Compilation of comments received on ISO/CD 26142

Date:2007-05-29	ISO/TC 197 doc. **N 368 Annex 1**
	Reference Document: ISO/TC 197 doc. **N 364**

1	2	(3)	4	5	(6)	(7)
MB[1]	**Clause No./ Subclause No./ Annex** (e.g. 3.1)	**Paragraph/ Figure/ Table/ Note** (e.g. Table 1)	**Type of comment**[2]	Comment (justification for change) by the MB	Proposed change by the MB	**Secretariat observations** on each comment submitted
CH	General		ge	No comments		
DE	General		ge	No comments		
DK	General		ge	ISO committee ballot on Committee Draft ISO/CD 26142 with closing date 2007-05-08. For the sake of good order we would like to cast the vote of the Danish NC. We are in favour without any comments.		
ES	General		ge	No comments		
FR	General		ge	No comments		
IN	General		ge	ISO/TC 197/ CD 26142 Approved		
IT	General		ge	We would recommend to consider carefully the opportunity of a deeper co-operation with IEC/TC 31, this in order to avoid any possible contradiction and/or overlapping with the existing standards on gas detectors, in particular IEC 60079-29-1. By the way, reference on the issue for further questions could be made to the Italian expert within the "drafting group".		The leadership of ISO/TC 197 is discussing cooperation mechanism with the leadership of IEC/TC 31. It is important to note that the WG13 was formed following proper ISO NWI process by ISO/TC 197 and that the ISO Central secretariat is fully aware of the situation.
KR	General		ge	The KATS approves the proposal for a new title and scope.		
NL	General		ge	We vote approval, no comments at N364 - ISO/CD 26142		
RU	General		ge	No comments		
SE	General		ge	No comments		

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US	General		ge	Consistent with the U.S. vote for this work item, general consensus is that if existing standards are incomplete, revising existing standards is a better approach than generating a new competing document.	Consider giving work to IEC/TC 31 to incorporate in their already existing standards.	The leadership of ISO/TC 197 is discussing cooperation mechanism with the leadership of IEC/TC 31. It is important to note that the WG13 was formed following proper ISO NWI process by ISO/TC 197 and that the ISO Central secretariat is fully aware of the situation.
AT	General	items	GE		In case of items finish sentences by "." or ";", and start the first word of a sentence with upper case letters.	
US	General		Ge	This is strictly a performance standard that does not address reliability that is necessary.	We suggest that the standard reference ISA 8401-2004 (AKA as IEC 61508): "FUNCTIONAL SAFETY – SAFETY INSTRUMENTED SYSTEMS FOR THE PROCESS INDUSTRY SECTOR," and that the detection apparatus manufacturer be required to determine and specify the Safety Integrity Level (SIL) as defined in ISA 8401. This requirement, which should be applicable to the Software description in Annex C as well as the main body of the standard, would require a formal reliability evaluation and specification without setting some arbitrary and potentially controversial minimum quantitative reliability. Another solution is as follows: Reliability –a reliability analysis be conducted on the devices as outlined in UL 2075. See excerpts from UL 2075 below: Per UL 2075, Section 4: "The maximum failure rate for an alarm, detector assembly or circuit shall be 4.0 failures per million hours as calculated by a full part stress analysis prediction per Section 2.0 of MIL-HDBK 217F or	

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					3.5 failures per million hours as calculated by a simplified parts count reliability prediction as described in Appendix A of MIL-HDBK 217F, or equivalent. A 'ground fixed' (GF) environment is to be used for all calculations. When actual equivalent data is available from the manufacturer it is not prohibited that it be used in lieu of the projected data for the purpose of determining reliability." And "The maximum failure rate for a sensor or individual component is 2.5 failures per million hours as calculated by a full part stress analysis prediction as described in Section 3.4 of MIL-HDBK 217F or equivalent. A 'ground fixed' (GF) environment is to be used for all calculations. When actual equivalent data is available from the manufacturer it is not prohibited that it be used in lieu of the projected data for the purpose of determining reliability." UL 2075 Supplement SA – *Reliability and Failure Rate Determination* provides guidance as well regarding evaluating the reliability of the device.	
AR	Title		Te	We agree with the proposed change in title	Accept proposed new title	

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CA	Introduction	Last paragraph above the Note	Te	It is important to clearly articulate specific features of the developed Standard – features that are not contained in other similar standards being currently developed by IEC TC 31. Both special requirements as well as a different approach need to be stated.	Replace the last paragraph above the Note with the following: "This standard concentrates its attention on specific requirements related to performance and testing of hydrogen detection apparatus such as specific detection range for single and multiple safety systems, selectivity, poisoning, and hydrogen-specific test methods needed by the hydrogen energy industry. This standard focuses primarily on stationary hydrogen technologies whose main purpose is to produce, store and handle hydrogen and not on systems that may generate hydrogen as an undesirable by-product. The purpose of a hydrogen detection apparatus under this standard is to mitigate risk from unintended hydrogen releases within a wide range of hydrogen concentrations including those exceeding low flammability limit."	
CA	Introduction	Note, bottom of page	Te	For risk mitigation purposes, it is important to monitor hydrogen concentrations not only below LFL but also exceeding LFL (e.g. in the case when the applied mitigation measures fail to stop hydrogen release), since a real hazardous situation can be expected from hydrogen concentrations above 8% vol. (e.g. sustained combustion).	Add at the end of the Note: "Monitoring hydrogen concentrations exceeding low flammability limit may become a recommended practice as a risk mitigation measure since timely facility evacuation may substantially reduce consequences of an unintended release in the case when applied mitigation measures fail to stop this release and ignition sources cannot be isolated."	

