materials are forbidden in this standard.
GB 003		01	Scope	Te	The text says "25 MPa (250 bar)". ISO directives part 2 section 9.3 requires the use of SI units. Conversions from the SI unit pascals into bar adds clutter and is an insignificant benefit for a suitably qualified reader.	Replace "25 MPa (250 bar)" with "25 MPa". Replace "200 kPa (2 bar)" with "200 kPa".	OK
US 004		02			ISO 9809-2 referenced but not used	Delete	Modification of 5.3.1 "Shells designed and tested in accordance with ISO 11119-1 or ISO 11119-2 that use seamless steel liners conforming to ISO 9809-1 shall have a tensile strength less than 950 MPa." Changed to "Shells designed and tested in accordance with ISO 11119-1 or ISO 11119-2 that use seamless steel liners conforming to ISO 9809-1 shall have a

1 **MB** = Member body / **NC** = National Committee (enter the ISO 3166 two-letter country code, e.g. CN for China; comments from the ISO/CS editing unit are identified by **)

2 **Type of comment:** **ge** = general **te** = technical **ed** = editorial

Template for comments and secretariat observations

Date:2018-01-27

Document: WG 25

Project: ISO 16111

MB/ NC ¹	Line number	Clause/ Subclause	Paragraph/ Figure/Table	Type of comment ²	Comments	Proposed change	Observations of the secretariat
							tensile strength less than 950 MPa. Alternatively seamless steel liners conforming to ISO 9809-2 can be used if the compatibility to hydrogen is demonstrated.
US 005		02			ISO 11114-1, -2 used but not referenced	Add	We add the reference (Remark this reference is already missing in the original version)
JP1 006	1 Page 2	02		ed	ISO 14687 consists of -1, -2 and -3 at the present time, and the applicable standard to MH is ISO 14687-2, although unification process of ISO 14687-1, -2 and -3 is going on.	"ISO 14682, ..." shall be replaced by "ISO 14682-2, Hydrogen fuel – Product specification – Part 2: Proton exchange membrane (PEM) fuel cell applications for load vehicles".	The MH Assembly has lot of potential applications not only "Proton exchange membrane (PEM) fuel cell applications for load vehicles" as described in 14687-2 but also applications covered by 14687-1 or 14687-3, so we consider that general reference to 14687 is sufficient.
GB 007		03		Ge	Where possible use ISO/TC 58 gas cylinder terminology. For instance: Is there a reason "maximum developed pressure" is used in place of "developed pressure"? If so, consider indicating why this different term is needed....	Update terminology where possible.	MH Assembly needs to define MDP, which is specific to this kind of storage. The MDP Definition is added in this standard, for the rest the terminology is similar.
GB 008	8	03.01		Te	'...taken and held through the formation of bonding interactions within the bulk of the material'	Change to: '...taken and held through the formation of chemical bonds within the bulk of the material'.	Ok
US 009		03.04			Why call it a fuel cell cartridge and not a fuel cartridge? Why limit the cartridge use.	Delete cell from "fuel cell cartridge".	Ok (This definition was already in the original version)

1 **MB** = Member body / **NC** = National Committee (enter the ISO 3166 two-letter country code, e.g. CN for China; comments from the ISO/CS editing unit are identified by **)

2 **Type of comment:** **ge** = general **te** = technical **ed** = editorial

Template for comments and secretariat observations

Date:2018-01-27

Document: WG 25

Project: ISO 16111

MB/ NC ¹	Line number	Clause/ Subclause	Paragraph/ Figure/Table	Type of comment ²	Comments	Proposed change	Observations of the secretariat
GB 010	26	03.06		Te	'material capable of combining directly with hydrogen gas to form a reversible metal hydride.'	Change to: 'material capable of incorporating hydrogen into their atomic structure to form a reversible metal hydride.' OR 'material capable of reacting with hydrogen to form a reversible metal hydride.'	'material capable of combining directly with hydrogen gas to form a reversible metal hydride.' changed to 'material capable of reacting with hydrogen to form a reversible metal hydride.'
US 011		03.09		te	The proposed revision to the definition of MDP leaves ambiguity, whereas the previous definition was clear. Recommend using the definition as published previously. It is important the gas is at equilibrium.	maximum developed pressure MDP highest gas gauge pressure developed internal to an MH assembly at rated capacity under normal service conditions or normal operating conditions, whichever is greater. <u>highest gas gauge pressure for a MH assembly at rated capacity and equilibrated at the maximum service temperature</u> NOTE The MDP term was specifically selected for MH assemblies to avoid confusion with the MAWP and the service pressure used in other ISO International Standards.	The MDP definition was modified because inducing difficulties for reversible hydride working at high temperature. However the notion of equilibrium can be added. "highest gas gauge pressure developed internal to an MH assembly at rated capacity under normal service conditions or normal operating conditions, whichever is greater" Changed to "highest gas gauge pressure developed internal to an MH assembly at rated capacity and equilibrium under normal service conditions or normal operating conditions,

