#development
#innovation

H2BOT

Mobile hydrogen powered semi-autonomous EV charger

No need to drive your car to a charging station. The charger can come to you.

H2BOT is a solution for charging of EVs in places where there is no charging infrastructure yet. H2BOT produces the electrical energy for charging itself directly "on board" using its own fuel cell. H2BOT is controlled by an operator remotely using teleoperation. No additional on-site service is required. The user orders H2BOT charging using the CarEn mobile app.

Charging power	42 kW
Hydrogen volume on board	14.1 kg at a pressure of 500 bar, equals 230 kWh of electrical energy
Charging method	DC
Charging connector used	type CCS or CHAdeMO

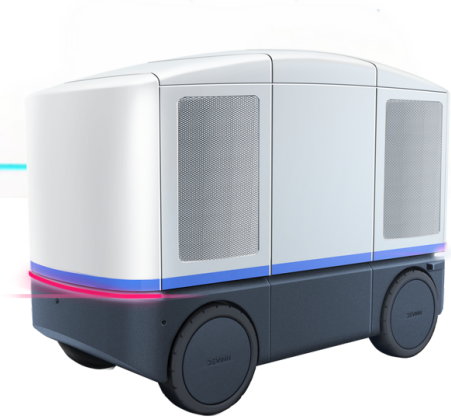
Areas of use

H2BOT can be used wherever it is not worthwhile or impossible to set up a stationary charging station. It can be a parking lot in a shopping center, a P+R parking lot on the outskirts of large cities, or perhaps temporary parking spaces at cultural events.

The price of charging with H2BOT is directly proportional to the price of the hydrogen used. Therefore, it is worthwhile to integrate H2BOT into a hydrogen energy storage project, where the energy for H2BOT is produced near ist place of use with an electrolyzer typically by using excess energy from photovoltaics.

CarEN mobile app

The CarEN app includes a complete user interface for operating a charging service using the H2BOT.



Charging order process

1. The user chooses his vehicle type in the app and confirms the charging order.
2. The app sends the charging request to the operator, who remotely navigates the H2BOT to the destination and directs the robotic arm near the vehicle's charging connector.
3. H2BOT will automatically open the lid, connect the connector and start charging.
4. The user can see the charging progress in the app and the appnotifies him about the completed charging.

CarEN mobile app

A configurable solution

We always adapt the application to your way of use. In most cases, it contains the following modules:

- Linking to a database of vehicles that H2BOT can automatically connect to
- Information about the availability of H2BOT at a given location (available, unavailable, available for a certain time)
- Placing an order for charging
- Charging status monitoring

In addition, the application may contain:

- Payment gateway for payment of charging or connection to an external partner

Zero CO_2 emissions

Thanks to the fuel cell, the only emissions the H2BOT produces at the charging point are heat and demineralized water. The total CO_2 balance always depends on the type of hydrogen used (green vs. gray). In general, 1 kWh of electricity from the regular grid corresponds to roughly 430 grams of CO_2. One charging of an EV (battery with a capacity of 80 kWh) to 80 % corresponds to the transfer of approximately 60 kWh of energy. If we use H2BOT powered with green hydrogen for charging, savings of up to 26 kg of CO_2 can be achieved compared to charging from the grid.

Type of fuel cell used	PEM liquid cooled
Approximate hydrogen consumption	75 g per 1 kWh of transferred energy (approx 4.5 kg of hydrogen to charge an EV)

