Physikalisch-Technische Bundesanstalt
Braunschweig and Berlin
National Metrology Institute

IEC TC 31 standards for Ex Equipment

standardisation for the hydrogen economy

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IEC TC 31 Chair "Equipment for Explosive Atmospheres"

International Standardisation

IEC TC 31

IEC TC 31

- Equipment for explosive atmospheres

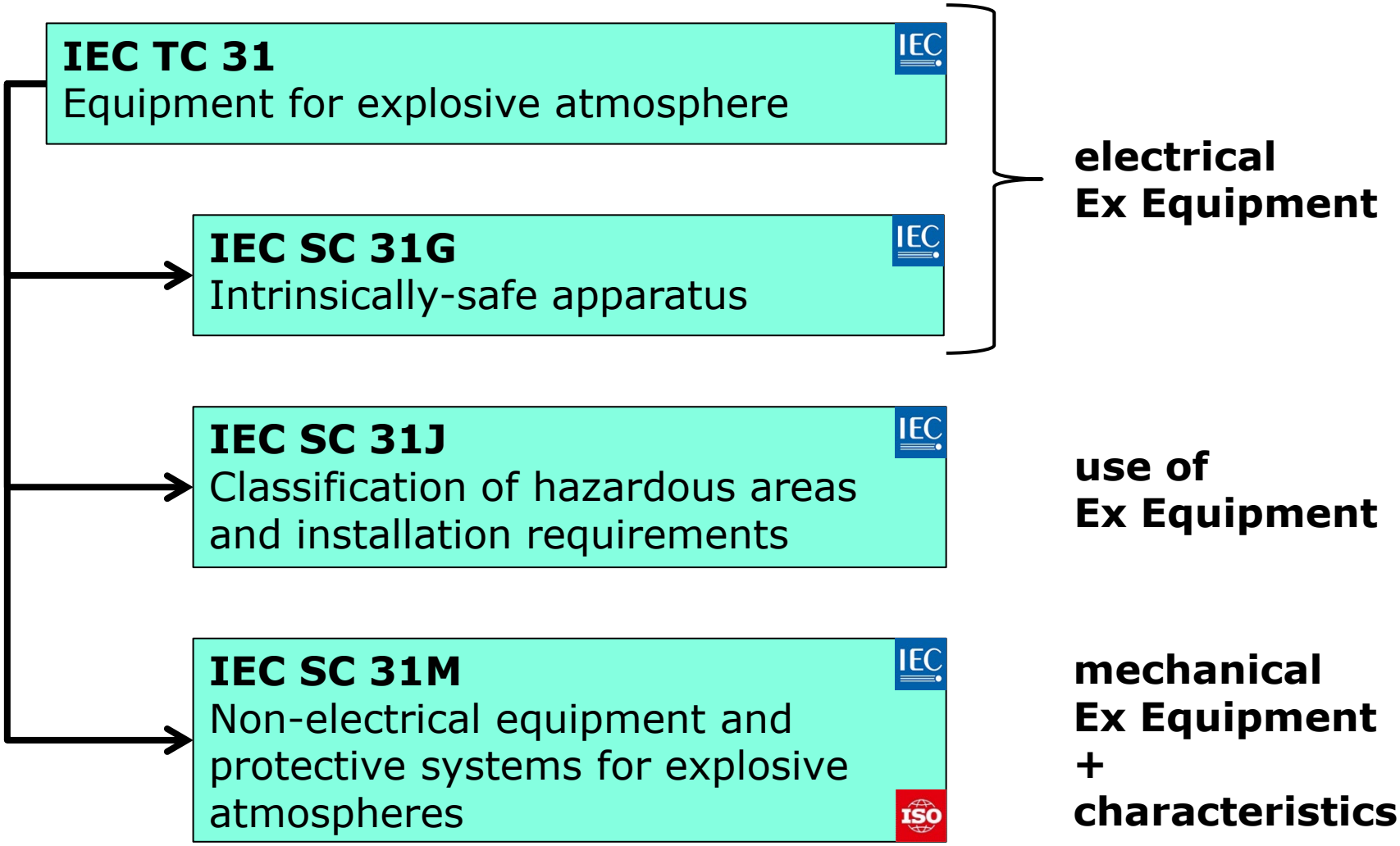
TC 31 Scope

To prepare and maintain international standards relating to equipment for use where there is a hazard due to the possible presence of explosive atmospheres of gases, vapours, mists or combustible dusts

