

**Report of voting on ISO/DIS 15869-5**  
**Compilation of comments**

Date:2004-04-19	<b>ISO/TC 197 N 299 Annex B</b>
	Reference document: ISO_DIS_15869-5

1	2	(3)	4	5	(6)	(7)
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DE			ge	Germany objects to forward this draft for ISO/FDIS without substantial amendment. We recommend a careful review of the existing text, in particular under the aspect of a car manufacturers' view, and a second ISO/DIS- ballot of the amended text.		
DE			ge	Too less information available at the moment to publish a standard for H2 storage tanks, e.g. on 700 bar. Further investigation is necessary. Taking over knowledge from CNG up to 350 bar without checking applicability seems to be an unprofessional way. Harmonization with ECE draft regulations not guaranteed, as these documents could be significantly changed in the future.	Postpone publication of the standard.	
FR			ge	We consider that this document shall cover not only tanks on vehicles but complete high pressure hydrogen system. With components as valves, pressure relief devices, connecting devices .. The EIHP document is considering that this way (here above) should be followed.		
NO			Ge	Part 5 of ISO/DIS 15869 must be seen in relationship with part 1 – 4, so they follow the same progress.		
**	General		ed	As specific clauses of norm refs are cited in text, these are correctly given as dated refs in clause 2 but are not always correctly cited as dated refs in text. See ISO/IEC Directives Part 2, 2001, 6.6.7.5.3.		Please use correct format for citing dated refs. in text. For this purpose, the year of publication of the various parts of ISO 15869 can be given as 2004.
SE	General		ge	The DIS varies from the harmonised technical requirements agreed at the joint GRPE/ISO meetings in 2002 & 2003 in a number of aspects and without discussion in the appropriate TC197 working group. A joint GRPE/ISO meeting to be held to discuss the variations.		
SE	General		te	At the joint GRPE/ISO meetings in 2002 & 2003 the term nominal working pressure was agreed as a more accurate description than working pressure together with	Change "working pressure" to "nominal working pressure"	

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				representatives from SAE. The use of "nominal" was intended to clarify that it does not represent the maximum in service pressure experienced by a component and to avoid misinterpretation used in other key standards. Pressure definitions must be standardised and acceptable.		
FR	Scope		ge	We request, as agreed on EIHDP draft, that removable cylinder assembly should be also considered in the document. This approach is indeed innovating and interesting in captives fleet	Scope ...as fuel for land vehicle with fixed or removable tanks.	
UK	Table A		TE	There is a need to remove any ambiguity with what constitutes a minor change and the affect of changing two parameters e.g. length and diameter.	Add further clarification	
UK	Title		ED	Spelling mistake	Change "vehicule" to "vehicle"	
US	TITLE		ed	Spelling error	Change vehicule to vehicle	
US	TITLE		ge	Word selection and alignment to other hydrogen documents	Change tanks to containers	
SE	Cover page & heading on Page 1	Main heading	ed	i) Vehicle spelt incorrectly ii) -	i) Change "vehicule" to "vehicle" ii) Change "with metal liner" to "with a metal liner"	
**	2		ed	Pls use correct fixed introductory text to norm refs. See Directives Part 2, 6.2.2.		
**	2		ed	In 5.2, ASTM D 3418-97 is cited normatively.	Pls list ASTM D 3418-97 in Clause 2	
US	5.1		te	In contact with what? Under what conditions?	Change to read: The design shall not have <del>incompatible</del> materials in contact with each other that are incompatible under expected operating conditions or when exposed to the solutions described in C.10 of Part 1.	
UK	5.5		TE		Materials should be compatible with ISO 11114-4	
US	6.1		te	The standard states that "The design shall ensure a leak before break failure mode under feasible degradation of	Provide specific tests and methodologies to ensure that this requirement is met.	