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US	Introduction	Para 2	te	This standard primarily is intended for hydrogen detection apparatus at vehicle refueling stations, where a high level of safety management is required, since it is the sector that has immediate need for this document and is expected to be the main application for such apparatus, but may be applied to other stationary installations where the detection of hydrogen is required. This statement presupposes that only sensors using this technology can be used in this application. This statement has the potential of generating anti-trust issues.	Delete implication that this is for catalyzed sensors.	
US	Introduction	Paragraph 2/ 3rd sentence	ge	What does this mean?	Suggest improving this sentence.	
US	Introduction	Paragraph 3/ 1st sentence	ed	Grammatical corrections.	By ensuring the safety with quantitative and technical specification against the danger of hydrogen leakage, well-developed hydrogen infrastructures will encourage the economics of hydrogen, lowering the cost of insurance and infrastructure in buildings, and safe operation of the station or system will appeal to the public.	
US	Introduction	Paragraph 3/ 2nd sentence	ed	Grammatical corrections.	The document will promote international cooperation under easy-to-understand requirements, in leading to widespread use of hydrogen energy.	
US	Introduction	Paragraph 5/ 2nd sentence	ed	Grammatical corrections.	It is necessary to present a revised or new standard for hydrogen detection apparatus that is practically usable for safety applications specifically for hydrogen gas.	

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US	Introduction	Para 5	ed	Even though there are many inflammable gas detectors available commercially, the current standards covering gas detection apparatus in accordance with the codes of electricity are not specific enough for the infrastructure of hydrogen safety. It is necessary to present a revised or new standard for hydrogen detection apparatus that is practically usable for safety applications specifically for hydrogen energy. This statement is confusing. What are the "Codes of Electricity"? The term "national electric codes" may be what is intended. In the US, the NEC is actually a model code and is usually adopted as part of the construction codes (fire, plumbing, building, fuel gas....) IEC 60079? NFPA 70?	Rephrase the statement to clarify the intent of the statement.	
US	Introduction	Para 6	ed	Hydrogen related facilities will be required to have the ability to detect hydrogen concentrations before a certain low concentration of hydrogen or fraction of flammable limit is reached, in order to allow for single and/or multilevel safety operations such as nitrogen purging or ventilation and/or system shut-off. This statement is an assumption. The requirements for sensors is the purview of the code official, not the product standard authors.	Amend the statement to "It is assumed that.." or "It would be prudent for …"	
US	Introduction	All	te	While the title of this standard, "Hydrogen detection apparatus" implies it is a performance standard only the introduction and scope say it is for safety. Actually the seem to indicate the standard is for both performance and safety. However, the standard contains requirements and tests only for performance. Not even the basic electrical safety tests of other product standards like IEC 60950-1 or IEC 61010-1 are included or referenced. Also missing are the requirements and tests of general safety standards such IEC 60204-1, IEC 61508, and IEC 62061. At the very least a safety standard for equipment with electrical contacts used for safety should reference IEC 60947-5-5	Introduction For several years, significant international efforts have been initiated for the development of necessary codes and standards required for the introduction of hydrogen energy systems in consumer environments. Such codes and standards usually require a ~~safety~~ system to detect hydrogen concentrations before a fraction of the flammable or explosive limit is reached~~, in order to allow for purging, shut-off, and similar safety operations..~~ This standard will provide requirements for	

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				safety should reference IEC 60947-5-5. At present this appears to be a performance standard only. Recommend removing all implications that this is a safety standard and add text to clearly indicate that this is not a safety standard and that sensors that comply with this standard are not necessarily adequate for safety applications. (Please note that we have used Microsoft Word's Track Changes feature to indicate proposed changes in column 6.)	stationary hydrogen detection apparatus, covering both performance requirements and test methods. This standard is intended to cover situations where the user desires the ability to detect hydrogen leaks and monitor hydrogen concentrations ~~relevant to safety.~~ It does not apply to methods of hydrogen detection that do not allow for monitoring hydrogen concentrations. This standard is primarily intended for hydrogen detection apparatus at vehicle refueling stations~~, where a high level of safety management is required~~, since it is the sector that has immediate need for this document and is expected to be the main application for such apparatus, but may be applied to other stationary installations where the detection of hydrogen is required. By ensuring the ~~safety~~ performance of hydrogen detection apparatus with the quantitative and technical specification ~~against the danger of hydrogen leakage,~~, well-developed hydrogen infrastructures will encourage the economics of hydrogen, lowering the cost of insurance and infrastructure buildings, and ~~safe operation of the station or system~~ will appeal to the public. The document will promote international cooperation under the easy-to-understand requirements, leading to widespread use of hydrogen energy. ~~Benefits to be gained by the implementation of the proposed hydrogen detection apparatus standard include:~~ ~~- Using the specification in the standard to establish common rules concerning the safe use and inspection of hydrogen related facilities in different countries and activating new participation from other countries.~~ ~~- Using the performance requirements in the~~	

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					~~standard to overcome safety concerns and aiding in development of the hydrogen fuel infrastructure.~~ Even though there are many inflammable gas detectors available commercially, the current standards covering gas detection apparatus in accordance with the codes of electricity are not specific enough for the infrastructure of hydrogen ~~safety~~. It is necessary to present a revised or new standard for hydrogen detection apparatus that is ~~practically usable for safety applications~~ specific~~all~~y for hydrogen energy. NOTE: Hydrogen related facilities ~~will~~ may be required to have the ability to detect hydrogen concentrations before a certain low concentration of hydrogen or fraction of flammable limit is reached~~, in order to allow for single and/or multilevel safety operations such as nitrogen purging or ventilation and/or system shut-off.~~ Hydrogen detection apparatus described in this standard can detect the hydrogen leak concentration at ~~multi-~~multiple points as determined by the users ~~to realize the multilevel safety operations~~.	
US	Scope	All	te	See comment regarding the Introduction. And, this standard does not contain any specific routine tests (for mass production) and is not likely to be suitable for certification purposes. (Please note that we have used Microsoft Word's Track Changes feature to indicate proposed changes in column 6.)	1 Scope This international standard defines the performance requirements and test methods of stationary hydrogen detection apparatus that is designed to measure and monitor hydrogen concentrations. ~~The provisions in this standard cover the hydrogen detection apparatus used to achieve the single and/or multilevel safety operations such as nitrogen purging or ventilation and/or system shut-off corresponding to the hydrogen concentration. The requirements applicable to the control system as well as the installation requirements of such apparatus are excluded.~~ This standard sets out	