1 **MB** = Member body / **NC** = National Committee (enter the ISO 3166 two-letter country code, e.g. CN for China; comments from the ISO/CS editing unit are identified by **)

2 **Type of comment:** **ge** = general **te** = technical **ed** = editorial

Template for comments and secretariat observations

Date:2018-01-27	Document: WG 25	Project: ISO 16111
-----------------	-----------------	--------------------

MB/ NC ¹	Line number	Clause/ Subclause	Paragraph/ Figure/Table	Type of comment ²	Comments	Proposed change	Observations of the secretariat
							whichever is greater”
AR 012		03.10		Te	Metal hydride should be redefined to avoid to exclude elements that form hydrides like MgH ₂ for instance “solid material formed by reaction between hydrogen and hydrogen absorbing materials”	Rephrase definition as follows: “solid material formed by reaction between hydrogen and hydrogen absorbing alloy or element”	solid material formed by reaction between hydrogen and hydrogen absorbing materials See proposed modification in comment GB10
GB 013	26	04.02		Te	Should the manufacturer not also state the total weight or volume of the alloy material?	Change to: ‘The manufacturer shall state the rated capacity, total weight or volume of the MH assembly by units of mass of hydrogen.’	
JP2 014	11 Page 5	04.06		ed	ISO 14687 consists of -1, -2 and -3 now, and the applicable standard to MH is ISO 14687-2.	“ISO 14682” shall be replaced by “ISO 14682-2”.	See comment JP06
US 015		05.02.1		te	The proposed technical change deviates substantially from the language approved by the regulatory bodies. The new language limits a probation on dangerous materials to Type 2.1 flammable gases only, whereas the previous language matched the requirements in the UN Recommendations on the Transport of Dangerous Goods, for Type 1 Explosives (gaseous, liquids, and solids). Making this change in the text may cause a significant discrepancy between the requirements of this standard and the transport regulations, which take priority.	Revert to language in published standard for the second paragraph under section 5.2.1 General Hydrogen absorbing alloys and/or metal hydride materials that are classified as class 2.1 flammable according to the UN Recommendations on the Transport of Dangerous Goods shall not be used in an MH assembly. <u>Hydrogen absorbing alloys and/or metal hydride materials that are classified as Type I explosive according to the UN Recommendations on the Transport of Dangerous Goods shall not be used in a MH assembly.</u>	OK This is a Mistake in the DIS Version “Hydrogen absorbing alloys and/or metal hydride materials that are classified as class 2.1 flammable according to the UN Recommendations on the Transport of Dangerous Goods shall not be used in an MH assembly”. Changed to “Hydrogen absorbing alloys and/or metal hydride materials that are classified as Type I explosive materials according to the UN

1 **MB** = Member body / **NC** = National Committee (enter the ISO 3166 two-letter country code, e.g. CN for China; comments from the ISO/CS editing unit are identified by **)