Unlimited range of teleoperation - one operator can operate multiple H2BOTs

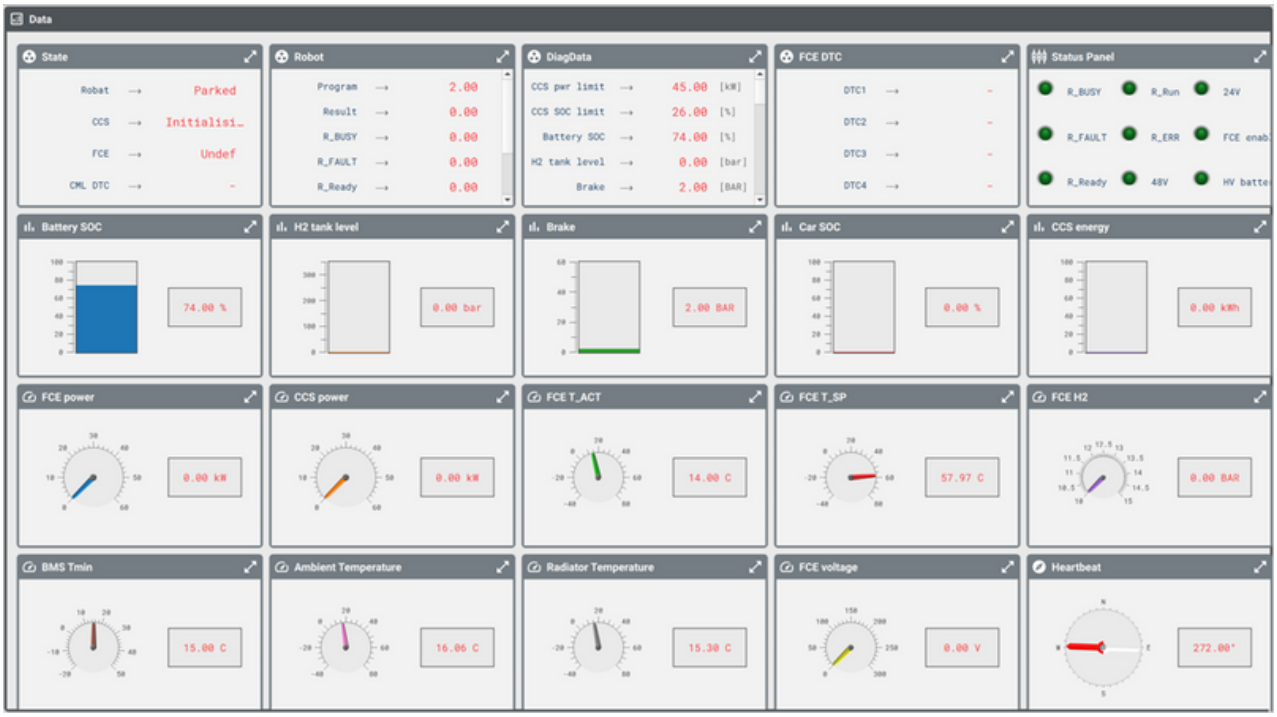
The operator has a view from several cameras and can switch between multiple H2BOTs. H2BOT is controlled remotely, similar to a car. A steering wheel is used for turning, pedals for acceleration and braking.

Connection method	Redundant 2x LTE
Cameras	8x overview FullHD, 1x 3D scanning sensor
System security	VPN connection, automatic stop of operation when the signal is lost
Maximum travel speed	20 km/h

Remote control panel

During operation, the following data is available to the operator in the control interface.

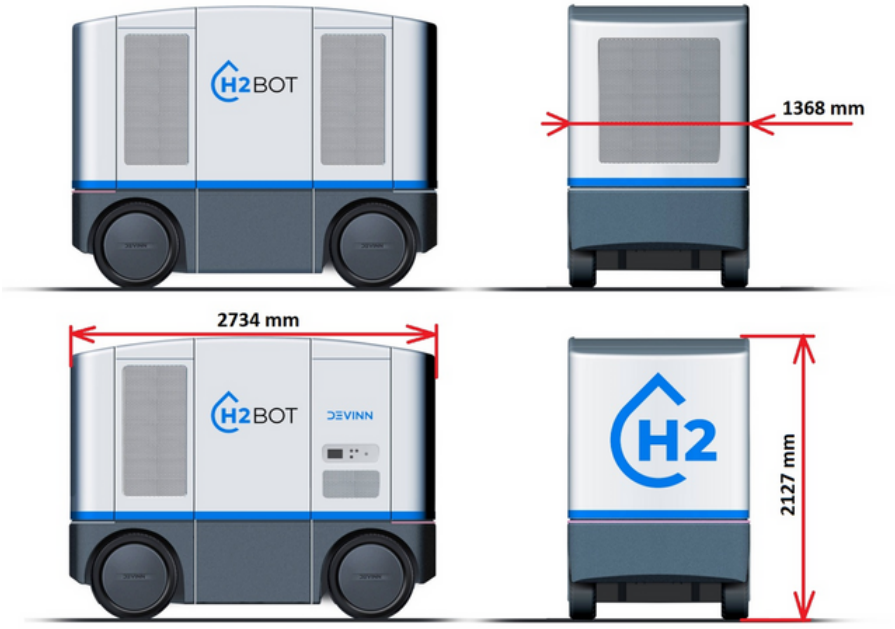
- Hydrogen tank status
- Vehicle telemetry information (speed, engine power)
- State of the fuel cell system (pressures, temperatures, diagnostics)
- Charging system status (robot diagnostics, 3D scan results)



Compact dimensions

Due to its length, the H2BOT occupies only one parking space. The operator can always connect it to the charged vehicle in a way that it does not block other parking spaces.

Dimensions (HWD)	2127 x 1368 x 2734 mm
Max. reach of the robotic arm	1600 mm
Turning radius	1950 mm
Total weight without hydrogen pressure vessel	1800 kg
Total weight incl. full hydrogen pressure vessel	2454 kg



Interchangeable easily removable hydrogen pressure vessel

In the central part of the H2BOT you can find a TPED certified pressure vessel, which serves as a hydrogen reservoir. It consists of composite pressure cylinders placed in a self-supporting steel cage on a steel pallet. To refill the hydrogen, just replace the empty tank with a full one. A manual high-lift pallet truck is sufficient for handling.