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					only the requirements applicable to a product standard of hydrogen detection apparatus, such as precision, response time, stability, measuring range, selectivity, and poisoning. This standard does not consider safety requirements for hydrogen detection apparatus nor their use in safety related systems.	
AR	1		Te	We agree with the proposed change in the scope	Accept proposed change in the scope	
US	1		te	The scope should be worded as to exclude hydrogen detection (or measurement) instruments incorporated into closed systems where hydrogen is present such as recirculation loops in hydrogen fuel cell systems.	Add," This standard is not applicable to hydrogen detection or measuring apparatus intended to measure hydrogen concentrations within a closed system or process."	
US	2	Entry 1	ge	Why is this document referenced? Are the sensors to only be used with hydrogen grades in this document? Does anyone presently purchase hydrogen to this product standard? ISO 14687 Grade A fuel may poison some types of sensors, and would poison fuel cell vehicles, if used for refueling vehicles.	Delete this reference. It is poor practice for one product standard to reference a second product standard without a specific use. Clause 6.5.13 does not count. Is ISO 14687 Grade A available or sold any where? Suggest using analytical grade of hydrogen that the quality exceeds 9999.	
US	3.1		ed	alarm set point - fixed or adjustable setting of the apparatus that is intended to preset the level of concentration at which the apparatus will automatically initiate an indication, alarm or other output function What is meant by "preset the level of concentration"?	Replace with "select the concentration level".	
US	3.2	Ambient Air	te	Ambiguous, what is normal for Miami is not normal for Denver	Define T, P, & RH.	
US	3.4		ed	clean air - air that is free of flammable gases and interfering or contaminating substances and dust Grammar...	air that is free of flammable gases, interfering or contaminating substances, and dust	

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US	3.12		ed	Latching - once activated, requires deliberate action to be deactivated This statement is confusing.	Amend the statement to "A function that…"	
US	3.13		ed	measuring range - range of values defined by the two extreme values within which a variable can be measured within the specified accuracy grammar	Replace with "between".	
AR	3.16		Ed	The definition of poisoning could be written in a better way: poisoning any interferant that permanently affects the sensitivity of a sensing element	Re-write definition as follows: poisoning damaging condition caused by any interferant that permanently affects the sensitivity of a sensing element	
JP	3.20		ed	Prevent any confusion among hydrogen sensor in a hydrogen detection apparatus, remote hydrogen sensor, hydrogen sensor, and hydrogen sensing element.	at the hydrogen sensor inlet ->at the inlet of the remote hydrogen sensor or the hydrogen detection apparatus which has built-in hydrogen sensor(s)	
US	4.1.1		ge	Does this document only intend to cover hazardous area locations? What about non-classified (normal) locations?	Add," In non-classified locations relevant electrical standards apply."	
US	4.1.1		te	Complying with Parts 1,2,7,11,15 and 18 of IEC 60079 could and most likely would be conflicting.	The hydrogen detection apparatus shall comply with Parts 0, 1, 2, 7, 11, 15 and 18 of IEC 60079 as applicable in its explosion protection method, materials, construction, and test for the hazardous area classification of its intended usage.	
US	4.1.4		ge	Is it the intent of this standard to exclude apparatus that do not have discrete alarm outputs? Many apparatus have continuous analog or digital signals corresponding to hydrogen concentration, e.g.0 to 5 V = 0 to 5 %H2, and the output is used in by larger system to control related safety equipment, e.g. fans, audible alarms, etc.	Add section ," A continuous signal, either digital or analog, that is proportional to hydrogen concentration may be generated to accomplish the the safety functions of the overall system wherin the apparatus is installed."	

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US	4.1.4.1		ge	Alarm devices shall be of a latching type requiring a deliberate manual action to reset. If two or more sets of alarm positions are provided, the lower may be non-latching based on user preference. While the alarm condition is still present, any alarms except for optional audible alarms shall remain in operation. Any optional visible alarms shall be in red. Unless a low- concentration alarm threshold (0,25 LFL or less) is established, no alarm set-points at higher than 0.25 LFL shall be possible. This requirement presupposes the model code requirements. Additionally, the grammar is somewhat confusing.	Replace with "the device shall have at least one alarm point set at the detection level stipulated in the local model codes or regulations." We intentionally did not stipulate which alarm point, that would presuppose the integration of the device into the application. Clarify sentence intent and consider multiple set points. We recommend the standard requires adherence with the limits indicated by the manufacturer, which should be within the national or regional code requirement limits. Per UL 2075, 16: "A detector or sensor shall operate for all conditions of its intended performance, at all sensitivity settings, when energized from a source of rated voltage, under all conditions covered both in the installation instructions and in any supplementary information provided by the manufacturer. Detectors or sensors with alarm capabilities shall consistently alarm at levels within 5 percent of the gas concentration levels specified by the manufacturer's installation and operation instructions. For multiple station alarm units, the activation of ones station's alarm shall result in the actuation of all connected alarms with the initiating alarm being uniquely identified."	

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JP	4.1.4.2		te	This clause is not for the internal wiring between a hydrogen sensor and the hydrogen detection apparatus but for the external connection among a remote hydrogen sensor, and the hydrogen detection apparatus or other systems that the signal from the hydrogen detection apparatus is sent to.	All of the sentences in this clause should be changed as follows: A fault signal shall be provided in the event of failure of power to the hydrogen detection apparatus, or loss of continuity in one or more of the wires to any remote hydrogen sensors. A short circuit or open circuit in the connection to any remote hydrogen sensor shall be indicated by a fault signal. An aspirated hydrogen detection apparatus shall indicate the adequacy of flow conditions and produce a fault signal in the event of a flow failure.	
US	4.1.5.1		ed	Assumed a visual indicator is desired.	"Detector shall provide a visual power indicator…"	
JP	4.2		ed	For d), My understanding is that 'a code or number or a combination thereof that identifies the unit to be unique and different from any other; ' is the definition of the meaning of 'serial number'. Is that right?		
AT	4.3	1st paragraph	TE	Each hydrogen detection apparatus shall be provided with an instruction manual that includes the following information: a) complete instruction, … b) recommendations …	Item a) covers all following listed items. Each hydrogen detection apparatus shall be provided with an instruction manual that includes the complete instruction manual, drawings and diagrams for safe and proper operation, installation and servicing of the hydrogen detection apparatus: a) recommendations for initial checking …	
US	4.3	e)/ 8)	Ge	What does this mean in the context of a fueling station apparatus? Is this for aspirated only?	Add aspirated: sample flow rate (aspirated)	
US	5		ed	A number of performance sections apparently are meant to be referenced to subsequent test sections to complete the requirement definition. This is inefficient and prone to misinterpretation. (Individual cases of this follow, but possibly not all are included.)	Change all performance requirements to be fully defined within their respective sections.	