2 **Type of comment:** **ge** = general **te** = technical **ed** = editorial

Template for comments and secretariat observations

Date:2018-01-27

Document: WG 25

Project: ISO 16111

MB/ NC ¹	Line number	Clause/ Subclause	Paragraph/ Figure/Table	Type of comment ²	Comments	Proposed change	Observations of the secretariat
							Recommendations on the Transport of Dangerous Goods shall not be used in a MH assembly"
JP3 016	27 Page 5	05.02.1		ed	This paragraph is described in order to exclude any explosive materials from hydrogen absorbing alloys and/or metal hydride materials for the MH assembly. "class 2,1 flammable" for flammable gas does not appropriate for the description of solid materials like hydrogen absorbing alloys.	"class 2,1 flammable" shall be replaced by "class 1 explosive" according to the UN Recommendations on the transport of Dangerous Goods.	See US15
CA 017		05.02.1		te	There is an error concerning the UN recommendations in this clause.	The second paragraph of cl 5.2.1 should read: Hydrogen absorbing alloys and/or metal hydride materials that are classified as Type I explosive materials according to the UN Recommendations on the Transport of Dangerous Goods shall not be used in an MH assembly.	See US 15
GB 018	27-8	05.02.1	Para. 2	Te	Class 2.1 is specific of gases, whilst class 4 is for flammable solids? There has been a further change in this issue between the 2008 version of the standard and the current DIS, i.e. metal hydrides that should not be used in MH assemblies in the 2008 standard were classified as Type 1 explosive materials whereas in this DIS this has changed to an exclusion for 'flammable'. Could the reason for this be explained please?		See US15
US 019		05.02.2			Do we need touch temperature limits and warnings?		This information is related to service condition Add warning on labelling
US 020		05.03.2b			Very confusing on system vs test pressure. In IEC 62282-3-100 we inserted a plot.	Insert a plot of system vs test pressure. See example below.	Insert a Plot

1 **MB** = Member body / **NC** = National Committee (enter the ISO 3166 two-letter country code, e.g. CN for China; comments from the ISO/CS editing unit are identified by **)

2 **Type of comment:** **ge** = general **te** = technical **ed** = editorial

Template for comments and secretariat observations

Date:2018-01-27	Document: WG 25	Project: ISO 16111
-----------------	-----------------	--------------------

MB/ NC ¹	Line number	Clause/ Subclause	Paragraph/ Figure/Table	Type of comment ²	Comments	Proposed change	Observations of the secretariat
GB 021	12-8	05.04	Note	Te	The manufacturer should have information or easily measure this. The lattice expansion by hydrogen inclusion and therefore the confined material expansion measurement should be provided as is important information to support the design of the shell.	Confined material expansion measurement should be provided.	No
US 022		05.05.3		te	The proposed revision creates confusion. By reverting to the published definition of MDP as proposed previously, the text is clearer as published.	<p>5.5.3 PRD activation temperature</p> <p><u>The temperature at which any thermally actuated PRD is set to activate shall be specified by the manufacturer and correspond to an equilibrium pressure inside the MH assembly of less than 1,25 times the MDP. In no case shall the temperature of actuation of a temperature-activated PRD result in an equilibrium pressure inside the MH assembly that exceeds the test pressure of the shell. The PRD shall have a pressure rating greater than the MDP at all temperatures less than or equal to 10 °C above the maximum service temperature.</u></p> <p><u>In no case shall the PRD activate at a temperature lower than the maximum service temperature.</u></p> <p>The temperature at which any thermally activated PRD is set to activate shall be specified by the manufacturer and correspond to an equilibrium pressure inside the MH assembly of less than 1.25 times the MDP. In no case shall the temperature of actuation of a temperature-activated PRD result in an equilibrium pressure inside the MH assembly that exceeds the test pressure of the shell. The PRD shall have a pressure rating greater than the MDP at all temperatures less than or equal to 10 °C above the maximum service temperature or operating temperature (whichever is higher). In no case shall the PRD activate at a temperature lower than the maximum service or operating temperature. 3</p> <p>NOTE Due to the MDP definition, an equilibrium pressure less than 1.25 times the MDP is compliant with 4.4.1.1 and 5.4, which respectively refer to the MDP assessment and the shell design. As an</p>	<p>the NOTE will be removed in the FDIS.</p> <p>“The temperature at which any thermally activated PRD is set to activate shall be specified by the manufacturer and correspond to an equilibrium pressure inside the MH assembly of less than 1.25 times the MDP. In no case shall the temperature of actuation of a temperature-activated PRD result in an equilibrium pressure inside the MH assembly that exceeds the test pressure of the shell. The PRD shall have a pressure rating greater than the MDP at all temperatures less than or equal to 10 °C above the maximum service temperature or operating temperature (whichever is higher). In no case shall the PRD activate at a temperature lower than the maximum service or operating temperature. 3</p> <p>NOTE Due to the MDP definition, an equilibrium pressure less than 1.25 times</p>

