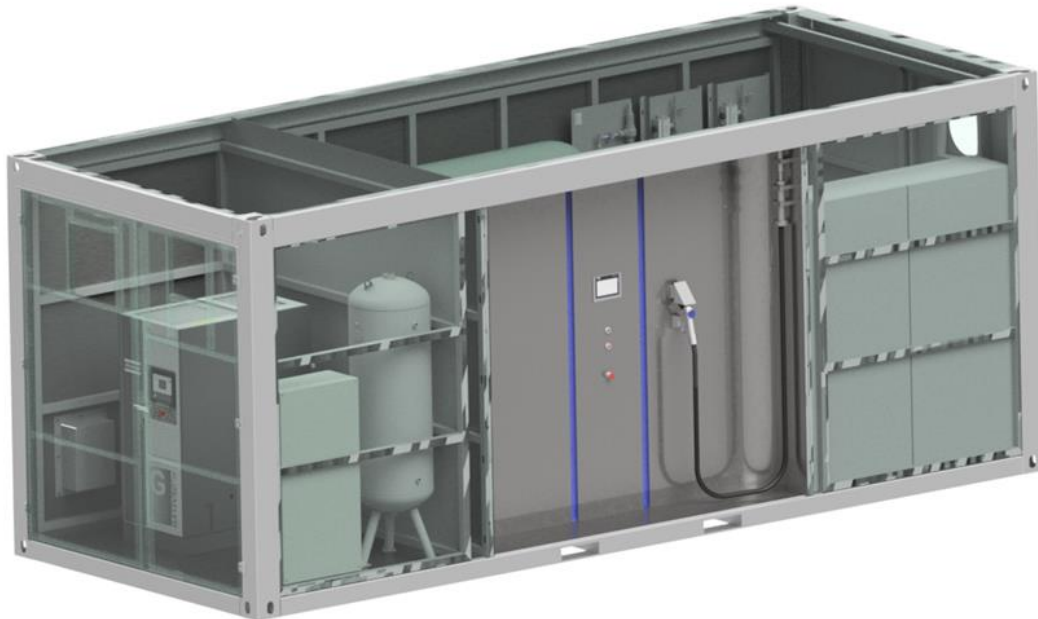


## Refuelling station HSC

The entire refuelling system is housed in a 20" container. The container is divided into an Ex and a NonEx part. A compressor station and an integrated high-pressure storage tank makes it possible to provide hydrogen at a level of 450bar. The dispenser unit (HSF) is the interface to the vehicle.

### Innenansicht des EDC Betankungscontainers:



The refuelling system is designed as a container. This means that a self-contained system can be brought to different locations relatively easily. On site, the container must be connected to the existing supply infrastructure. After installation and acceptance by the respective authorities, the refuelling system is ready for use.

### Supply:

The H2 supply of the system is provided by the customer with H2 5.0,  $P_{max} = 300\text{bar}$ . The version offered contains the connection option for 3 supply storages.

### H2 compressor:

By means of a compressor station consisting of two small compressors, the mobile supply storages can be emptied as far as possible and the station's own pressure tanks can be filled to obtain a higher final pressure in the vehicle tank. Furthermore, starting from the highest available pressure level, compression can be performed directly into the vehicle tank. This allows the target pressure to be reached completely if the duration is sufficiently long.

The compressor station consists of a compressed air preparation unit in the non-Ex-part and 2 independent pneumatic compressors in the Ex-part of the container.

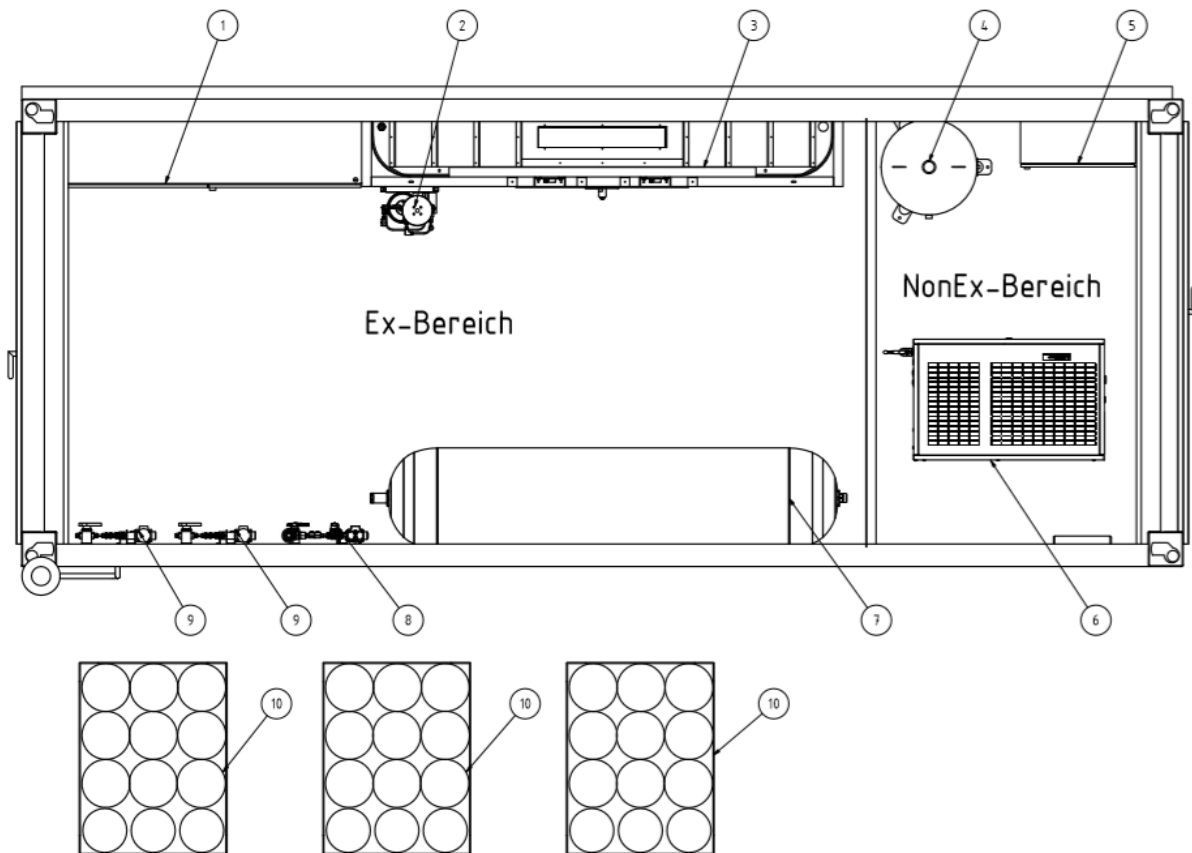
### Buffer storage:

