

CEN/TC 58 Hydrogen Activities

Parameters to be investigated

With a number of pilot projects ongoing there are also projects in place to develop appliances for the use with hydrogen or hydrogen blends

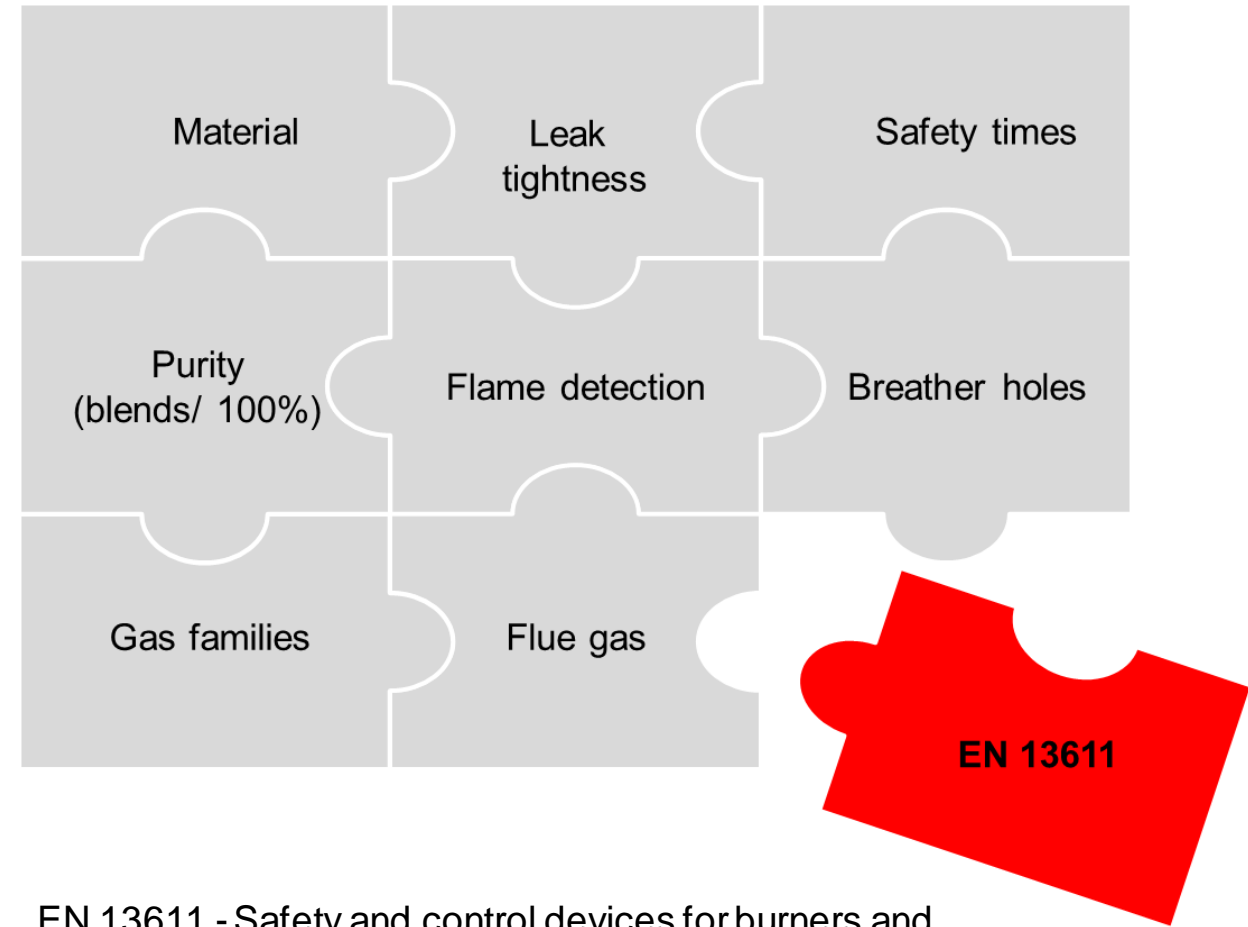
For the time being products have been approved on the basis of manufacturer declarations

European standards will have to be adapted to cover requirements related to hydrogen

For controls a lot of parameters are relevant and need to be considered.

Controls will be among the first products requested to be certified to updated standards

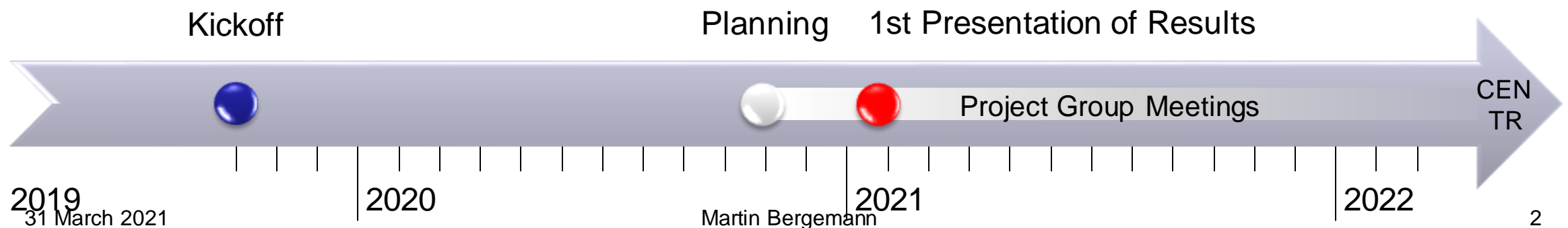
CEN/TC 58 has taken early action to get to results