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AT	5.2	2nd sentence	TE	Each final indication in the three sets of measurements shall not differ …	A reference to the "three sets of measurements" is missing	
AT	5.2	2nd sentence	ED	… by more than ±5x10^{-5} for the 1x10^{-4} test gas and ±25 % of the volume fraction of the test gas in the case of the standard test gas and the test gas with a volume fraction of 2x10^{-2}.	… by more than ±50 % for the 1x10^{-4} test gas and ±25 % of the volume fraction of the test gas in the case of the standard test gas.	
CA	5.2	1st sentence	Te	It is important that established limits for measuring range do not become an operational nuisance, in other words they should avoid false alarms during regular hydrogen handling operations, e.g. refuelling. It is known that SAE has been developing a new version of SAE J2578 Recommended Practice For General FC Vehicles Safety that will become a performance base standard. As has been proven by many experiments lean limit of sustained combustion of diffusion hydrogen jets is around 8% vol. This may mean that hydrogen FC vehicles may for a short time (during shut down and start up of FC vehicles) emit hydrogen concentrations up to 8% vol. (or 80,000 ppm) from their tail pipes. This regular "puffs" from FC vehicles before and after refuelling lasting a few seconds may regularly trigger sensor alarms at refuelling sites if they are set too low. There is, hence, a valid concern that currently suggested detection limit of 100 ppm is too low and will lead to regular false alarms. CFD analysis of this situation suggests that setting a 10-time higher level, i.e. 1000 ppm will ensure that FC vehicles' exhausts will not trigger sensors installed at canopies unless hydrogen concentration in the exhaust exceeds 8% vol. Also, as was noted above in the previous comment, monitoring concentrations above LFL may be a wise risk mitigation measure. So, it will be desirable to accurately monitor concentrations up to 8% vol. or 80,000 ppm.	Change the first sentence to read: "The measurement range covered by this standard shall be from ~~1 x 10-4~~ 1 x 10^{-3} to ~~2 x 10-2~~ 8 x 10^{-2} in volume fraction."	

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CA	5.2	2nd sentence	Te	It is important that key concentration points are measured accurately, so it is recommended to increase the number of measurement sets from 3 to 5. Calibration and tolerance ranges are to be discussed.	Increase the number of measuring sets from 3 to 5 as follows: 1000 ppm, 10,000 ppm, 20,000 ppm, 40,000 ppm and 80,000 ppm.	
US	5.2	Paragraph 1/ 2nd sentence	Ge	What does this mean?		
US	5.2		te	The measurement range covered by this standard shall be from 1 x 10-4 to 2 x 10-2 in volume fraction. Each final indication in the three sets of measurements shall not differ from the volume fraction by more than ± 5 x 10-5 for the 1 x 10-4 test gas and ± 25 % of the volume fraction of the test gas in the case of the standard test gas and the test gas with a volume fraction of 2 x 10-2. Where did this requirement come from? The upper range is based on 50% of the LFL of hydrogen as defined in the US Bureau of Mines Report 503. What is the lower range (100 ppm) based upon? LFL should be applicable to national electric code of a region. This confusion gets us back to the technology being used. If this is being written for a specific piece of vendor hardware, this should be clearly identified in the title or scope. Otherwise we may be treading on anti-trust issue!!!	Rephrase to a more generic requirement. The lower limit is not practical. Relax the requirement for accuracy +/- 50 ppm. Sensitivity should be a percentage of the range, and the range should not be specifically defined but be identified by the name plate. If want to be more stringent, use +/- 5%; or more relaxed--+/- 10% of reading.	
US	5.2		ge	Range and accuracy should be separate subsections.	Create 5.2.1 Measurement Range and 5.2.2 Accuracy	
US	5.2		ed	Standard test gas not defined until test section 6.4.1	Either reference section 6.4.1 or create definition for standard test gas in definitions.	
US	5.2		te	Why is a lower detectable limit (LDL) of 1 X 10-4 volume fraction (100 ppm) being specified when this equates to 0.25% of LFL for hydrogen? A reasonable LDL would be 4 X 10-3 volume fraction (10% of LFL) so as to not exclude certain viable sensor technologies.	Increase LDL to 4 X 10-3 volume fraction (10% of LFL).	

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US	5.2		te	Measurement range is too confined and specific. Why specify a LDL of 1 X 10-4 volume fraction (100 ppm) but only require a UDL of 2 X10-2 volume fraction (2%)? Why not specify a UDL equal to the LFL, 4 X10-2 volume fraction (4%)?	Establish maximum lower detectable limit, such as 4 X 10-3 volume fraction (10% of LFL), and minimum upper detection limit., such as 2 X 10-2 volume fraction (50% of LFL).	
US	5.2 (and others)		ed	Units for gas concentration should be consistent with other standards, i.e. 2% volume fraction not 2 X10-2 volume fraction.	Change exponential concentration notation to percentage notation.	
AT	5.3	Paragraph 5.3.1	TE		The time period for the “Short-term stability” is not defined.	
AT	5.3	Paragraph 5.3.2	TE		The time period for the “Long-term stability” is not defined. Paragraph 6.5.3.3. defines a long-term measurement of 3 month.	
JP	5.3.1		te	The objective of this test is not clear. Judging from the test method described in 6.5.3.2, this test is concerned with repeatability or reproducibility.	If repeatability or reproducibility is the objective, change to the following: For each test gas, the deviation of each reading from the average reading value shall be smaller than whichever greater of $\pm 5\times10^{-5}$ or the test gas concentration ±10%.	
JP	5.3.1		te	It specifies only the standard test gas (1×10^{-2}) for the test gas (test gas concentration±10%) in relation to the test method described in 6.5.3.2. In order to require multi-level detection starting from 1×10^{-4}, the document needs to provide performance requirements for the 1×10^{-4} test gas. There is no reference point provided for the short-term variability.	Change as follows: For each test gas, the short-term variability from the initial value shall be smaller than whichever greater of $\pm 5\times10^{-5}$ or the test gas concentration±10%.	
US	5.3.1		te	Conditions not specified so requirement not fully defined, “Short-term” undefined.	Reference conditions as described in test section 6.5.3.2.	