1948	1957	2003	2005	2023
Conception	1st standard 'flameproof'	IECEx 1st certificate	SC 31M joint ISO/IEC work begins	>50 publications

IEC 60079 and ISO/IEC 80079 series
used for 1st, 2nd and 3rd party assessment

IEC TC 31 and the 3 SCs



IEC TC 31 – overview

- Classification and characterisation of explosion hazards and hazardous areas
- Ventilation systems
- Electrical installations and maintenance
- Electrical Ex Equipment
- Flammable properties of materials gas/vapour/dusts
- Mechanical Ex Equipment
- Gas detectors – design and use
- QMS, assemblies and others

New projects:
Ignition systems, Portable electronic equipment, Flame arrestors, Personnel competency, Explosion venting devices, Basic Safety Publication

Hydrogen

IEC TC 31

IEC TC 31 and H2

- IEC TC 31 standards don’t care what colour the hydrogen is. Green, blue or brown are all the same for IEC TC 31.
- Hydrogen diffuses very easily through materials or seals, but also quickly escapes upwards
- Explosion protection characteristics:

	hydrogen	ammonia	methane
CAS-No.	1333-74-0	7664-41-7	74-82-8
Equipment group	IIC	IIA	IIA
Lower flam. limit [Vol. %]	4,0	15,0	4,4
Upper flam. limit [Vol. %]	77,0	33,6	17,0
Auto ign. temp. [°C]	560	630	600
Temperature class	T1	T1	T1
Min. ignition energy [mJ]	**0,019**	14	0,28

→ atmospheric conditions: -20 °C to +60 °C and 0.8 bar to 1.1 bar

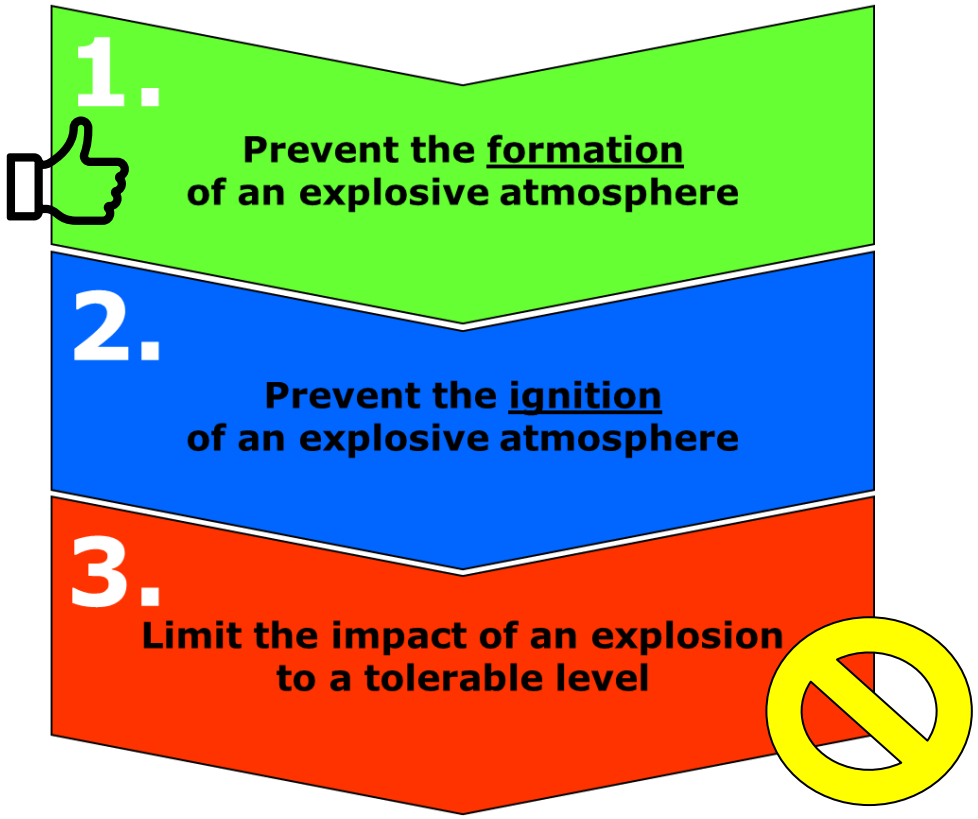
- Reaction rate is high – hydrogen explosions are very fast and difficult to stop