EN 13611 - Safety and control devices for burners and appliances burning gaseous and/or liquid fuels - General requirements

CEN/TC 58 Hydrogen Activities Timeline

- Kick-off meeting 5 September 2019
Sharing information between 26 experts from various CEN TCs,
organize further activities in standardization
- Follow-up meeting 31 March 2020 just before the CEN/TC 58 plenary
→ Had to be cancelled because of Covid-19
- Planning meeting on 30 October 2020
Identification of topics, 4 project groups have been established
- Discussion of first results 27 Jan 2021



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Project Group 1: Leakage rates and breather holes

Assessment parameters

- Minimum air exchange rate requirements
- Lower explosion limit (LEL) of hydrogen

Leak-tightness test results for controls:

- Tests done by several manufacturers
- Test gases: methane air, helium, hydrogen → no significant difference
- Test results below the limits given by EN 13611 and EN 126
- Insignificant temperature dependence

Breather holes

- For the case of a diaphragm failure higher flow rates through breather holes have been measured for hydrogen than for methane
- Risk assessment needed



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Project Group 2: Combustion Safety

Assessment parameters

- High temperature exposure of parts
- NOx emissions

To be investigated

- Accumulation of leakage rates, avoid ATEX zones
- Avoid deflagration
- Purging procedure
- Procedure for components only temporarily supplied with hydrogen
- Procedure for part replacement (filters, valves, actuators)
- Detection of incomplete combustion, hydrogen emission measurement
- Factors compromising product lifetime



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Project Group 3: Sensors and Electronics

Assessment parameters

- Flame detection signal strength
- Safety times of burner controls

To be investigated

- Focus on EN 298 (burner controls), EN 12067-2 (electronic fuel/air ratio controls) and EN 16340 (combustion product sensors)
- What are the limits of ionization sensors for increasing hydrogen content, can the method still be used for adaptive systems?
- Will the difference of the spectral range of natural gas and hydrogen flames cause any problems for optical sensors?
- Higher ignition energy needed for hydrogen, flame detection time may need to be adjusted
- Moisture becomes a factor to be considered especially for combustion product sensors



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Project Group 4: Materials

Assessment parameters

- Temperature
- Pressure

To be investigated

- Gas temperature is not a factor considered in today's standards
- Operating temperature classes to be added to the standard EN13611
- High temperature effects can be excluded for gas temperatures below 178°C
- H₂ embrittlement to be considered for metals even for temperatures below 0°C
- Springs not made from austenitic steels need to be qualified by endurance tests



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Next Steps

- Detailed discussion in the project groups to be continued
- EN 13611 has been marked up to show parts that need to be checked and probably adapted
- The investigation results are to be compiled in a document available to the public earlier than a standard → 1 year
- A New Work Item proposal for a CEN Technical Report has been submitted to CEN/TC 58 for decision on the next plenary on 9 April 2021:
- “Safety and control devices for burners and appliances burning gaseous and/or liquid fuels – Guidance on hydrogen specific aspects”.
- A new Working Group is to be established within CEN/TC 58

6.2.3 Breather holes

6.2.3.1 Requirements

Breather holes in controls with diaphragms which are not provided with a connection for a vent pipe shall be designed in such a way that when the diaphragm is damaged, air does not escape at a rate of more than 70 dm³/h at the maximum inlet pressure. Review requirements and tests with respect to H2 and redraft accordingly H2-PG1 ? 2.3.2

Conformity shall be verified by the method specified in 2.3.2. If a leakage rate limiter is used, it shall be able to withstand 3 times the maximum inlet pressure. If a safety diaphragm is used as a leakage rate limiter, it shall not take the place of the working diaphragm if there is a fault.

Breather holes shall be protected against blockage or they shall be located such that they do not easily become blocked. They shall be positioned in such a way that the diaphragm cannot be damaged by a sharp device inserted through the breather hole.

6.2.3.2 Test for leakage of breather holes

Rupture the dynamic part of the working diaphragm. Ensure all closure members of the control, if any, are in the open position. Pressurize all gas-carrying compartments to the maximum inlet pressure and measure the leakage rate.

6.2.4 Screwed fastenings

Screwed fastenings which can be removed for service or adjustment shall have metric threads that conform to ISO 262:1976 unless a different thread is essential for the correct operation or adjustment of the control. Review requirements with respect to H2 and redraft accordingly.