As internal high-pressure buffer storage 500bar vessels are implemented. These enable around 1050 litres of hydrogen to be stored at a pressure level of 450bar.

### Dispenser:

The dispenser is integrated in the container and is designed as a 350bar version without cooling. Integrated is the refuelling generally according to SAE2016 including 350bar, uncooled according to SAE2010.

### Layout plan:



1. H2 compressor
2. Refuelling-rack
3. Dispenser unit
4. compressed air reservoir (max. 12bar)
5. electrical cabinet
6. Pneumatic compressor
7. H2-buffer (max. 500bar)
8. Supply-rack
9. Additional-supply-rack
10. H2-Supply (max. 300bar)

## Software

EDC has been automating hydrogen refuelling stations in Europe, Japan, Korea and the USA for over 10 years. The software (refuelling, cooling, compressor) comes completely from EDC, for many applications EDC also did the electrical planning. Refuelling appears to be the most complex part in terms of functional safety and correct implementation.

The refuelling itself, as well as all other safety-relevant functions, are safely executed and monitored by means of failsafe PLC.

## HSF

The HydrogenSmartFueller (HSF) is a flexible refuelling system, specially developed for hydrogen filling stations. Thanks to the control system integrated in the dispenser, the system can be modularly extended with supply connections, a compressor system, high-pressure storage tanks, cooling system, etc. The monitoring and control of these extensions can be taken over by the HSF control system. Depending on the design (especially the refuelling equipment), both 350bar and 700bar vehicles can be refuelled (of course also other pressure levels after adaptation of the software, e.g. 500bar). This modularity allows a wide range of applications, so the HSF can refuel any kind of hydrogen vehicles.

## Refuelling process

The refuelling of tanks  $\leq 10\text{kg}$  is carried out according to SAE J2601 - (revised 2016-12).

The SAE only regulates cooled refuelling. In the case of uncooled, alternative refuelling versions, the refuelling method (ramp, target pressure) must be implemented by agreement and in accordance with the manufacturer's specifications, and tested and approved together with the manufacturer and system operator.

For the refuelling of tanks  $> 10\text{kg}$ , such as buses, trucks or trains, there is currently no binding standard. The Japanese JPEC contains tables for vehicles  $> 10\text{kg}$ , but these are cooled 700bar refuellings.

The refuelling of tanks  $> 10\text{kg}$  is therefore also carried out according to the manufacturer's specifications, tested together with the manufacturer and the system operator and released together.

## Specification EDC refuelling container (HSC)

### Connection:

Power supply	400V, 50Hz, 45A
Hydrogen	Quality 5.0 (according to SAE J2719), $P_{\max}(\text{supply})=300\text{bar}$ , 3 connection points

### Dimension:

Container	20"
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### Pneumatic:

Pneumatic compressor	5,5 – 10bar Compressed air
Oil-water separator	Integrated

### H2 compressor:

H2 discharge flow rate	~2,55kg/h @250bar Gas pressure
Min. Inlet pressure	50bar (70bar recommended)

### Buffer storage:

Medium Pressure Storage System	~1050 Litre H <sub>2</sub> @450bar
Mounting	Integrated in Container
Temperature range	-40°C bis +65°C

### Dispenser unit:

Dispenser	HydrogenSmartFueller
Refuelling equipment	WEH TK17 35MPa
Pressure protection	425bar
Operating display	7" HMI
Login via RFID	possible
Remote maintenance	Integrated router
Ambient temperature	-20°C bis +40°C

The container configuration described here is designed for the refuelling of 35MPa vehicles. On request and after clarification of technical details a 70MPa variant can also be realized.