



**German Hydrogen Association**

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## **Safety of Hydrogen: Standards and Regulations,**

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## Missing link?



- A lot can be said about hydrogen **safety**
- A lot can be said about **regulations and standards** for hydrogen
- But why on earth does everybody want me to tell something about **both together**?
- There is definitely a link between these two topics, but it is weaker than many think

## Where Safety does not come from



### **Safety is not**

the result of numerous, comprehensive, and exhaustive standards and regulations. (You can not ordain safety.)

### **Safety is** the result of

- sound engineering
- extensive testing
- well-trained employees
- uncomplicated procedures
- good support
- ... and also reasonable rules which can be followed

**You can make products and systems as safe as you want, yet accidents and mishaps will occur.**

## Distinction Regulations / Standards



	Regulations	Standards
<b>Purpose</b>	to protect the public, workers, the environment, values ... from dangers	to support the free exchange of goods and services
<b>Legal power</b>	compelling	not a legal requirement, but useful
<b>Created by</b>	political bodies (parliament, government) as they are usually laws or based on them	made by the interested parties (companies, associations)

## EU regulations



### Guidelines for basic requirements

- Pressure Equipment (97/23/EC)
- Transportable Pressure Equipment (99/36/EC)
- Protection from explosions (94/9/EC, 99/92/EC)
- Seveso II (emissions) (96/82/EC)
- Machinery (98/37/EC)
- ...

Guidelines must be incorporated into national law by the member states

**Operational requirements** (of which many are important for safety) remain in the responsibility of the member states

## Other regulations



- **Transport of dangerous goods:**
  - ADR (road)
  - RID (rail)
  - IATA / ICAO (air)
  - IMO (sea)
  - ADNR (inland waterways)
  - ...
- **Approval of road vehicles: UN ECE**
  - For hydrogen cars: EIHP
- **Individual national regulations**

## Regulations for hydrogen



- **Which regulations apply to hydrogen?**
- Wrong question – there are no hydrogen specific rules
- Substance specific rules exist only
  - for particularly dangerous substances:
    - Acetylene
    - Oxygen
  - Or for economically important substances:
    - Natural gas
    - LPG
- Regulations are usually application specific
- Correct question is therefore:
  - **Which regulations apply to my hydrogen application?**

## Standardisation bodies



### National bodies

ON  
DIN  
AFNOR  
BSI  
UNI  
ANSI  
SCC  
...

Membership

### Worldwide

**ISO** (International Organization for Standardization)

**IEC** (International Electrotechnical Commission)

...

### EU

**CEN** (European Commission for Standardization)

**CENELEC** (European Commission for Electrotechnical Standardization)

## International and European Standards



	general	electrical	other
World	ISO	IEC	...
Interface	Vienna Agreement		...
EU	CEN	CENELEC	...

## How to get into international committees



- The national standard organisation must be a **member** of ISO / IEC / CEN / CENELEC ...
- The work of ISO, IEC ... is done in **Technical Committees** (TCs)
- The national standard organisation must be a **P member** of the respective TC
- P member countries send a delegation to the **plenary meetings** of this TC and can propose work items
- Experts from the P member countries can participate in the **working groups** (WGs)

## ISO TC 197



Title: „Hydrogen Technologies“

Secretariat: Canada (SCC)

### P members

Argentina  
Belgium  
Egypt  
France  
Germany  
Italy  
Japan  
Korea, Republic of  
Libyan Arab Jamahiriya  
Netherlands  
Norway  
Russian Federation  
Sweden  
Switzerland  
USA

### O members

Australia  
**Austria**  
China  
Czech Republic  
Hungary  
India  
Jamaica  
Serbia and Montenegro  
Spain  
Thailand  
Turkey  
Ukraine  
United Kingdom

## ISO TC 197 Working Groups



WG	Topic	Secr.
1	Liquid hydrogen - Land vehicles fuel tanks	CAN
2		
3		
4	Airport hydrogen fuelling facility	D
5	Gaseous hydrogen - Land vehicle filling connectors	CAN
6	Gaseous hydrogen and hydrogen blends - Land vehicle fuel tanks	CAN
7	Basic considerations for the safety of hydrogen systems	D
8	Hydrogen generators using water electrolysis process	CAN
9	Hydrogen generators using fuel processing technologies	NL
10	Transportable gas storage devices - Hydrogen absorbed in reversible metal hydride	USA
11	Gaseous hydrogen - Service stations	CAN
12	Hydrogen fuel - Product specification	J

## Papers published by ISO TC 197 so far



- ISO 13984: Liquid hydrogen -- Land vehicle fuelling system interface
- ISO 14687: Hydrogen fuel -- Product specification
- ISO/TR 15916: Basic considerations for the safety of hydrogen systems

<p><b>Title: „Fuel Cell Technologies“</b>                  Secretariat: Canada (SCC)</p>	
<p><b>P members</b></p> <ul style="list-style-type: none"> <li>Australia</li> <li>Canada</li> <li>China</li> <li>Denmark</li> <li>Finland</li> <li>France</li> <li>Germany</li> <li>Italy</li> <li>Japan</li> <li>Korea (Republic of)</li> <li>Netherlands</li> <li>Spain</li> <li>Switzerland</li> <li>United Kingdom</li> <li>USA</li> </ul>	<p><b>O members</b></p> <ul style="list-style-type: none"> <li><b>Austria</b></li> <li>Belgium</li> <li>Norway</li> <li>Poland</li> <li>Portugal</li> <li>Serbia and Montenegro</li> <li>Egypt</li> <li>Sweden</li> </ul>

<b>WG</b>	<b>Topic</b>	<b>Secr.</b>
1	Terminology	USA
2	Fuel cell modules	D
3	Stationary fuel cell power plants – Safety	USA
4	Performance of Fuel Cell Power Plants	J
5	Stationary Fuel Cell Power Plants - Installation	USA
6	Fuel cell system for propulsion and auxiliary power units (APU)	D
7	Portable fuel cell appliances - Safety and performance requirements	CAN



## Give Europe more weight!



- It is highly desirable that the point of view prevailing in Europe gets more weight in international standardization of hydrogen and fuel cell technology
- All interested parties should urge their national standard bodies to become P member of ISO TC 197 and IEC TC 105, if they are not yet
- Travel costs for the working group meetings are the price to be paid to avoid that the international standards for the field are made in America and Japan



**Thank you for your attention!**

And see us occasionally at  
[www.dwv-info.de](http://www.dwv-info.de)