



A Vision Becomes Reality

Innovative technologies for the hydrogen infrastructure

Leading.


THE LINDE GROUP

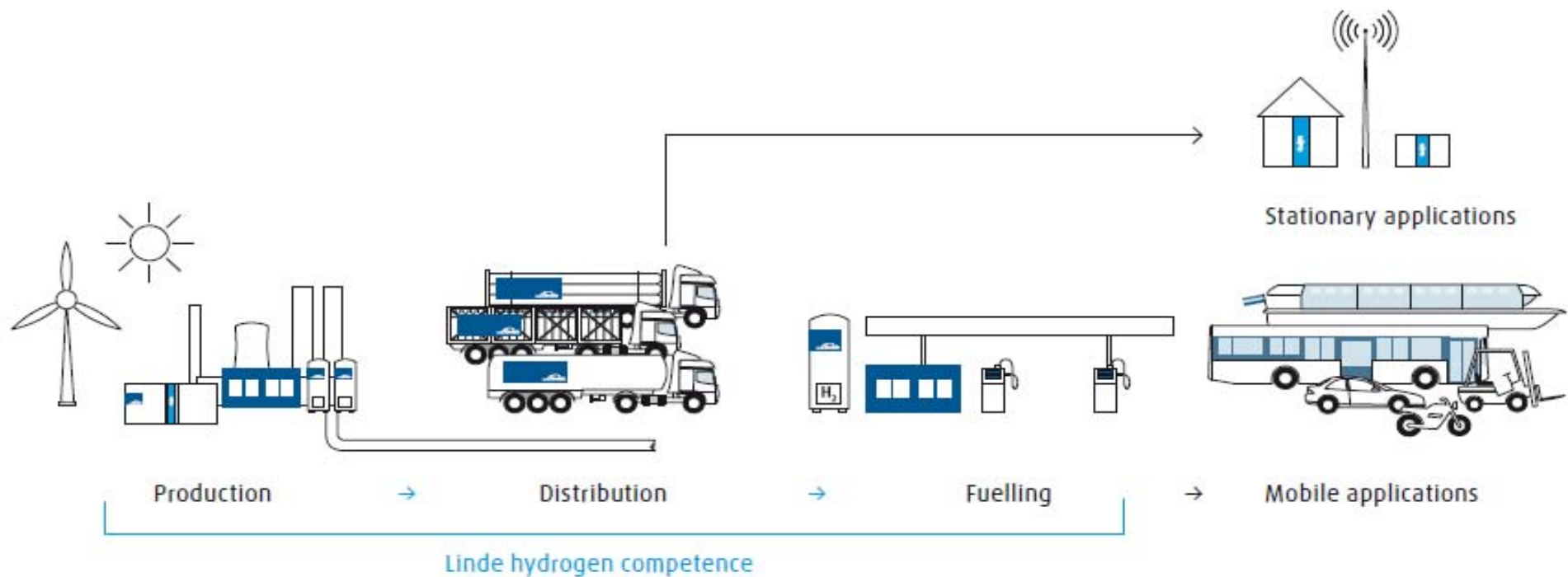
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Hydrogen and Linde

Leading the way. Our expertise and technologies for hydrogen energy applications



Linde is a full-range solution provider along the entire hydrogen value chain.

The Core of hydrogen refuelling stations. Hydrogen Compression technologies

- Is the hydrogen feed liquid or gaseous?
- How much hydrogen is needed per hour?
- What is the required pressure?
- What kind of hydrogen vehicles are to be fuelled?
- How fast do the vehicles need to be fuelled
- How many vehicles need to be fuelled sequentially?

Compression technology	Linde product lines	Min. ² /Max. inlet [bar]	Approx. max. throughput [kg/h]	Max. pressure [bar]	700 bar	350 bar	≤350 bar	Liquid
Ionic compressor Ionic liquid as piston for compression	→ Ionic fueller 42	25/300	22	420	○	○	●	○
	→ Ionic fueller 45	25/300	22	450	○	●	○	○
	→ Ionic fueller 50	25/300	20	500	○	●	○	○
	→ Ionic fueller 90	5/300	75	900	●	○	○	○
Cryo pump Processes liquid hydrogen feed	→ Cryo pump 45	3/5 (liquid)	100	450	○	●	○	○
	→ Cryo pump 90	3/5 (liquid)	100	900	●	○	○	○
Dry runner Lubricant-free, dry-running piston compression	→ Mini fueller 90	15/300	5.5	875	●	○	○	○
	→ Max fueller 90	25/300	11	900	●	○	○	○
	→ High flow fueller 43 ¹	25/300	22	438	○	●	○	○
	→ High flow fueller 83 ¹	400/400	100	830	●	○	○	○
Other, e.g. diaphragm (membrane) compression	→ fuelH ₂ [™] 45, custom-built	450	5.5	450	○	○	●	○
Overflow unit w/o compression	→ Fuelling panel	300/300	Varies	300	○	●	●	○
LH₂ fuelling Liquid transfer pump and dispenser	→ LH, Mobile	≤4	215	≤8	○	○	○	●
	→ LH ₂ Stationary	≤4	215	≤8	○	○	○	●

