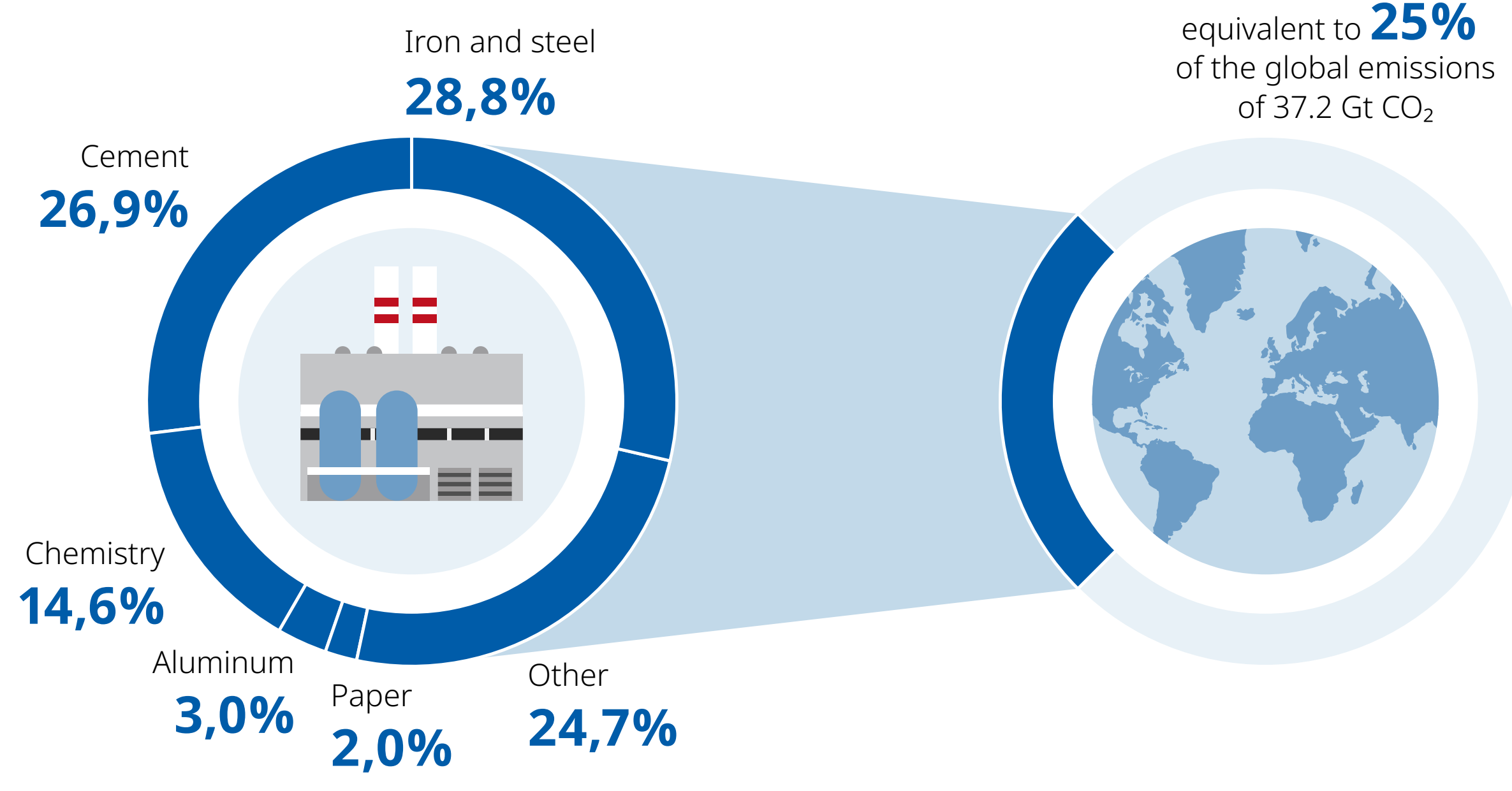


HYDROGEN – KEY ELEMENT FOR THE ENERGY TRANSITION

It is suitable for applications in industry, heat and power generation as well as mobility. Climate-neutral production significantly reduces CO₂ emissions.

