

**Hydrogen and Fuel Cell Vehicles GTR (HFCV):  
2nd Meeting of the sub Group Safety (HFCV – SGS)**

**SGS 2 - 4**

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# **Natural Gas Odorization**

**Transmitted by the expert from JAPAN**

Vehicle Fuel Integrity (Table 1)										
		Conventional Gasoline and Electrical / Hybrid			CNG/LPG			Hydrogen- / Fuel Cell- Vehicle		
		Japan	EU	US	Japan	EU	US	Japan	EU***	US
Fuel Integrity Crash test	Full frontal	50	N	48	N	N	48	50	N	N
	Offset frontal	N	N	N	N	N		N	N	N
	Side	50	N	53	N	N	48	50	N	N
	Rear	50	N	80	N	N	48	50	N	N
	Rollover	N	N	Static rollover	N	N	N	N	N	N
Integrate system safety and system requirements	Fuel tank and underride protection		Y	N		Y	Y (Tank)		Y	N
	Fuel lines		Y	N		Y		Y	Y	N
	Detection of leakage	N	N	N	N*****	N	N	Y	N	N
	Purge gas							Y	N	N
	Blow off	N/A	N/A	N/A	N	N	N	N	Y	N
	Container Assembly	N/A	N/A	N/A	N	Y	Y	Y	Y	N
	Fault Strategy / Safety management system	N	N	N	N	N	N	N	Y	N
	Prevention of misfueling	N/A	N/A	N/A		Y			Y	
	Installation and mounting requirements		Y		Y	Y		Y	Y	
Component requirements	Container	N/A	N/A	N/A	Y	Y	Y	Y	Y	N
	Container Attachments	N/A	N/A	N/A	Y	Y	N	Y	Y	N
	Other components of the fuel system	N/A	N/A	N/A	Y	Y	N	Y	Y	N
	Fuel Cell	N/A	N/A	N/A	N/A	N/A	N/A	N	N	N

\*\*\*\*\* Odorant in CNG fuel

# Natural gas odorization (additives) in the U.S.

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Natural gas odorization with Mercaptan is mandated for public safety by the Department of Transportation (DOT) .

Federal regulations, 49CFR, 192.625, "Odorization of Gas," requires that gas transmitted interstate be odorized. The odorants most commonly used are mixtures of two general classes of organosulfur compounds--mercaptans and sulfides.

49 CFR - CHAPTER I

S.192.625 Odorization of gas.

(a) A combustible gas in a distribution line must contain a natural odorant or be odorized so that at a concentration in air of one-fifth of the lower explosive limit, the gas is readily detectable by a person with a normal sense of smell.



**The presence of natural gas at 1.26% in air must be detected by smell.**

# Natural gas odorization (additives) in Europe

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Odourants are added to natural gas to give it the familiar 'gas'smell, as without the odourants it has no smell.

[http://www.ngva.co.uk/index/fuseaction/site.home/con\\_id/5083](http://www.ngva.co.uk/index/fuseaction/site.home/con_id/5083)

Methane is the main component of natural gas and usually makes up about 90% of “pipeline quality” natural gas.

To meet specified requirements the gas is separated and then processed to remove contaminants. Natural gas is odourless so odourants are added to give it the familiar gas smell for safety purposes.

[http://www.gasfuellingtech.com/cleaning\\_burning\\_fuels.php](http://www.gasfuellingtech.com/cleaning_burning_fuels.php) (UK)

Germany, UK, France

Directive G280 (DVGW) on gas odorization:

When the fuel gas is at a concentration in air of one-fifth of the lower flammable limit, its odor must be at Level 2 (neither strong nor weak).



**The presence of natural gas at 1% in air  
must be detected by smell.**

# Natural gas odorization (additives) in Japan

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General High-Pressure Gas Safety Regulations

(Ministry of International Trade and Industry Ordinance No. 53 of May 25, 1966)

(Technical Standards for Compressed Natural Gas Stations)

Article 7-3, para. (2)-b:

The CNG to be supplied shall be odorized so that the gas is detectable by smell when its mixture ratio in air is one 1,000th by volume.



**The presence of natural gas at 1,000 ppm in air must be detected by smell.**

# Summary

In the U.S., Europe, and Japan, the detection of gas leaks from natural gas vehicles is ensured based on the odorization of the natural gas used, which is required by law.

	U.S., Canada	Germany, UK, France	Japan
Natural gas odorization requirement	49 CFR CHAPTER I S.192.625	G280 (DVGW)	High-Pressure Gas Safety Regulation
	1/5 of lower explosive limit	1/5 of lower flammable limit	—————
	The presence of natural gas at 1.26% in air must be detected by smell.	The presence of natural gas at 1% in air must be detected by smell.	The presence of natural gas at 0.1% in air must be detected by smell.



**For fuel cell vehicles that use odorless hydrogen gas as fuel, it is necessary to specify technical standards concerning performance of hydrogen gas leak detection that is equivalent or similar to that of natural gas leak detection by sense of smell.**

# **Attachment 100 TECHNICAL STANDARD FOR FUEL SYSTEMS OF MOTOR VEHICLES FUELED BY COMPRESSED HYDROGEN GAS**

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## **3.9. Detection of hydrogen gas leakage, etc.**

3-9-1 At least one detector of hydrogen gas leakage (hereinafter “hydrogen gas leakage detector”) shall be installed at a position fitting for detection, such as the upper section of the area where the components (except one-piece piping) from the main stop valve to the fuel cell stack (the engine in a vehicle other than fuel cell vehicle) are installed. However, this provision shall not apply to the construction that comes under one of the following Items 3-9-1-1 or 3-9-1-2.

3-9-2 A device shall be installed, that gives a warning to the driver that hydrogen gas is leaking when the hydrogen gas leakage detector detects hydrogen gas leakage.

3-9-3 A device shall be installed, that shuts off the supply of hydrogen gas when the hydrogen gas leakage detector detects hydrogen gas leakage.

3-9-4 The warning device shall be located at a position readily recognizable by the driver.

3-9-5 When subjected to the tests according to Attached Table 3 “Test for Hydrogen Gas Leakage Detector, etc.,” the hydrogen gas leakage detector, device that gives a warning to the driver and device that shuts off the supply of hydrogen gas shall detect hydrogen gas, actuate the warning device, and shut off the supply of hydrogen gas. Moreover, if a motor vehicle is equipped with plural hydrogen systems, it shall be acceptable if the device shuts off the supply of hydrogen gas from the hydrogen system that is leaking hydrogen gas.

3-9-6 There shall be a device which gives a warning to the driver at the driver’s seat when an open wire or a short circuit takes place in the hydrogen gas leakage detector.