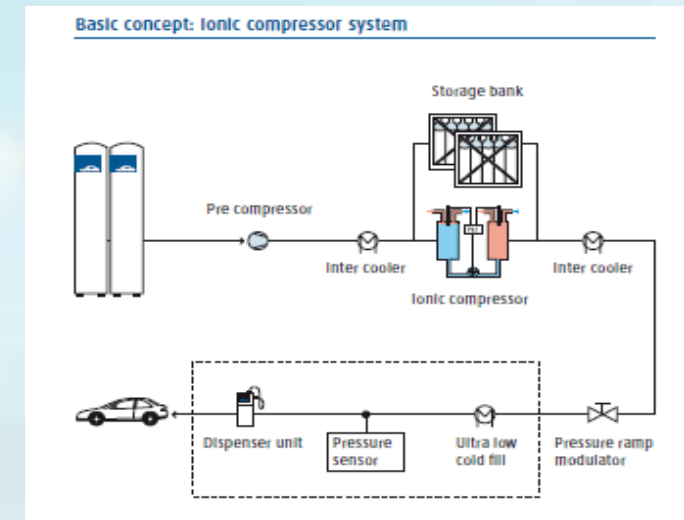
Special: The ionic compressor

Advantages of ionic liquids at a glance:

- No contamination of hydrogen (or other gases)
- Not volatile and not combustible
- Environmentally safe
- good thermal capacity
- Not electrically conductive
- Good lubricating qualities
- Corrosion inhibition

Advantages of the ionic compressor at a glance

- Close to 100 percent energy conversion efficiency
- Lower energy consumption
- very small number of moving parts (due to use of ionic liquid as piston)
- reduced wear and long service life
- Little maintenance effort and costs
- Lower material costs
- Low noise emission
- conformity with newest fuelling standard SAE J 2601



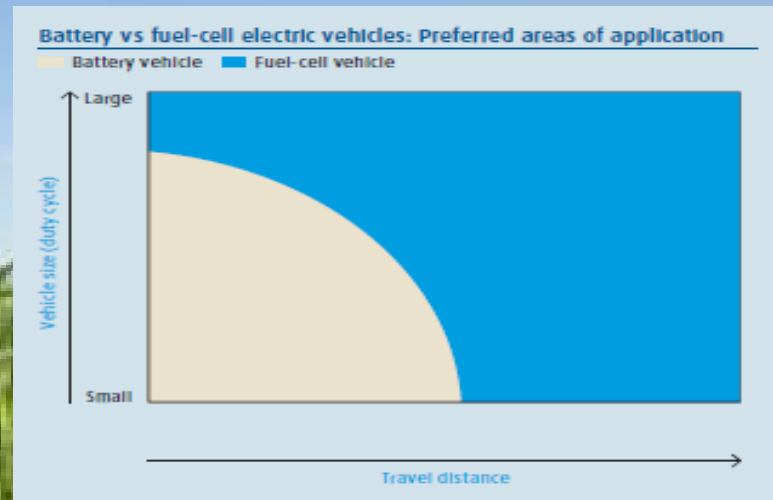
Fast, Safe, Reliable. Hydrogen Fuelling Dispensers



Hydrogen fuelling dispenser portfolio

	Name	Max. fuelling pressure [bar]	Max. inlet pressure	SAE J2601 ¹	IR com ²	Max. flow rate [g/sec]
CGH, dispenser	→ 25fork	312	420	No	No	60
	→ 35HF	438	500	No	No	Up to 120
	→ 35A	438	500	Yes	Yes/option	60
	→ 35B	438	500	Yes	Yes/option	60
	→ 70A	875	900	Yes	Yes	60
	→ 70B	875	900	Yes	Yes	60
LH, dispenser	→ LH2 A	10 (liquid)	5 (liquid)	Not applicable	Yes (wired)	60

Special: Battery and fuel cell electric mobility



Tried and tested in China

Selected reference





Get in touch with us. Your partner for hydrogen project

- Linde's global presence as a company and our commitment to excellence ensures that anyone doing business with us has access to high-quality gases, technology and services – anytime and anywhere.
- High levels of safety are a top priority for Linde – especially when working with hydrogen. With Linde, you can be sure that the strictest safety regulations are always observed.
- We deliver state-of-the-art turnkey technologies, developed and engineered by our highly qualified staff.
- Linde reliably supplies high-purity gaseous and liquid hydrogen for hydrogen fuelling stations.
- Linde is the ideal development partner for customised solutions.