GLOBAL CO₂ EMISSIONS BY INDUSTRY



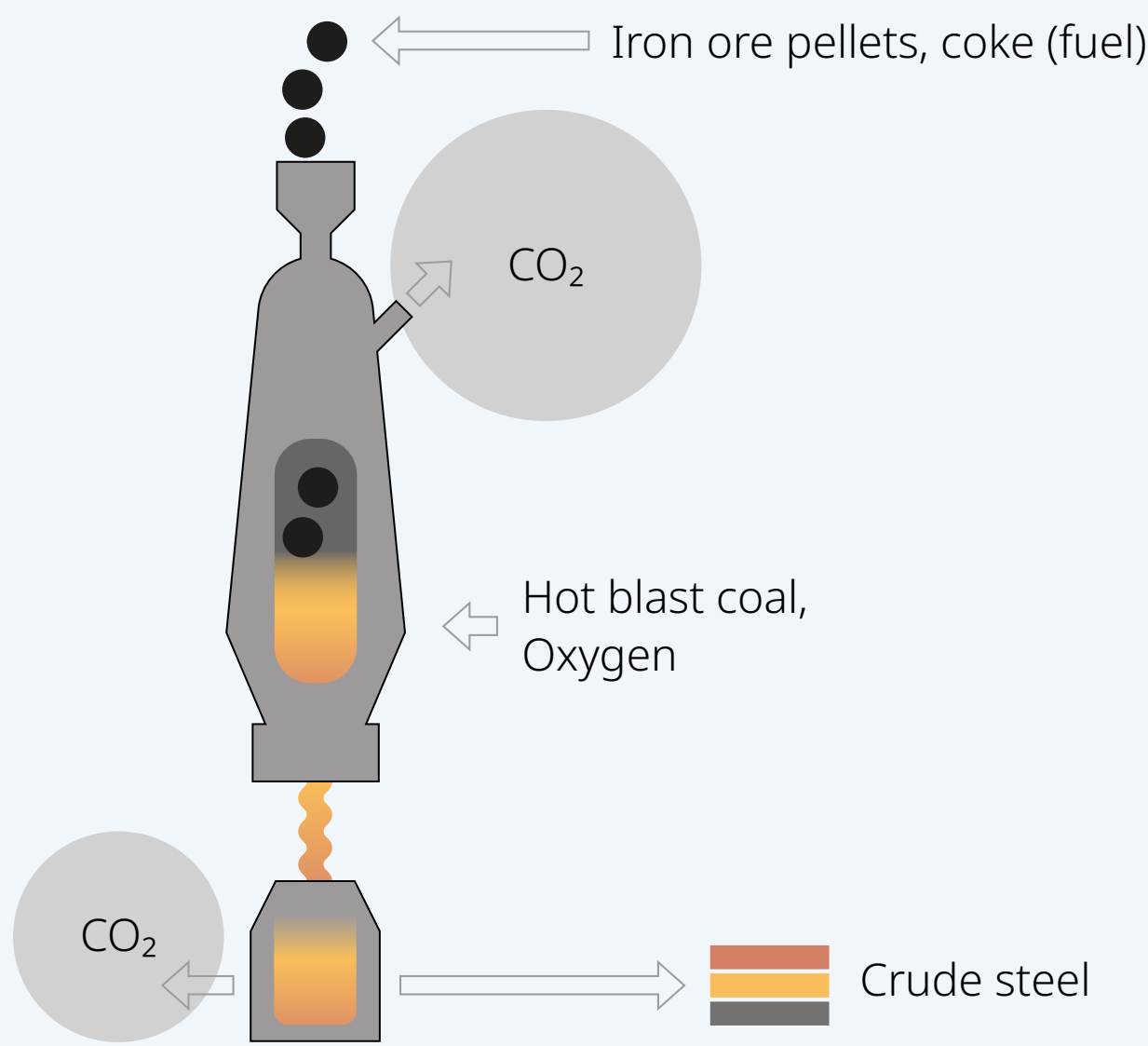
Every year, the industrial sector emits around **9.3 Gt of CO₂**.