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MB[1]	**Clause No./ Subclause No./ Annex** (e.g. 3.1)	**Paragraph/ Figure/ Table/ Note** (e.g. Table 1)	**Type of comment**[2]	Comment (justification for change) by the MB	Proposed change by the MB	**Secretariat observations** on each comment submitted
JP	5.3.2		te	It specifies only the standard test gas (1×10^{-2}) for the test gas (test gas concentration±30%) in relation to the test method described in 6.5.3.3. In order to require multi-level detection starting from 1×10^{-4}, the document needs to provide performance requirements for the 1×10^{-4} test gas.	Change as follows: For each test gas, the long-term variability from the initial value shall be smaller than whichever greater of $\pm5\times10^{-5}$ or the test gas concentration±30%.	
US	5.3.2		te	Conditions not specified so requirement not fully defined, "Long-term" undefined.	Reference conditions as described in test section 6.5.3.3.	
US	5.4		ed	Conditions not specified so requirement not fully defined.	Reference conditions as described in test section 6.5.4	
US	5.4		te	"Manual reset action" undefined.	Add " and where a manual reset action is used, it shall be tested".	
JP	5.5		te	It specifies only the standard test gas (1×10^{-2}) for the test gas (test gas concentration±20%) in relation to the test method described in 6.5.5. In order to require multi-level detection starting from 1×10^{-4}, the document needs to provide performance requirements for the 1×10^{-4} test gas.	Change as follows: For each test gas, the difference from the value obtained at 20□ shall be smaller than whichever greater of $\pm5\times10^{-5}$ or the test gas concentration±20%.	
US	5.5		ge	Temperature - The variation of the final indication obtained from the test at each specific temperature from that obtained at 20 ℃ shall not exceed ± 20 % of the volume fraction of the test gas. We are back to how NTP is defined. ISO has been pushing other SDO's to adopt 15°C, yet uses 0°C, 15°C, 20°C, 22°C and 25°C.	This is supposed to be a standard. Standardize on 15°C. This should be considered for all ISO/TC 197 standards.	
JP	5.6		te	It specifies only the standard test gas (1×10^{-2}) for the test gas (test gas concentration±30%) in relation to the test method described in 6.5.6. In order to require multi-level detection starting from 1×10^{-4}, the document needs to provide performance requirements for the 1×10^{-4} test gas.	Change as follows: For each test gas, the difference from the value obtained at 100 kPa shall be smaller than whichever greater of $\pm5\times10^{-5}$ or the test gas concentration±30%.	

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US	5.6		te	Pressure - The variation of the final indications at 80 kPa and 110 kPa from the final indication at 100 kPa shall not exceed ± 30 % of the volume fraction of the test gas. What is the basis of this requirement? My hand calculations indicate that these pressures are equivalent to +2951 and -345 meters relative to msl. There are major cities outside of this range (Mexico City, Bogota, Quito, cities on the Dead Sea)	These values look like they were picked from air. There needs to be some geographical justification for these values. Select values that represent likely markets. Mexico City with 9 million inhabitants and very high air pollution should be considered.	
JP	5.7		te	It specifies only the standard test gas (1×10^{-2}) for the test gas (test gas concentration±30%) in relation to the test method described in 6.5.7. In order to require multi-level detection starting from 1×10^{-4}, the document needs to provide performance requirements for the 1×10^{-4} test gas.	Change as follows: For each test gas, the difference from the value obtained at a relative humidity of 50% shall be whichever smaller than the greater of $\pm5\times10^{-5}$ or the test gas concentration±30%.	
JP	5.7		te	Initial temperature shall be harmonized with 6.5.7	at 20 -> at 40	
US	5.7	Sentence	Ed	Grammatical correction.	The variation of the final indications at relative humidities of 20% and 90% from the final indication at a relative humidity of 50%, at 20ºC, shall not exceed ± 30% of the volume fraction of the test gas.	
US	5.7		te	Humidity - The variation of the final indications at relative humidities of 20 % and 90 % from the final indication at a relative humidity of 50 % , at 20 ℃ , and shall not exceed ± 30 % of the volume fraction of the test gas This is consistent with other product standards.	This is supposed to be a standard. Standardize on 15°C.	
US	5.7		te	Humidity range too narrow. The SW US regularly experiences single digit humidity and the SE US regularly experiences > 90% humidity. Also, condensing conditions, RH=100%, are likely at any location.	Change to, "... at relative humidities of 5% and 100% (condensing) …"	