1 MB = Member body / NC = National Committee (enter the ISO 3166 two-letter country code, e.g. CN for China; comments from the ISO/CS editing unit are identified by **)

2 Type of comment: ge = general te = technical ed = editorial

Template for comments and secretariat observations

Date:2018-01-27	Document: WG 25	Project: ISO 16111
-----------------	-----------------	--------------------

MB/ NC ¹	Line number	Clause/ Subclause	Paragraph/ Figure/Table	Type of comment ²	Comments	Proposed change	Observations of the secretariat
						<p>immediate consequence, the pressure inside the MH assembly cannot exceed the test pressure of the shell at the temperature of actuation.</p>	<p>the MDP is compliant with 4.1.1 and 5.4, which respectively refer to the MDP assessment and the shell design. As an immediate consequence, the pressure inside the MH assembly cannot exceed the test pressure of the shell at the temperature of actuation.”</p> <p>Changed to “The temperature at which any thermally activated PRD is set to activate shall be specified by the manufacturer and correspond to an equilibrium pressure inside the MH assembly of less than 1.25 times the MDP. In no case shall the temperature of actuation of a temperature-activated PRD result in an equilibrium pressure inside the MH assembly that exceeds the test pressure of the shell. The PRD shall have a pressure rating greater than the MDP at all temperatures less than or equal to 10 °C above the maximum service temperature or operating temperature (whichever is higher). In no case shall the PRD activate at a temperature lower than the maximum service or operating temperature”.</p>
US		05.06			What does this section mean? The manufacturer		Same in the original version.

1 **MB** = Member body / **NC** = National Committee (enter the ISO 3166 two-letter country code, e.g. CN for China; comments from the ISO/CS editing unit are identified by **)

2 **Type of comment:** **ge** = general **te** = technical **ed** = editorial

Template for comments and secretariat observations

Date:2018-01-27

Document: WG 25

Project: ISO 16111

MB/ NC ¹	Line number	Clause/ Subclause	Paragraph/ Figure/Table	Type of comment ²	Comments	Proposed change	Observations of the secretariat
023					cannot insure this. The best that can be hoped for is that the manufacturers shall supply instructions.		To check if we can remove or modify
GB 024	12	05.09		Te	It is worth mentioning that metal hydride powders change size as they are cycled because the lattice expansion and compression can affect agglomerated small clusters. This could have an impact on the valve and any filter needed.	Add that metal hydride powders change size as they are cycled because the lattice expansion and compression can affect agglomerated small clusters.	This is considered especially in 6.2.6 test hydrogen cycling test.
US 025		06.01.6.3		te	Cycling testing has been eliminated for this draft. Even for a MH Assembly designed to be used in a single orientation, the MH assembly has to be transported to its location. It may also be moved. Therefore, all MH assemblies should undergo vibration testing to assure the integrity of the assembly.	<p>Restore vibration testing as a part of the cycle testing as follows:</p> <p>6.1.6.3 Test method</p> <p>For MH assemblies designed to be transported and used in a single orientation, at least five MH assemblies shall be tested in that orientation. For MH assembly designs that do not preclude use in more than one orientation, at least three MH assemblies shall be tested in two orientations perpendicular to each other, with the MH assembly axis horizontal and vertical. The MH assemblies shall be hydrogen charge cycled from not more than 5 % of rated capacity to not less than 95 % of rated capacity. The RCP shall be used for charging and the temperatures shall be held within the operating temperature range. The cycling shall be continued for at least 106 cycles and until the acceptable results defined in 6.1.6.4 are met. If the measured strain on consecutive cycles exceeds the design stress limit or plastic deformation of the shell material occurs, the testing shall be discontinued.</p> <p>As a minimum, a measurement from each strain gauge shall be recorded on every cycle while at the maximum charge condition.</p> <p><u>After the fifth complete cycle and then at intervals of not more than 50 cycles, with the MH assemblies charged to not more than 5 % of their rated capacity, each MH assembly shall be subjected to the following vibrational sequence while in the orientation for cycling:</u></p> <p><u>- A sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes. This cycle shall be repeated 12 times</u></p>	<p>Vibration phase has been kept in the procedure 6.2.6 . The only change to the original version , is that for one of the tested tank one tank will have no vibration but the other will have vibration :</p> <p>Example 1 orientation : 5 tank tested : 4 have vibration phase 1 not 2 orientations: 2 sets of 3 tanks are tested</p> <p>For one set two tanks have vibrations, one no vibration.</p> <p>So in that way we consider all cases.</p>