Source: IEA (2021)

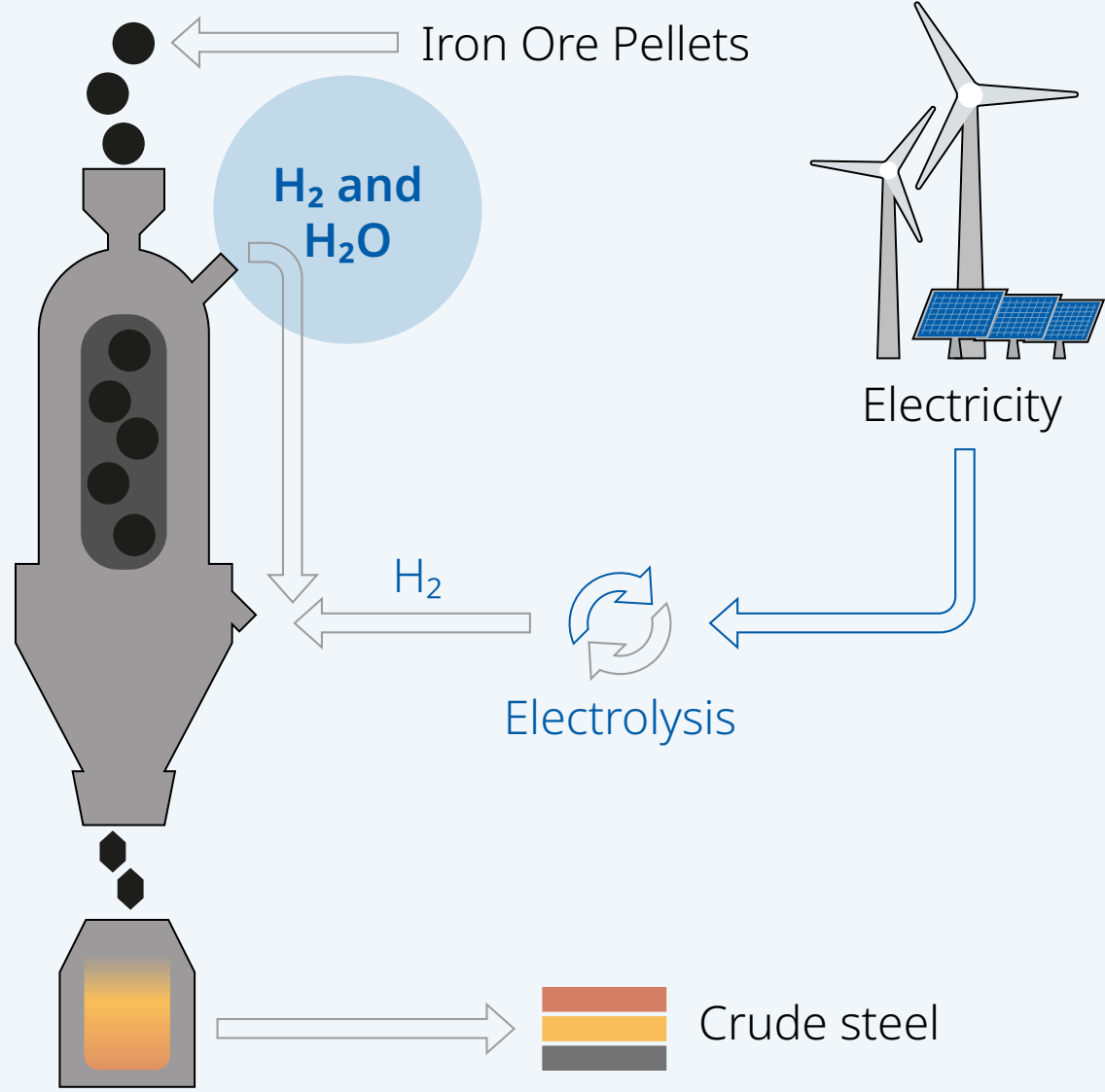
REDUCED CO₂ IN INDUSTRIAL PROCESSES

With regard to climate protection targets, the steel industry is increasingly relying on future-oriented hydrogen technologies. For example, the hydrogen-based blast furnace route offers great potential for saving CO₂ emissions compared with the classic blast furnace route.

CLASSIC BLAST FURNACE ROUTE

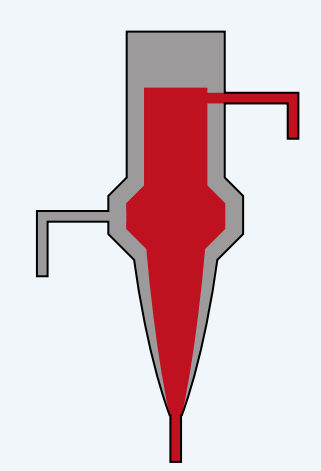


HYDROGEN BLAST FURNACE ROUTE

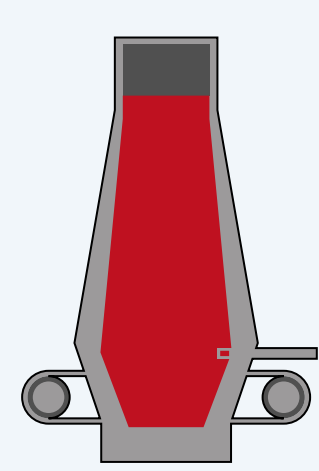


The use of **one ton** of green hydrogen saves **26 t of CO₂** compared with the classic blast furnace route.