IEC TC 31 & others and H2

- 3 principles of explosion protection

➔ IEC TC 31 defines the "explosive atmosphere"

➔ Technical measures are important to avoid an explosive atmosphere, for example:
- closed system
- (permanently) technically sealed
- exclusion of oxygen



➔ **Requirements should be in the scope of other TCs/SCs of IEC or ISO, such as "ISO TC 197 Hydrogen technologies" or "IEC TC 105 Fuel cell technologies"**

Typically regulated by occupational safety measures!

IEC TC 31 standards and H2

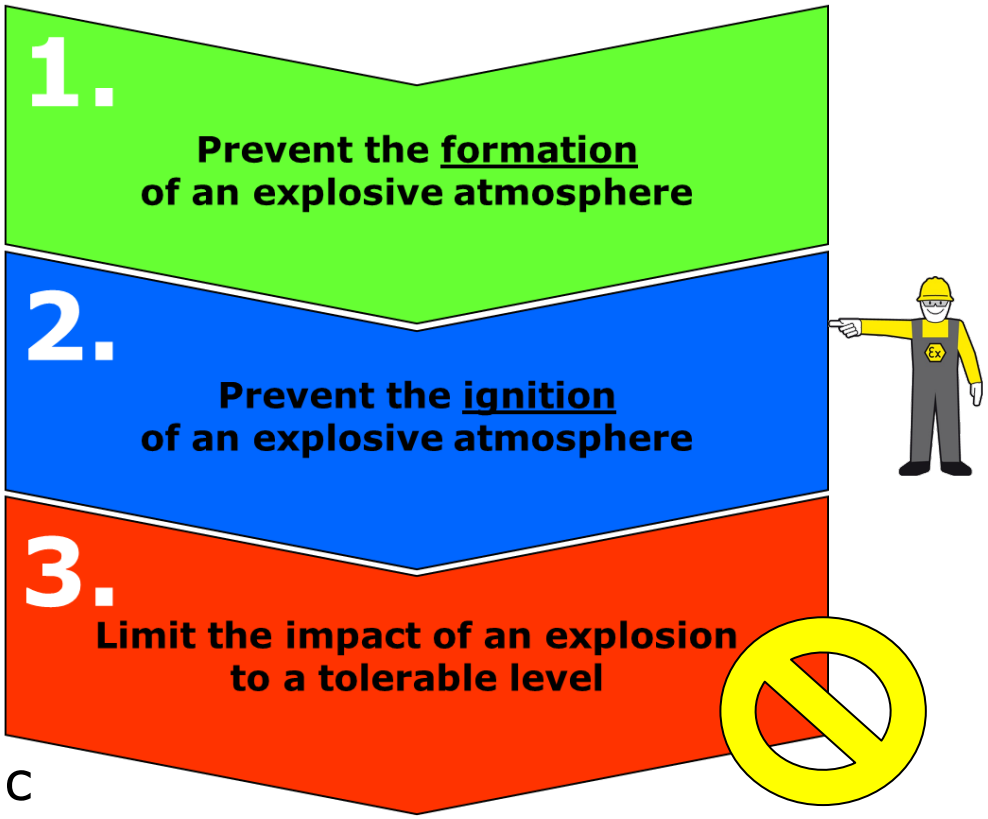
- IEC TC 31 standards are applicable, if the explosive atmosphere is present.