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JP	5.8		te	There is no reference to the test gas to be applicable for 6.5.8. Therefore it is not clear ±10% is for what?	Similar to the above proposals, change the test gas description as follows if 1×10^{-4} and $1\times10^{-2}$are to be used. For each test gas, the difference from the value obtained at the rated flow shall be smaller than the greater of $\pm5\times10^{-5}$or the test gas concentration±10%.	
AT	5.9		TE		If the volume fraction is outside the measurement range, a definition of tolerance is not possible. In case of a value below the lower limit, the value could be “0”, and in case of exceeding the upper limit of measurement range, an overflow shall be indicated.	
US	5.9		ed	Incorrect wording, “… shall not exceed the following range: a) less than…”,”…b) less than…”	Correct to “shall be: a) less than…”,”… b) less than…”	
JP	5.10		te	Time of recovery is not needed (cannot understand why it is needed. No description of this procedure is included 6.5.10.	Delete it.	
US	5.10		te	What technical justification results in a t(90) requirement of 20 s or less when accepted combustible gas detector standards require 30 s or less?	Change to, “t(90) shall be 30 seconds or less.”	
US	5.10		te	What technical justification results in a t(10) requirement of 30 s or less when accepted combustible gas detector standards require 45 s or less? Furthermore, there is no increase in safety due to a faster recovery time.	Change to, “t(10) shall be 45 seconds or less.”	
US	5.11		te	Conditions not specified so requirement not fully defined: this section does not specify selectivity. As well Annex B should be modified to include some nominal volume fraction hydrogen such as 1% in the mixture, i.e. 1% hydrogen, 1% methane, balance air.	Change to, “With a gas mixture as specified in Annex B applied the final indication shall not exceed,” whatever is specified as accuracy requirement at the appropriate volume fraction hydrogen.	

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JP	5.12		te	Original requirements allow 90% of variation.	After the poisoning test, the variation from the final indication of the standard response test before the poisoning test shall not exceed ± 10 % of the same.	
US	5.12		ed	Conditions not specified so requirement not fully defined.	Change to, " … poisoning test as described in section 6.5.12 …"	
US	5.13		ed	Conditions not specified so requirement not fully defined.	Reference conditions as described in test section 6.5.13	
JP	5.14		te	See the comment for 6.5.14.	The variation of final indications shall not exceed ± 10 % of the final indication of the standard response test at the nominal supply voltage.	
US	5.14		ed	Conditions not specified so requirement not fully defined.	Reference conditions as described in test section 6.5.14	
US	5.15		ed	Conditions not specified so requirement not fully defined	Reference conditions as described in test section 6.5.15	
US	5.16		ed	Conditions not specified so requirement not fully defined	Reference conditions as described in test section 6.5.16	
US	5.17		ed	Conditions not specified so requirement not fully defined	Reference conditions as described in test section 6.5.17	
JP	5.18		te	Clarify the objects to be compared with in relation to tense. Test period is changed according to the comment for 6.5.18	At the end of the test period, the variation of final indications shall not exceed ±10 % of the final indication of the standard response test conducted before this test. At the end of a further 10 minutes following the indication of a low battery condition, the variation of final indications shall not exceed ± 15 % of the indication of the standard response test conducted before this test.	

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US	5.18		ed	Conditions not specified so requirement not fully defined	Reference conditions as described in test section 6.5.18	
US	6.2.1.2	Last sentence	Ge	In a hereof – What does that mean?		
AT	6.3.1	1st sentence	ED	A diffusion chamber that can seal and contain the atmosphere in it and has an internal volume of around 30 L. or larger …	Delete the point after 30 L	
US	6.3.1	1st sentence	Te	30L – Why so large? What shape? Eddies? Sensor Head Position? Exhaust Port?	I would specify all this for standard measurement.	
US	6.3.1		te	The use of a diffusion chamber as described is inherently flawed for the testing of gas sensors as well as not being the most cost-efficient method: 1) A syringe loaded with pure hydrogen is subject to leakage and dilution from the moment it is loaded to the moment it is discharged into the chamber. As the concentration desired to test can be extremely low according to this document, any deviations in the injected amount are greatly multiplied as deviations in final concentration. 2) Hydrogen will leak from any enclosure at a rate much greater than other gas species via seals as well as directly permeating the materials of construction. A fixed volume amount of hydrogen injected into a chamber will immediately begin to dilute as hydrogen preferentially leaks out of the chamber. 3) Purging hydrogen from a large volume is problematic. Especially if hydrogen-retaining materials, typically polymers and thermoplastics, are used widely in the chamber construction.	Apply a known concentration, as verified/certified by a third party, to the unit under test via appropriate mmanufacturer-supplied fixture at a flow rate of 0.2 to 1 slpm.	

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AT	6.3.3		ED	The hydrogen detection apparatus with a hydrogen sensor or remote hydrogen sensor shall be placed …	The hydrogen detection apparatus with an integrated or remote hydrogen sensor shall be placed ...	
US	6.3.5	6.3.5.1 – 6.3.5.4	Te	Loose specs here might not identify significant sensor sensitivity to these variables.	I would make them much tighter, say 20ºC (or 15 ºC) , 101kPa, 50% RH.	
AR	6.3.5.1		Ed	The following paragraph related to temperature variations of the atmosphere should be revised: Temperature Throughout the duration of each test, the atmosphere in the chamber shall be held within the range of 15 ℃ to 25 ℃ and the temperature shall be kept at a constant temperature within ± 2 ℃.	Re-write the conditions for the temperature as follows: Temperature Throughout the duration of each test, the atmosphere in the chamber shall be held within the range of 15 ℃ to 25 ℃ and the temperature shall be kept constant within ± 2 ℃.	
AT	6.3.5.1		ED	... the temperature shall be kept at a consta nt temperature ...	… constant …	
US	6.3.5.1		te	Temperature - Throughout the duration of each test, the atmosphere in the chamber shall be held within the range of 15 ℃ to 25 ℃ and the temperature shall be kept a t a constant temperature within ± 2 ℃. Why is the test range for an outside device not tested at out door temperatures?	This is supposed to be a standard. Standardize on 15^{o}C Outdoor range should more realistic, such as -40 ºC with 0% RH to 66 ºC with 95% RH.	
JP	6.3.5.3		ed	Clarify that the tolerance shall be within plus/minus relative humidity of 10% for each set value of humidity.	The relative humidity (RH) of the atmosphere in the test chamber shall be maintained within ±10%(RH) of a value to be arbitrary set between relative humidities of 50 % and 60 %.	
US	6.3.5.3		Te	Humidity Consider: MIL-STD-810F 1 January 2000 *Department of Defense Test Method Standard for Environmental Engineering Considerations and Laboratory Tests*	Consider testing at two ranges—15 ºC and 10% RH and 95% RH rather than a single value. This should be brought in line with other standards.	