FURTHER H₂ APPLICATIONS IN THE STEEL INDUSTRY



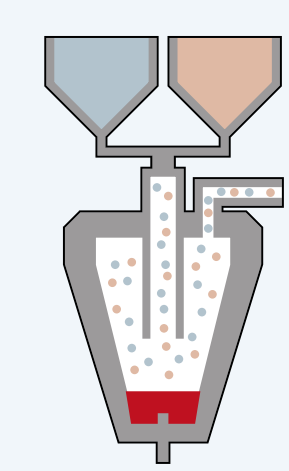
Direct reduction
Substitute for natural gas in shaft furnaces



H₂ injection
Substitute for coal in blast furnaces



H₂ burner
Substitute for natural gas



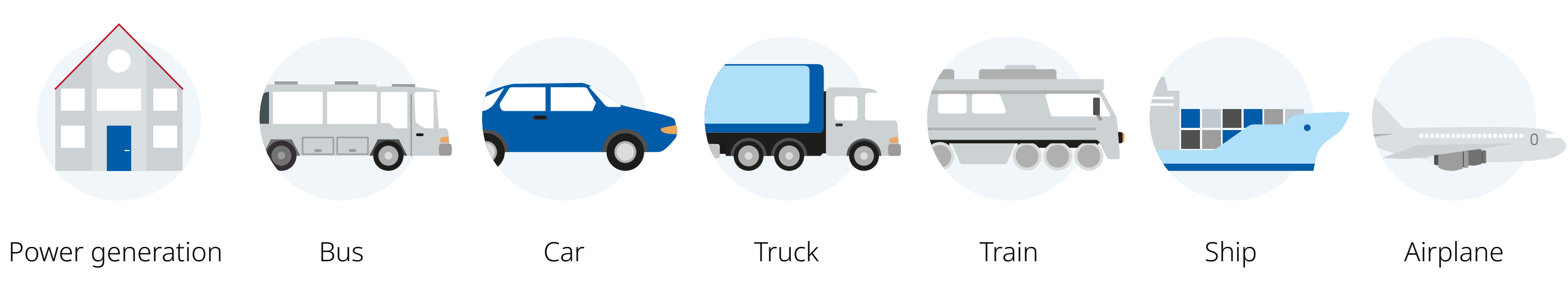
H₂ plasma melt reduction
Substitute for coal

Sources: Forbes (2021); Vattenfall (o. D.); DWV (2021); MHI (o. D.)

DRIVING FORCE IN THE ENERGY TRANSITION

Hydrogen can be converted into electricity and heat with the help of fuel cells, which can be easily stored. This can be used to power electric motors or heating systems, for example.

