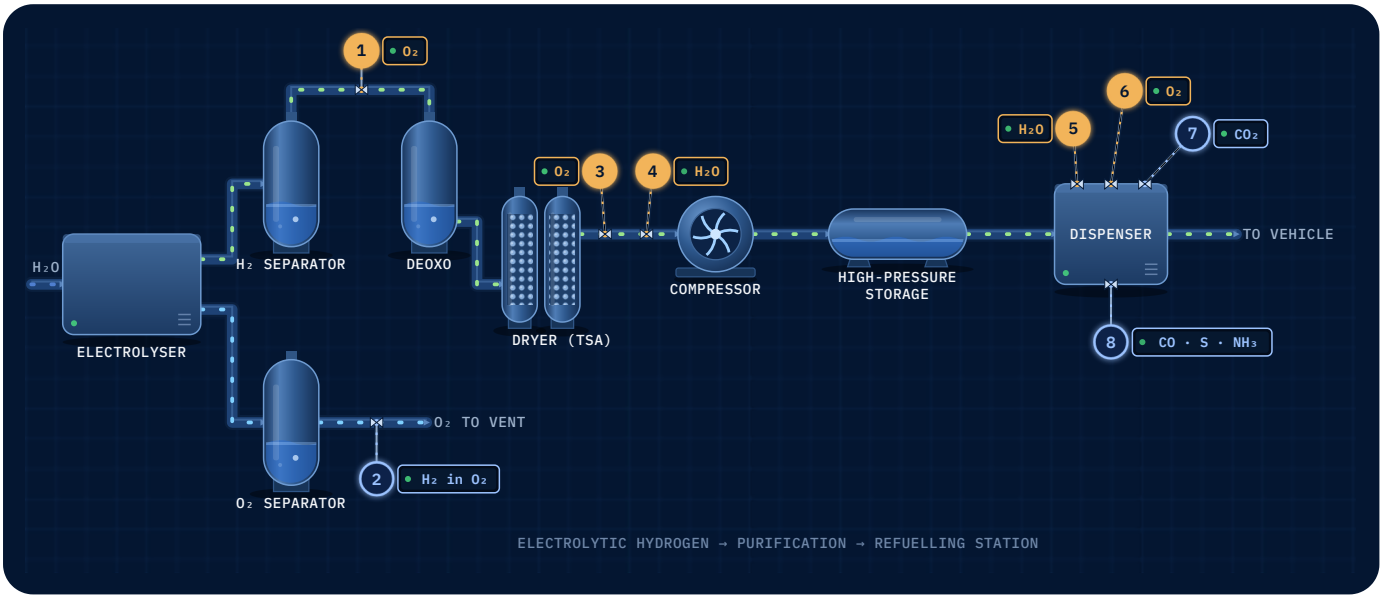
Green hydrogen and refuelling: where to measure O_2 and moisture

Follow the hydrogen from the electrolyser through the deoxo reactor and dryer to the refuelling dispenser. Each numbered point shows the limit, why it matters and the analyzer that fits.



● YORK instrument ○ Integrated system (supplied through YORK)

How the process works

An electrolyser splits water into hydrogen and oxygen. The raw hydrogen is wet and carries some oxygen, so it is purified before compression. Fuel-cell vehicles need hydrogen to ISO 14687 Grade D, with impurity limits in µmol/mol.

1. **Electrolysis.** The stack produces hydrogen on one side and oxygen on the other. Gas-liquid separators return the electrolyte or water.
2. **Deoxo.** A catalytic reactor turns the residual oxygen in the hydrogen into water.
3. **Drying.** A temperature-swing adsorption (TSA) dryer removes the water, down to a few ppm.
4. **Compression and storage.** Compressors raise the pressure for high-pressure storage.
5. **Dispensing.** The dispenser fills the vehicle; the hydrogen at the nozzle must meet ISO 14687 Grade D.

Interactive version with animation:
https://www.yorkinstrument.ae/guides/green-hydrogen-refuelling-measurement-points/

Measurement points

#	POINT	MEASURES	TYPICAL VALUE / LIMIT	RECOMMENDED SOLUTION
1	Raw hydrogen before the deoxo	Oxygen in hydrogen (%)	0.15–0.3 mol % O_2 in raw hydrogen from an alkaline electrolyser (design study)	PGA500-EX
2	Oxygen side of the electrolyser	Hydrogen in oxygen	Alarm and trip levels are set by the electrolyser safety concept	Integrated system: thermal-conductivity H_2-in-O_2 analyzer
3	After deoxo and dryer	Trace oxygen	< 5 ppm (design target in a purification-train study)	PGA500-EX
4	After deoxo and dryer	Trace water	< 5 ppm (design target in a purification-train study)	DPT990-EX
5	Dispenser (ISO 14687 Grade D)	Water	≤ 5 µmol/mol (≈ −65 °C frost point at 1 atm)	DPT990-EX, DPT-600 Plus-EX
6	Dispenser (ISO 14687 Grade D)	Oxygen	≤ 5 µmol/mol	PGA500-EX
7	Dispenser (ISO 14687 Grade D)	Carbon dioxide	≤ 2 µmol/mol	Integrated system: trace CO_2 by gas chromatography or laser spectroscopy
8	Dispenser (ISO 14687 Grade D)	Other impurities and hydrogen index	CO ≤ 0.2; total sulfur ≤ 0.004; formaldehyde ≤ 0.2; NH_3 ≤ 0.1 µmol/mol; hydrogen index ≥ 99.97 %	Integrated system: gas chromatography with several detectors, cavity ring-down or FTIR spectroscopy

Typical values from published standards, regulations and technical literature. Your contract, licensor or plant specification always governs. Integrated systems are supplied by YORK through its partner integration factory.

Key references

1. Hydrogen Fuel Regulations (Sec. 4181) — California Department of Food & Agriculture
2. MetroHyVe / HYDRAITE report on ISO/TC 197 hydrogen quality — SINTEF
3. Spatolisano & Pellegrini, A technical analysis of the H_2 purification trains downstream of alkaline electrolyzers, Energies (2025) — Politecnico di Milano