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US	6.4.1	6.4.1	Te	What flow rate?	Clarify whether test is static or dynamic.	
JP	6.4.2		ed	1) Correct according to the definitions and the expressions used in 6.5.5 2)According to the title of 6.3, this correction is also necessary to make the condition for 6.5.10 clear 4) In order to discriminate between the inlet of the sensor and that of the apparatus 5) Make sure that next test is to start in clean air, which is essential to 6.5.3.2	1) hydrogen sensor -> remote hydrogen sensor or hydrogen detection apparatus with hydrogen sensor(s) incorporated 2) normal condition -> the normal test condition specified in 6.3 4) the inlet -> the inlet of the chamber 5) ventilated -> completely replaced with	
US	6.4.2	Item 1	ed	set the hydrogen sensor in the diffusion chamber, then wire and activate the hydrogen sensor; Awkward word selection	Replace with “Position”	
US	6.4.2	Item 2	ed	the diffusion chamber shall be sealed with clean air as the internal atmosphere. The fan shall be run until the atmosphere stabilizes at the normal condition; What is meant by “sealed”? Is the intent “purged and filled”?	Clarify the thought.	
US	6.4.2	Item 3	ed	the offset value shall be measured; What offset value? Is the intent to record the measurement on clean air?	Clarify the thought.	
US	6.4.2	Item 4	ed	hydrogen source gas shall be injected through the inlet by a syringe, etc., as the atmosphere changes to the standard test gas, and the final indication shall be measured; What inlet? Why a syringe? Is the intent to inject the hydrogen into the diffusion chamber? State the intent of the step, do not require specific tooling unless a calibrated measurement is required.	Clarify the thought.	
US	6.4.2	4)	Te	1% pressure change?	Is that okay, injection in sealed chamber?	

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US	6.4.3	1st sentence	ed	Define appropriate.		
US	6.5.2.2	1st sentence	Te	Beyond detection limit for many sensors.		
US	6.5.2.2		te	Holding a tolerance of +/- 2 X 10-6 (2 ppm) using an injection syringe will be extremely difficult. See discussion above.	Use pre-mixed certified gas blends.	
JP	6.5.3.2		te	Judging from the particulars of this test method, the objective seems to be repeatability or reproducibility.	Change the heading to “Repeatability” or “Reproducibility.	
JP	6.5.3.2		te	It specifies only the standard test gas (1×10^{-2}) for the test gas. In order to require multi-level detection starting from 1×10^{-4}, the document needs to provide performance requirements for the 1×10^{-4} test gas.	Change as follows: Using both a test gas of 1×10^{-4} and standard test gas, repeat the test procedure five times each in accordance with the standard response test.	
JP	6.5.3.3		te	It specifies only the standard test gas (1×10^{-2}) for the test gas. In order to require multi-level detection starting from 1×10^{-4}, the document needs to provide performance requirements for the 1×10^{-4} test gas.	Change as follows: During the three-month period, record the final indicated value by testing in accordance with the standard response test at every two weeks by using both a test gas of 1×10^{-4} and the standard test gas.	
US	6.5.4.2	1st sentence	Ge	Clarification.	Define type a) apparatus and type b)	
JP	6.5.5		te	It specifies only the standard test gas (1×10^{-2}) for the test gas. In order to require multi-level detection starting from 1×10^{-4}, the document needs to provide performance requirements for the 1×10^{-4} test gas.	Change “ air and the standard test gas” in a)1, a)2, and b) to: air, a test gas of 1×10^{-4} and the standard test gas	
US	6.5.5	all	te	This device is supposed to be operated outside. As such, the device should be seeing ambient conditions ranging from -50°C to 50°C. Add in thermal radiation effects, the range expands to -50°C to 85°C. Set the ambient test range to reflect the installation instructions for the device.	Expand the test range to cover the application of the device.	

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US	6.5.5 and 6.5.6		te	Difficult test using described diffusion chamber.	Test in environmental chamber with pre-mixed certified gas blends cooled to the chamber temperature.	
JP	6.5.6		te	It specifies only the standard test gas (1×10^{-2}) for the test gas. In order to require multi-level detection starting from 1×10^{-4}, the document needs to provide performance requirements for the 1×10^{-4} test gas.	Change as follows: Using both a test gas of 1×10^{-4} and the standard test gas, conduct a test at 80 kPa, 100 kPa, and 110 kPa in accordance with the standard response test method.	
US	6.5.6	Paragraph 2/ 1st sentence	Ge	80 kPA is okay for Denver (5000 ft.), how about Leadville (10000 ft.)? And pressure (atmospheric) variations?	Broaden the range.	
AT	6.5.7	3rd sentence	ED	After stabi lizing it shall be	… stabilizing …	
JP	6.5.7		te	It specifies only the standard test gas (1×10^{-2}) for the test gas. In order to require multi-level detection starting from 1×10^{-4}, the document needs to provide performance requirements for the 1×10^{-4} test gas.	Change as follows: Expose the hydrogent detection apparatus to clean air at each humidity for 15 minutes or more and then to a test gas of 1×10^{-4} of the same humidity for 15 minutes or more to be followed by another exposure to clean air at the same humidity for 15 minutes or more.	
JP	6.5.7		te	Initial humidity shall be harmonized with 5.7	The hydrogen detection apparatus shall be allowed to stabilize at (40 ± 2) ℃ and a relative humidity of 50 %,	
JP	6.5.8		te	There is no description of applicable test gases.	Change the test method as follows: Using a test gas of $1\times10^{-4}$and the standard test gas, the hydrogen detection apparatus shall be tested by varying the flow rate as follows:	
JP	6.5.8		te	There is no description of an air velocity test for the diffusion type, which corresponds to this provision. A test method and requirements need to be defined.	4.4.10 in IEC 61779-1describes a test at wind speeds of 0 and 6 m/s.	