1 MB = Member body / NC = National Committee (enter the ISO 3166 two-letter country code, e.g. CN for China; comments from the ISO/CS editing unit are identified by **)

2 Type of comment: ge = general te = technical ed = editorial

Template for comments and secretariat observations

Date:2018-01-27	Document: WG 25	Project: ISO 16111
-----------------	-----------------	--------------------

MB/ NC ¹	Line number	Clause/ Subclause	Paragraph/ Figure/Table	Type of comment ²	Comments	Proposed change	Observations of the secretariat
						<p>for a total of 3 hours for each MH assembly. The logarithmic frequency sweep shall be as follows: from 7 Hz a peak acceleration of 1 gn shall be maintained until 18 Hz is reached. The amplitude shall then be maintained at 0,8 mm (1,6 mm total excursion) and the frequency increased until a peak acceleration of 8 gn occurs (approximately at 50 Hz). A peak acceleration of 8 gn shall then be maintained until the frequency is increased to 200 Hz.</p> <p>For MH assemblies with a mass greater than 100 kg, the following vibration sequence may be used as an alternative to the above sequence.</p> <p>- Simple harmonic motion with a vertical amplitude of 0,8 mm with a 1,6 mm maximum total excursion. The frequency shall be varied at a rate of 1 Hz/min between the limits of 10 Hz to 55 Hz. The entire range of frequencies and return shall be traversed in 95 min □ 5 min.</p>	
CA 026		06.02.2		te	<p>The fire test requirements are wholly inadequate. Not only is the test temperature condition undefined, but there is no consideration for a localized fire. Temperature and pressure readings are required, but there is no point measuring these values as there is no specification as to what is acceptable.</p> <p>What exactly does it mean to say “engulfing” fire? This term must be defined, otherwise a repeatable fire condition is not possible.</p>	<p>More closely define fire conditions such that a repeatable fire can be performed by different test laboratories. Factors to consider include the temperature of the fire, and the heat flux. Use the UN GTR 13 fire test requirements as guidance but adapt wording to consider irregular shapes.</p>	<p>The DIS version was not changed to the original version.</p> <p>However to add details about fire conditions we suggest to make reference to the bonfire conditions of the ISO standards used by the manufacturer in the shell design 5.3.</p> <p>“The bonfire test conditions should be in agreement with the one proposed in the ISO 11119-3 or equivalent”</p>
JP4 027	14-15 Page 11	06.02.2.3		ed	<p>The monitoring interval is described as “ ≤ 15s ” in ISO16111 (2008), not a fixed value such as “ at 15s ” in this draft. Interval shorter than 15s is considered to be acceptable for the fire test.</p>	<p>“ at intervals of 15s ” should be replaced by “ at intervals not more than 15s ”.</p>	<p>Ok “ at intervals of 15s ” changed to “ at intervals not more than 15s ”.</p>
US		06.02.2.4	Paragraph	te	<p>The statement “Any fuel may be used for the fire</p>	<p>Add a test provision that states: “The fire exposure</p>	<p>See CA026</p>

1 **MB** = Member body / **NC** = National Committee (enter the ISO 3166 two-letter country code, e.g. CN for China; comments from the ISO/CS editing unit are identified by **)