➔ Classification of the
- explosive atmosphere
- hazardous area

➔ Selection of suitable Ex Equipment

➔ Design, manufacturing & testing of Ex Equipment
- electrical & mechanical

➔ Installation and safe use
- technical requirements
- guidance for electrostatic



– no requirements for certification
– no regulations for a market access
– no regulations for occupational safety measures

IEC TC 31 and H2 ➔ TO DO

? Explosion characteristics
→ outside atmospheric conditions
→ for mixtures with other gases or for hybrid mixtures

? Requirements for Ex Equipment
→ for higher pressures (e.g. pressures up to 900 bar for storage)
→ for higher temperatures (e.g. operating temperature of solid oxide electrolyzer cells *SOEC* is between 500 °C and 850 °C)

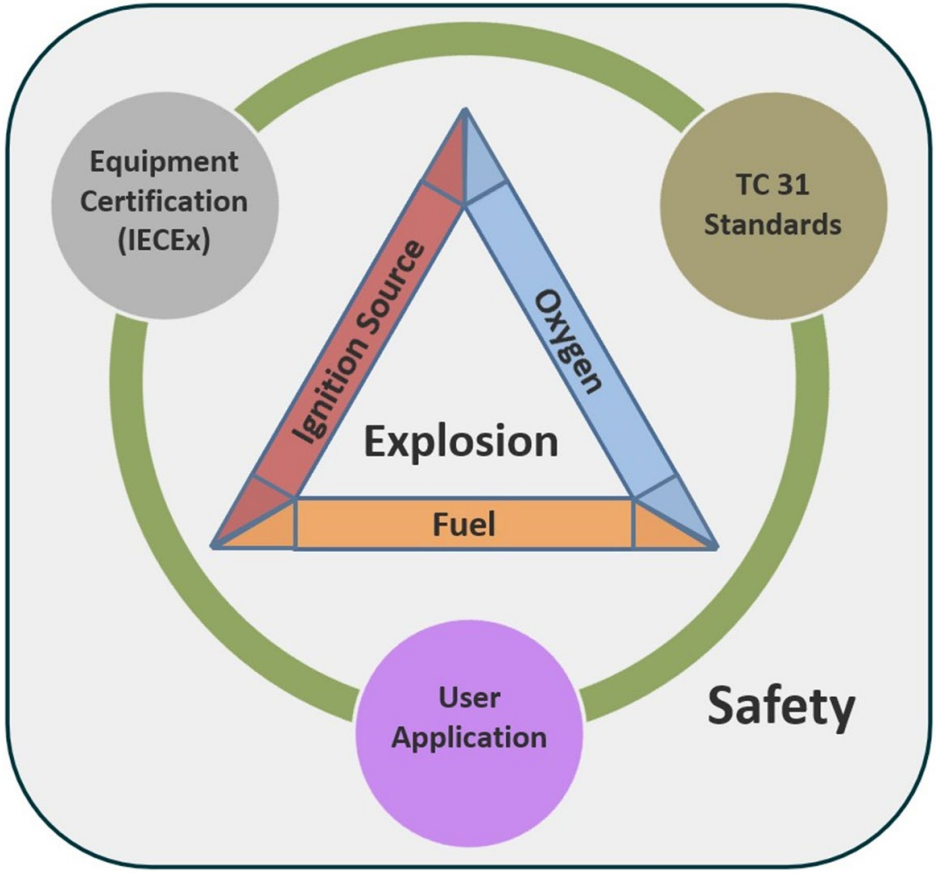
? Use of LOHC (liquid-organic hydrogen carrier)

? Requirements for flame arrestors

? Guidance documents needed, such as: "How to avoid an explosive atmosphere" or "How to handle hydrogen"

! <u>Supporting IECEx and TCs/SCs of IEC and ISO</u>
➔ IEC TC 31 has recently formed AG 59 "Hydrogen Advisory Group" recognizing the growth in this field to help with developments and coordination
➔ AG 59 can support other groups related to explosion protection

! <u>Awareness of overlap with other TCs/SCs of IEC and ISO</u>
➔ Duplicated work & conflicting requirements shall be avoided



Source: Neil Dennis (AECOM)

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