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US	6.5.8		te	A velocity test should be added for non-aspirated apparatus.	Add, “Air Velocity Test – Expose apparatus to an air velocity of 5 m/s with pre mixed hydrogen in air mixtures. Accuracy and stability shall not be degraded.”	
JP	6.5.9		ed	To discriminate the title for 5.2	Title shall be the same as 5.9	
US	6.5.9		ge	See comments for clause 5.2	Rephrase to a more generic requirement.	
US	6.5.9	Paragraph 1/ 1st sentence	ge	below and above – How much?	Needs to be more specific.	
JP	6.5.10		te	Despite its heading of “Time of response and recovery” there are no procedures provided for the time of recovery. The ground for this test is not clear, either.	Change the title to “Time of response”	
JP	6.5.10			(1) Integrated hydrogen sensor is not defined in this document, so we should use the same expression in 6.5.5. (2) See the comment for 6.4.2 with regard to the conditions. (3) To explain the procedure clearly and correctly.	(1) integrated -> hydrogen detection apparatus with hydrogen sensors incorporated. (2) See the comment for 6.4.2 with regard to the conditions (3) The indication shall be recorded -> the data shall be collected according to 6.4.3	
US	6.5.10	a) – e)	Ge	Not a fair test unless the box is standardized. Or might want to get away from the box with a standard measurement.		
US	6.5.10 c)		te	How will stabilization of the test gas in the diffusion chamber be known? Conditions not specified so test not fully defined.	Add , “Allow mixture to stabilize for a minimum of 5 minutes.”	
US	6.5.10 Note and Annex A	Fig A.1	Te	The standard indicates using the diffusion method that UL has been using for years. This deviates from the standard method that has been used by CSA and adopted by the international community for many years.	Reconsider diffusion method.	

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US	6.5.10 e) and Annex A	Fig. A.1	Te	Using the knife to break the seal and measure the time response is inappropriate. Depending on the material to slice through and the diffusion of H2 gas into the enclosed space, the timed response test can change by several seconds. This can result in unacceptable results.	The WG should reconsider their approach and simply remove the cover encloses the sample and not cut it open. This method eliminates the cooling that is often associated with airflows across catalytic bead type sensors and immediately plunges the sample into the hazardous environment.	
JP	6.5.11			Avoid the mixture of a gas listed in Annex B and standard test gas.	according to the standard response test for each gas listed in Annex B -> In accordance with the procedure specified in 6.4.2 using a gas listed in Annex B for standard test gas.	
JP	6.5.12		te	Apparent miss type.	1 ->10	
US	6.5.12		te	This standard appears to be written for a specific technology. The testing of a competing technology device might be different (e.g. poisoning).	Make the poisoning paragraph more general for any sensor technology or make clear it is only for catalyzed sensors.	
US	6.5.13	Paragraph 1/ 1st sentence	Ge	Step change – How fast? Grade A - %H2?	Must define what is meant by a "step change." May want to consider another type of apparatus. Use an analytical grade hydrogen, such as 9999 or 99999 grade hydrogen.	
JP	6.5.14		te	Definition of hydrogen detection apparatus calibration is unclear.	The hydrogen detection apparatus calibration shall be checked at both 115 % and 80 % of nominal supply voltage. -> The standard response test shall be carried out at both 115 % and 80 % of nominal supply voltage.	
US	6.5.15.2	Short interruption of power supply	Ge	Random time – Why not specify intervals so that all testing is standard?		

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JP	6.5.16		te	To comply with the definition of terms	hydrogen sensor(housing) -> the hydrogen detection apparatus with remote hydrogen sensor, or the remote hydrogen sensor	
US	6.5.16	Dust	Ge	Why not a simple dust chamber and standard dust?	Should use standardized dust test using standardized dust, like MIL-STD-810F.	
KR	Annex A		ge	It should be clarified an expression concerning “Rubber film” . It might cause confusion on whether it makes holes on rubber film or removes a cap.		
US	Annex A	Paragraph 1/ 2nd sentence	Ed	Grammatical correction.	It is an acrylic plastic box (70 mm x 70 mm x 50 mm).	
US	Annex A	Figure A.1	Te	1. Why acrylic & rubber? Does this introduce interferrants? 2. Want minimum time to max H2 concentration in box. Why knife the diagram? How about mass flow controllers, solenoid valves to switch, and minimal residence volume.	Stabilization of concentration in the measurement volume should be less than 1s. (see attached diagram)	
US	Annex A		te	Puncture of rubber film not repeatable and could interfere with the flow of gases.	Suggest sudden removal of small box with an actuation device e.g. spring-loaded arm or pneumatic actuator.	
JP	Annex B		te	No explanation is provided for the selection of the test gases: methane, propane, and isobutane. In particular, why propane and isobutene are included despite the fact that they are much heavier than hydrogen? Under what conditions, are they expected to be present together?	Explain the need for methane, propane, ad isobutene.	
US	ANNEX B		te	The list of gases and contaminants presupposes a technology. Additionally, CO and CO2 may cause spurious readings.	Add a disclaimer and generalize. Pick one hydrocarbon, CO, and H2S	
US	Annex C	C.2 / 1st sentence	Ge	Special state – What does this mean?		

Compilation of comments received on ISO/CD 26142

Date:2007-05-29	ISO/TC 197 doc. **N 368 Annex 1**
	Reference Document: ISO/TC 197 doc. **N 364**

1	2	(3)	4	5	(6)	(7)
MB[1]	**Clause No./ Subclause No./ Annex** (e.g. 3.1)	**Paragraph/ Figure/ Table/ Note** (e.g. Table 1)	**Type of comment**[2]	Comment (justification for change) by the MB	Proposed change by the MB	**Secretariat observations** on each comment submitted
US	Annex C	C.3 / c) / 2nd sentence	Ge	Special state – What does this mean?		
US	C.5		te	Many self-tests suggested here could apply to equipment without embedded software. Why is equipment with embedded software subject to requirements that equipment without embedded software are not?		
US	Bibliography		ge	Include applicable US product standards.	Add UL references as follows: Reference / USA reference CSA C22.2 No. 152 / UL 2075, *Gas and Vapor Detectors and Sensors* BS EN 50291 / UL 1484, *Standard for Residential Gas Detectors* JIS M7626 / UL 2075 JIS M2653 / UL 2075 OIML R 121 / UL 2075, Section 30	
US	N364 Diagram