2 **Type of comment:** **ge** = general **te** = technical **ed** = editorial

Template for comments and secretariat observations

Date:2018-01-27

Document: WG 25

Project: ISO 16111

MB/ NC ¹	Line number	Clause/ Subclause	Paragraph/ Figure/Table	Type of comment ²	Comments	Proposed change	Observations of the secretariat
028					source, provided it supplies uniform heat sufficient to maintain the specified test conditions for a minimum of 20 min" does not fully establish the test requirements. It is possible to establish test conditions that are biased for successful performance. For example, if hydrogen is used as the exposing flame the low luminosity of the flame will limit heat transfer to the hydride container. If the test is then conducted in a location with limited thermal radiation reflection (e.g., unheated room in winter, cooled furnace walls, open environment on a cold night), the thermal radiation from the vessel to the environment will significantly reduce the thermal demand on the container.	shall produce and maintain a wall temperature in excess of 1000°C or a heat flux exposure of 120 kW/m ² for the duration of the required fire exposure. (Note: The values are consistent with the SFPE Guide for Fire Exposures to Structural Elements, page 68; and the SFPE Engineering Standard on Calculation Fire Exposures to Structures, paragraph 6.5.2.3.2.) If sacrificial cooling protection is provided (e.g., absorption of energy by conversion of bound water to steam) that lowers the exterior wall temperature, it shall be acceptable to demonstrate that the fire test exposure meets the wall temperature or heat flux criteria if the protective method were not present.	
CA 029		06.02.3		te	6.2.3 Initial burst tests for MH assemblies with an internal volume of 120 ml or less – the requirement does not define a rate of pressurization. The rate of pressurization is essential to ensure consistent results between test labs. A fast rate of pressurization results in artificially high burst results.	Limit rate of pressurization to not more than 3.45 bar/second, a value consistent with cylinder standards.	Ok we propose to add a limit rate of pressurisation at 345kPa/sec
AR 030		06.02.4.3		Te	As it is explained, the steel apex of the drop test obviously should be steel, but if not defining steel type, thickness, etc., the use of a thin sheet of ordinary steel is not excluded. Therefore, to avoid this, it is necessary to add some characteristics of the material used in the test	It is proposed to add the minimum thickness of the material as proposed by GB38, and/or to include a phrase that explains that the steel apex must maintain its structural integrity during and after the test, thus making it clear that it must be robust enough	No change with the Original version
US 031		06.02.4.5		ed	The text is confusing.	Revise as follows: 6.2.4.5 Blunt impact test for MH Assembly with mass greater than 25kg 19 The MH assembly designed and tested according to ISO 7866, ISO 9809-1, ISO 9809-3, ISO 11119-1, 20 ISO 11119-2, ISO 11119-3 having mass higher than 25kg shall be subjected to blunt impact testing in 21 accordance with 6.2.4.6.	OK

1 **MB** = Member body / **NC** = National Committee (enter the ISO 3166 two-letter country code, e.g. CN for China; comments from the ISO/CS editing unit are identified by **)

2 **Type of comment:** **ge** = general **te** = technical **ed** = editorial

Template for comments and secretariat observations

Date:2018-01-27	Document: WG 25	Project: ISO 16111
-----------------	-----------------	--------------------

MB/ NC ¹	Line number	Clause/ Subclause	Paragraph/ Figure/Table	Type of comment ²	Comments	Proposed change	Observations of the secretariat
						The MH assembly designed with proof of performance in accordance to ISO16528 shall be tested in accordance to the procedure of Type 1 and Type 2 following procedure described in 6.2.4.6 the 6.2.4.6 . The blunt impact test must be performed at the lowest shell thickness location.	
US 032		06.02.4.X		te	The new DIS differentiates some requirements for "Type 1 MH Assemblies" and "Type 2 MH Assemblies"; yet these are not well-defined.	Add definitions for the various Types of MH assemblies referred to in the document.	Type 1 and Type 2 are now well understood by tank manufacturers or notified bodies. And make reference to various design ISO Standard Add reference ISO 11119-1 and 2
CA 033		06.02.5		ed	For 6.2.5 Leak test, subclause 6.2.5.2.1 MH assemblies with internal volume greater than 120 ml, the statement " <i>The value of K is defined by the following equation: K should be the greater value of 6 or 15 times the internal volume of the shell (in litres/150)</i> " is not at all clear English	Clarify, or at least reword the sentence	The maximum volume of the tank is 150L this is why we have in the K definition Volume of the shell in liter /150 "The value of K is defined by the following equation: K should be the greater value of 6 or 15 times the internal volume of the shell (in litres/150" Changed to "The value of K is defined by the following equation: K should be the greater of 6 or 0,1 times the internal volume of the shell (in liter)"
CA 034		06.02.5.2.1		ed/te	Acceptance criteria for MH assemblies >120ml leak testing, is unclear relating to their definition of "K", and potentially allows for a very high leak rate if interpreted incorrectly	Reward the definition of K for clarity.	The greatest value between 6 or Shell volume in liter/150