Type of pressure vessel used	pressure composite vessels type III
Water volume	460 l
Volume of hydrogen	14.1 kg (at a pressure of 500 bar)
Weight of one empty hydrogen pressure vessel	640 kg
Hydrogen quality requirements	designed for hydrogen meeting the SAEJ2719 specification

Safety systems and measures

- Collaborative robot

In the event of a collision with the surroundings, the movement of the robotic arm automatically stops immediately.

- Central stop
- The vehicle's systems are protected against the effects of the weather.
- Heating of the fuel cell preventing damage to the switched off burner. article in the cold
- Continuous measurement of insulation resistance of high voltage systems (protection against electric shock)
- Monitoring of hydrogen/smoke leaks and eventual automatic shutdown of the system
- Independent GSM monitoring of fuel cell temperature in winter (notification by SMS and a call)
- Automatic shutdown of the system when the connection with the operator is lost
- Two-way voice communication with the operator

Operating conditions

Operating temperature range	-20 to +40 °C
Temperature range for storage of the switched off device	-40 to +50 °C

Vehicle database for automatic connector connection

Before automatically connecting the charging connector, H2BOT recognizes the type of vehicle using cameras located on the robotic arm. The cameras scan the contours around the connector cap and compare them with the database. Thus, H2BOT can only connect to vehicles from our database. We are continuously adding new types of vehicles. Please contact us to verify compatibility with H2BOT.

Legislative terms and conditions

H2BOT is not currently approved for autonomous driving in road traffic. It can therefore only be operated within private parking lots and similar areas. We will provide you with detailed training for operating H2BOT. In addition, you will need an ADR certificate to transport hydrogen vessels by road (e.g. due to filling at a filling station).

Service and inspection requirements

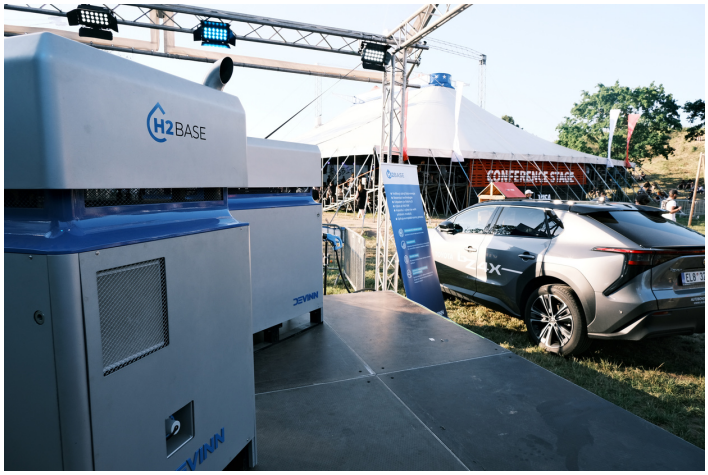
Requirement	Frequency
Revision of gas equipment	Once a year
Fuel cell system check	min. twice a year, or according to operating hours
Calibration of hydrogen leak sensors	Once a year

Product variants

Variants	
Charging power	42 kW
Additional equipment and accessories	
A second interchangeable pressure vessel for hydrogen transport and storage	
The possibility of adding another type of vehicle into the database for automatic connection of the charging connector using the robotic arm	

Other products for mobile EV charging by DEVINN

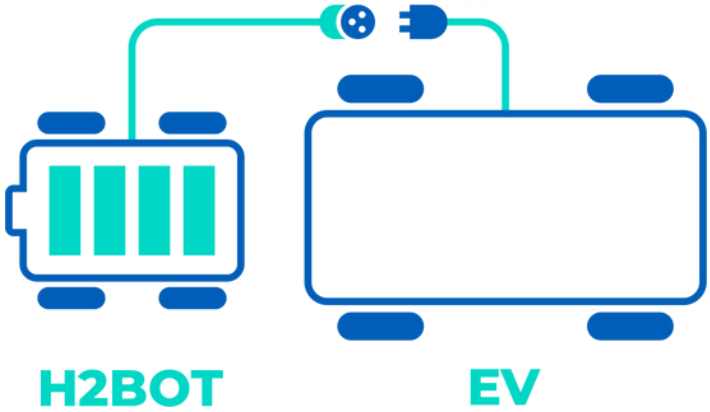
A temporary charging station can also be created using our H2BASE generator. Like the H2BOT, it produces energy from hydrogen completely emission-free using a fuel cell



Find out more

Alternatively, we can equip the H2BOT with an energy storage unit consisting of second-life batteries instead of a fuel cell. The device can then essentially serve as a remote-controlled mobile "power bank".

A battery storage unit with a capacity of up to **100 kWh** can be placed in the installation space of the hydrogen pressure vessel of the standard design of the H2BOT.



Standards and Conformity

2014/30/EU	Electromagnetic compatibility
2014/35/EU	Low voltage
2000/14/ES	Noise
2014/68/EU	Pressure equipment
EN 62282-5-1	Portable fuel cell power systems

H2BOT online tour

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