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				pressure parts during normal service." There is no definition of what degradation is to be considered or what is normal service and no guidance is given as to how to carry out this requirement.		
FR	6.3		te	We do recommend that the value of burst pressure to working pressure made on type agreement should be confirmed by test made on batch test. This should be done to keep an homogeneity of performance.	The metal tank shall have a minimum actual burst pressure of 2.25 time working pressure, at time of type approval. For batch the actual burst pressure shall be ≥ to the minimum value obtained at time of type approval.	
DE	6.3			At the moment there is no scientific basis for burst pressure ratios for high pressure composite vessels (e.g. 700 bar). More investigation is necessary. We propose to set requirements only with an existing scientific rationale.		
UK	6.3		TE	This is a performance based standard, so the burst test is sufficient	Remove all references to "Stress Ratios"	
US	6.3	Table 1	Te	Reduce stress ratio requirements. The proposed values are incorporated in ANSI/CSA NGV2 and in use for over 10 years, and have proven safe in service. CNG service in the US has been with a 21C reference temperature. The specific stress ratios and reference temperature for hydrogen were discussed in the U.S. NGV2/HGV2 is now using these stress ratio values for hydrogen service with a 15C reference temperature. Note that the pressure increase vs. temperature for hydrogen is lower than that for natural gas, for which the higher stress ratios were developed. Also note that the minimum burst pressure would drop accordingly. The 2.25 minimum burst ratio is currently allowed in ISO 15869-2. Similar changes to stress ratio requirements need to be made to ISO 15869-3 and ISO 15869-4	Change the stress ratio for glass fiber from 3.65 to 3.5. Change the stress ratio for aramid fiber from 3.10 to 3.0. Change the stress ratio for carbon fiber from 2.35 to 2.25. Change the minimum burst pressure for glass fiber tanks from 3.65 to 3.5. Change the minimum burst pressure for aramid fiber tanks from 3.1 to 3.0. Change the minimum burst pressure for carbon fiber tanks from 2.35 to 2.25. Note: similar changes need to be made to ISO 15869-3 and ISO 15869-4.	
US	6.3		ed	Make it clear that verification of stress ratio may also be done by calculation.	Change to read: Verification of the stress ratios may <del>also</del> be performed <u>by calculation or</u> using strain gauges. An	

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UK	7.3		ED	Lack of consistency with part 4.	acceptable method <a href="#">for using strain gages</a> is outlined in ISO 15869-1, Annex A.	
UK	7.4 last para.		TE	Further clarification is required of "The coating shall be designed to facilitate subsequent in-service inspection...." It is not realisable to remove all coatings.	Add "the maximum curing time and temperature shall not adversely affect the liner, resin and fibre properties"	
SE	8.1		te	The DIS varies from the harmonised technical requirements agreed at the joint GRPE/ISO meetings in 2002 & 2003 by not including prototype tests for: i) Resin: Glass transition temperature ii) Coatings iii) Leak test	Re visit	
UK	8.1.4		TE	not realisable in practice	Add requirements as appropriate (see proposed changes to ISO15869-1). i) Resin: Glass transition temperature: Three samples shall be tested in accordance with ISO 15869-1, clause C.7 and shall meet the requirements therein. ii) Coatings: Where exterior environmental protective coating is used, e.g. organic coating/paint, samples shall be tested as specified in ISO 15869-1, clause C.7 and shall meet the requirements therein. iii) Leak: One finished tank shall be tested as specified in ISO 15869-1, clause C.16 and shall meet the requirements therein.	
UK	8.1.5		TE	This is a performance based standard, so reference to stress ratios is not appropriate	Remove paragraph	
FR	8.1.10		te	In case of plastic liners we should take into account the full range of temperature which can be reached during filling.	Remove "and in no case be less than the value necessary to meet the stress ratio requirement of 6.3"	

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KATS	8.1.10	title	ed	The term of "test" should be added to the title as in other titles.	Extreme temperature pressure cycling test.	
KATS	8.1.11	title	ed	The term of "test" should be added to the title. as in other titles	Rein shear strength test	
SE	8.1.11		te	The DIS varies from the harmonised technical requirements agreed at the joint GRPE/ISO meetings in 2002 & 2003.	Change "One sample coupon...." to "Three sample coupons....."	
SE	9.2		te	The DIS varies from the harmonised technical requirements agreed at the joint GRPE/ISO meetings in 2002 & 2003 by not requiring leak and boss torque tests.	Add new paragraph: "A further tank shall be subjected to a boss torque test as specified in ISO 15869-1, clause C.4, followed by the additional periodic ambient temperature cycling test specified in 9.3, followed by a leak test as specified in ISO 15869-1, clause C.16 and shall meet the requirements therein."	
UK	9.2 para. 1		TE	This is a performance based standard, so reference to stress ratios is not appropriate	Remove "and in no case be less than the value necessary to meet the stress ratio requirement of 6.3"	
UK	9.2 para. 2		GE	This section is confusing, there is a need to differentiate between test on the liners and test on the completed tanks.	Re visit wording.	
UK	9.3		TE	it should not be necessary to have higher cycle life requirements for longer test cycle. Appropriate SPC techniques should be agreed with the verification body.	Re visit	
DE	9.3 a			Why a leak test (C.16) following the pressure cycling test is only required for Type IV tanks?	Include a leak test in Part 4, 9.3a.	
SE	10	b)	te	The DIS varies from the harmonised technical requirements agreed at the joint GRPE/ISO meetings in 2002 & 2003. Add thread details.	Change to "to verify the critical dimensions, thread details and mass....."	