1 MB = Member body / NC = National Committee (enter the ISO 3166 two-letter country code, e.g. CN for China; comments from the ISO/CS editing unit are identified by **)

2 Type of comment: ge = general te = technical ed = editorial

Template for comments and secretariat observations

Date:2018-01-27	Document: WG 25	Project: ISO 16111
-----------------	-----------------	--------------------

MB/ NC ¹	Line number	Clause/ Subclause	Paragraph/ Figure/Table	Type of comment ²	Comments	Proposed change	Observations of the secretariat
					<p>(whereas if it is interpreted the way I think it is intended, it is probably fairly reasonable). The total hydrogen leak rate shall be less than K standard cm³/h (standard conditions of 0 °C and 19 101,325 kPa absolute). If hydrogen gas is not used, the leak rate shall be converted into an equivalent hydrogen leakrate.</p> <p>The value of K is defined by the following equation: K should be the greater value of 6 or 15 times the internal volume of the shell (in litres/150)</p> <p>I believe this is supposed to mean either K should be 6 cm³/h, or 15x shell volume in litres? However, this would mean that a shell of just 1 litre internal volume would have an allowable leak rate of 15cm³/h, which seems quite high. That being said, the "(in litres/150)" in parentheses at the end of the definition could alternately imply that the allowable leak rate of a 1 litre shell would be 15x1/150 = 0.1cm³/h, defaulting the leak rate to 6cm³/h for any shell smaller than 60 litres, which I am guessing was supposed to be the intent? This would make the allowable leak rate for a 90litre shell to be 9cm³/h... IF this is the intent, then technically the statement is probably fine, but definition should be reworded for clarity.</p>		<p>That means for a volume of 1 liter you have to choose the greatest value between 6cm³/h and 15*1/150= 0.1 cm³/h</p> <p>So you have to choose 6</p>
GB 035		07.02.4		Te	<p>There should be a link or a mention made associating the temperatures and the equilibrium pressure intrinsic of the material. This should also address the Max operation pressures and maximum safety pressures mentioned in the standard. 6.2.5.1 Test procedure covers this for example. A metal hydride alloy heat of formation</p>	<p>Mention the association of temperature and the equilibrium pressure intrinsic of the material. Also address the Max operation pressures and maximum safety pressures mentioned in the standard. 6.2.5.1 Test procedure covers this for example. A metal hydride alloy heat of formation KJ/mol H₂ is enough for the trained eye to</p>	<p>This information seems related to MDP information</p> <p>The WG25 have for mission to revise the 2008 version, but to keep the scope and</p>

1 MB = Member body / NC = National Committee (enter the ISO 3166 two-letter country code, e.g. CN for China; comments from the ISO/CS editing unit are identified by **)

2 Type of comment: ge = general te = technical ed = editorial

Template for comments and secretariat observations

Date:2018-01-27

Document: WG 25

Project: ISO 16111

MB/ NC ¹	Line number	Clause/ Subclause	Paragraph/ Figure/Table	Type of comment ²	Comments	Proposed change	Observations of the secretariat
					Kj/mol H2 is enough for the trained eye to understand if is suitable for a car application. Material equilibrium pressures at -40C, 20C and 150 C should also be provided by manufacturer.	understand if is suitable for a car application. Material equilibrium pressures at -40C, 20C and 150 C should also be provided by manufacturer.	especially to exclude fixed on board fuelled vehicles so Car applications are excluded Why 150°C? 85°C is the maximum
GB 036		08.02.2.2		Te	The material will heat up during charging as covalent hydrogen bonds are made during the absorption process. This will depend on the absorption kinetics of the material, the amount of it and thermodynamic nature of the bonds. This could make a considerable temperature rise in some alloys.	Note that the material will heat up during charging as covalent hydrogen bonds are made during the absorption process. This will depend on the absorption kinetics of the material, the amount of it and thermodynamic nature of the bonds. This could make a considerable temperature rise in some alloys.	The temperature rises during charging. However if the temperature is higher to the temperature where absorption is possible at the refilling pressure, the absorption is stopped and the rising of temperature is stopped. So this rising is more or less selfcontrolled. To take care of this phenomenon the information is provided in the operating manual 8.2.1 (refilling condition) Warning on the labelling on the tank surface
** 037		1 Scope		Ed (conformity assessment issue)	The last sentence in the Scope is not allowed.	Delete the last sentence in the Scope. It is in conflict with the conformity assessment rules here: https://www.iso.org/foreword-supplementary-information.html	We have for mission to keep as it is the scope.
** 038		6 Inspection and Testing 6.01 General		Ed (conformity assessment issue)	1) 6.1 first sentence: Standards cannot mention that there is a need to comply with regulation as this is	1) Delete 6.1 first sentence 2) Delete 6.1, 2 nd paragraph, 2 nd sentence 3) Delete 6.1, NOTE	