APPLICATION AREAS FOR HYDROGEN FUEL CELLS

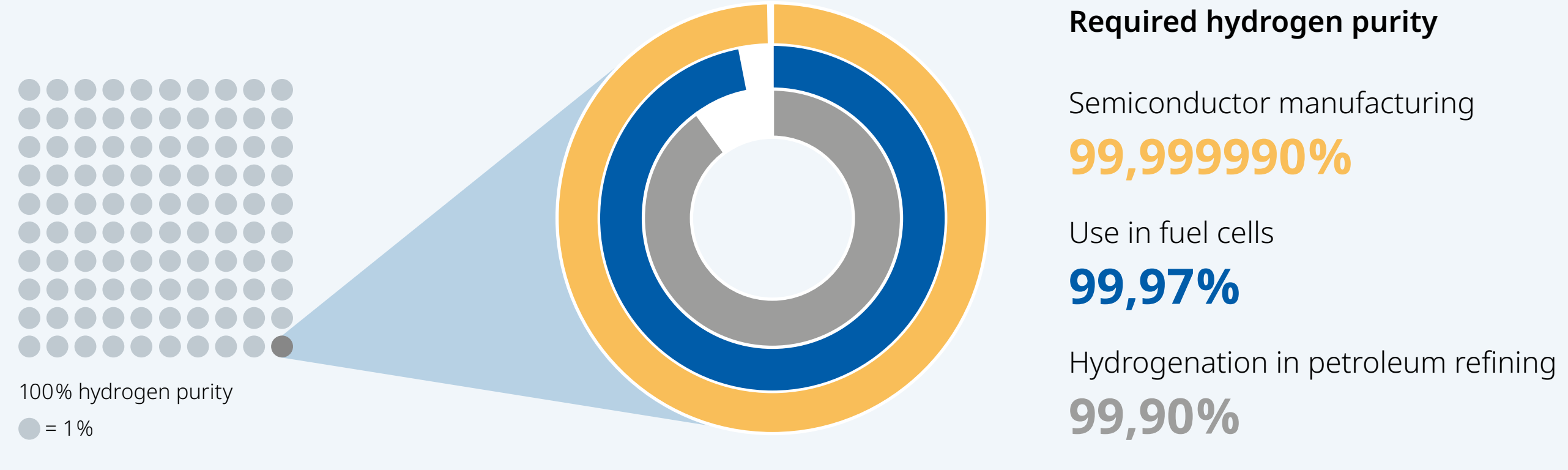


Requirement for this: Hydrogen must be available in **high quality**.

Sources: BMWI (2021), BMBF (2022)

ALL DEPENDS ON THE PURITY

Not all hydrogen is the same. The degree of purity plays a significant role for the use of the climate-friendly energy medium. There are different quality requirements depending on the area of application.

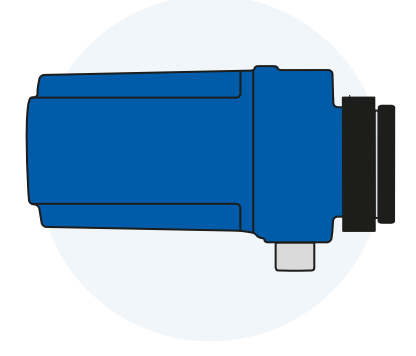


Any **impurity** can **affect** the performance and lifetime of a fuel cell system.

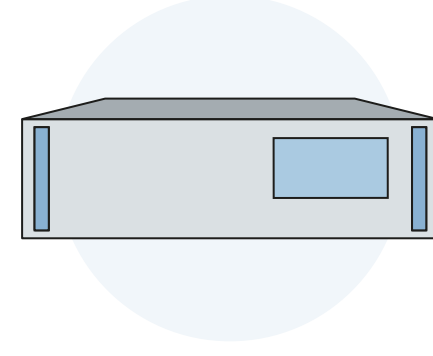
Source: Emcel (2020)

YOUR PARTNER IN THE EXPANDING "HYDROGEN ECONOMY"

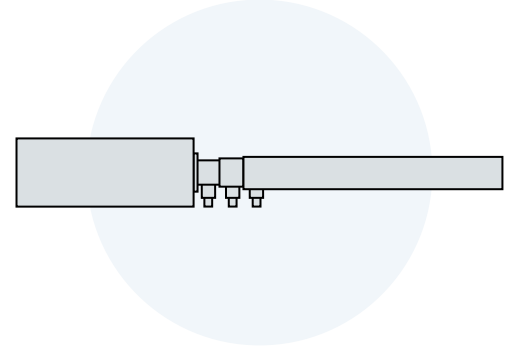
The use of hydrogen poses special challenges for the products.



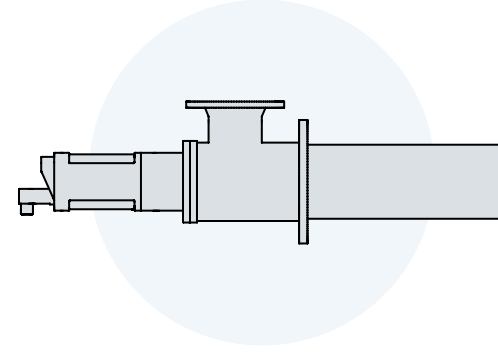
Flame supervisor
Optical monitoring of all fuel flames of all fuels, including in complex multi-burner plants



Gas analyzer
Measurement of more than 30 gases from ppt to 100%



Furnace camera
Visualization of combustion chambers, combustion processes, flames and other hot processes



Gas burners, gas pilot and pilot burners
For industrial combustion plants, thermal processes, combustion chambers, boilers, furnaces, reactors, etc.

H₂-ready – our product portfolio is already ready for hydrogen use today.