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SE	10	f)	te	<p>All produced containers of any type are hydraulically tested to 1.5 times working pressure. In our view, there is no need to expose all "Type 4" containers to an additional leak test, which is very cost- and safety demanding due to the presence of high-pressure test gas.</p> <p>Generally, the design performance of any container type is demonstrated by the approval tests. Once approved, it is basically the manufacturer's responsibility to guarantee the performance of each container made.</p> <p>"Type 4" containers differ from other types of containers in that their design must make sure that no leakage is possible between the liner (non-metallic) and the boss (metallic). Unlike other container types, a "Type 4" design must therefore meet the requirements of a leak test, a boss torque test and a hydrogen gas cycling test to get approved.</p> <p>A possible leakage between the boss and the container valve is another concern, which actually relates to all container types. This must be dealt with through a separate test of the complete gas storage assembly, which is not within the scope of this standard. And if it was, such a test should be made on all containers of any type, not exclusively to "Type 4" containers.</p>	<p>Delete par. 10 f).</p> <p>(Discussion: It may be necessary to insert the leak test as a new paragraph 8.1.x (prototype test). On the other hand, both the boss torque test and the hydrogen gas cycling test already require the leak test to be performed.)</p>	
US	10	a)	ed	<p>The word "defect" is problematic when it is used to describe anomalies in materials. If we talk about defects with certain dimensions being acceptable, that puts us in the position of permitting tanks to be manufactured with defects... a not very popular position to be in when trying to describe how this is all OK to the public. The word "discontinuity" is preferred. When a discontinuity exceeds the permitted size, then it becomes a defect.</p>	<p>Consider using "discontinuity" in place of "defect" where the term is used in this standard.</p>	
US	10	(a)	te	<p>It is stated that the maximum defect size present is smaller than the size specified in the design. No procedure or methodology is provided to define the specified defect size and each manufacturer can define a different size for</p>	<p>A uniform and adequate procedure must be defined to determine the maximum allowable defect size.</p>	

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UK	10 (b)		ED	essentially the same cylinder.		
NO	10 f)		te	All produced containers of any type are hydraulically tested to 1.5 times working pressure. In our view, there is no need to expose all "Type 4" containers to an additional leak test, which is very cost- and safety demanding due to the presence of high-pressure test gas. Generally, the design performance of any container type is demonstrated by the approval tests. Once approved, it is basically the manufacturer's responsibility to guarantee the performance of each container made. "Type 4" containers differ from other types of containers in that their design must make sure that no leakage is possible between the liner (non-metallic) and the boss (metallic). Unlike other container types, a "Type 4" design must therefore meet the requirements of a leak test, a boss torque test and a hydrogen gas cycling test to get approved. A possible leakage between the boss and the container valve is another concern, which actually relates to all container types. This must be dealt with through a separate test of the complete gas storage assembly, which is not within the scope of this standard. And if it was, such a test should be made on all containers of any type, not exclusively to "Type 4" containers.	Replace "any" with "the"  Delete par. 10 f).  (Discussion: It may be necessary to insert the leak test as a new paragraph 8.1.x (prototype test). On the other hand, both the boss torque test and the hydrogen gas cycling test already require the leak test to be performed.)	
SE	Annex A	A.1	te	A change of plastic liner, fibre and resin material is permitted but appears not to require any material tests on the new material.	Add a new column "M" with an "x" in the row for plastic liner material, fibre material and resin material. Add a new note "M is the material tests described in 8.1.1, 8.1.2, 8.1.2.1 and the tests in comment 7 above for resins and fibres] as appropriate."	
SE	Annex A	A.1	te	Changes in other factors than the type of pressure relief device may affect performance in the bonfire test.	Change final row "Pressure relief device" to "Fire protection system or pressure relief device or pressure relief device location"	

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SE	Annex A	A.1	te	The DIS varies from the harmonised technical requirements agreed at the joint GRPE/ISO meetings in 2002 & 2003. Add requirement for LBB test for change of fibre manufacturer and fibre material.	Add "x" to Column L on fibre manufacturer and fibre material rows.	
US	Annex A	Table A.1	Ed	Clarify note "a".	a) Only when thickness changes proportional to diameter and/or pressure change, <u>otherwise, qualify as a new design.</u>	