1 **MB** = Member body / **NC** = National Committee (enter the ISO 3166 two-letter country code, e.g. CN for China; comments from the ISO/CS editing unit are identified by **)

2 **Type of comment:** **ge** = general **te** = technical **ed** = editorial

Template for comments and secretariat observations

Date:2018-01-27

Document: WG 25

Project: ISO 16111

MB/ NC ¹	Line number	Clause/ Subclause	Paragraph/ Figure/Table	Type of comment ²	Comments	Proposed change	Observations of the secretariat
					<p>given when a regulation exists</p> <p>2) 6.1, 2nd paragraph, 2nd sentence: If it is required by regulation in a country then it has to be done</p> <p>3) 6.1, NOTE: the NOTE contradicts the requirements</p>		
AR 039		All		Ed	Decimal point and comma are used not consistently in different parts of the document as decimal signs	Homogenize the use of one decimal mark only throughout the document	ok
US 040		Bibliography		ge	Include 19881	Please include ISO/DIS 19881: "Gaseous hydrogen – Land vehicle fuel containers"	Land vehicles used with hydride are excluded from the scope
GB 041	5	Introduction	Para. 1	Te	'One of these techniques employs the absorption of hydrogen into specially formulated alloys.'	Change to: 'One of these techniques employs the chemical absorption of hydrogen into specially formulated alloys.'	No reference to the process of absorption is necessary
GB 042	9	Introduction and throughout	Para. 1	Ge	Why 'MH assemblies' not MHA?	Change to: '...referred to as "metal hydride assemblies" (MHA)'. Change 'MH assemblies' to 'MHA' throughout.	Original version uses MH Assemblies, we keep it MH is well understood as Metal Hydride materials

D:\ISO\data\prod_iso_comment-collation\work\temp\ISO_DIS 16111 (Ed 2)_ANSI.doc: Collation successful

1 **MB** = Member body / **NC** = National Committee (enter the ISO 3166 two-letter country code, e.g. CN for China; comments from the ISO/CS editing unit are identified by **)

2 **Type of comment:** **ge** = general **te** = technical **ed** = editorial

Template for comments and secretariat observations

Date:2018-01-27	Document: WG 25	Project: ISO 16111
-----------------	-----------------	--------------------

MB/ NC ¹	Line number	Clause/ Subclause	Paragraph/ Figure/Table	Type of comment ²	Comments	Proposed change	Observations of the secretariat
------------------------	----------------	----------------------	----------------------------	---------------------------------	----------	-----------------	------------------------------------

D:\ISO\data\prod_iso_comment-collation\work\temp\ISO_DIS 16111 (Ed 2)_BSI.doc: Collation successful

D:\ISO\data\prod_iso_comment-collation\work\temp\ISO_DIS 16111 (Ed 2)_IRAM.docx: Collation successful

D:\ISO\data\prod_iso_comment-collation\work\temp\ISO_DIS 16111 (Ed 2)_ISO.doc: Collation successful

D:\ISO\data\prod_iso_comment-collation\work\temp\ISO_DIS 16111 (Ed 2)_JISC.doc: Collation successful

D:\ISO\data\prod_iso_comment-collation\work\temp\ISO_DIS 16111 (Ed 2)_SCC.doc: Collation successful

Collation of files was successful. Number of collated files: 6

SELECTED (number of files): 6

PASSED TEST (number of files): 6

FAILED TEST (number of files): 0

CCT - Version 4.0/2015

¹ **MB** = Member body / **NC** = National Committee (enter the ISO 3166 two-letter country code, e.g. CN for China; comments from the ISO/CS editing unit are identified by **)

² **Type of comment:** **ge** = general **te** = technical **ed** = editorial