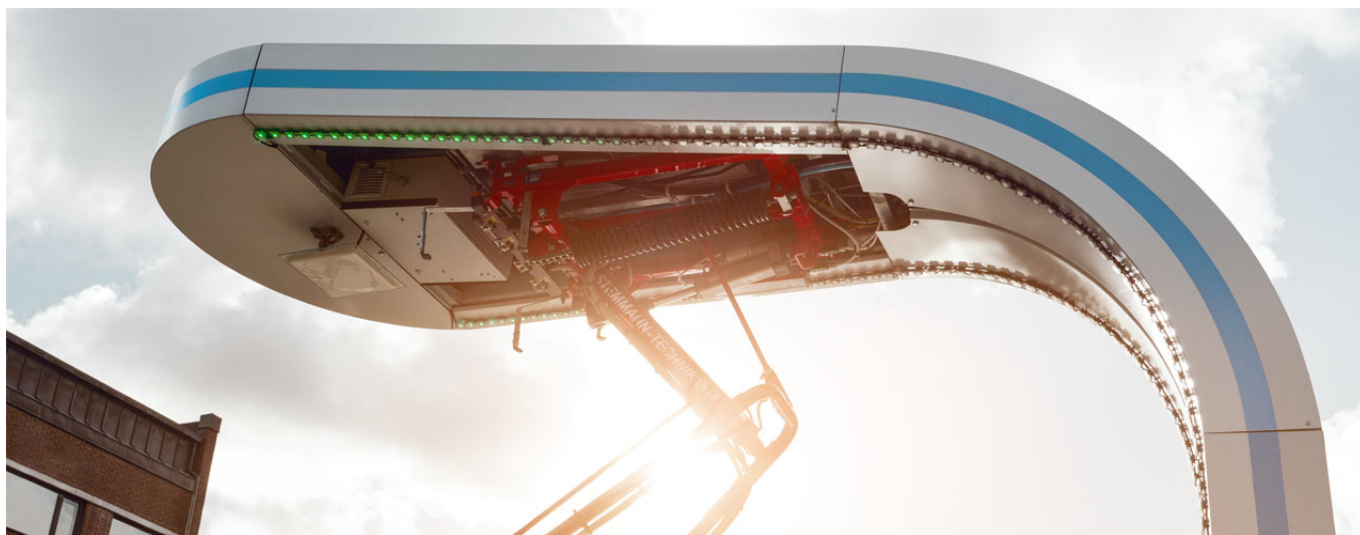




Volvo Buses. Driving quality of life

VOLVO OPPORTUNITY CHARGING SYSTEM

For Electric and Electric Hybrid buses



Fast, reliable and safe

Rapid and fully automatic charging keeps productivity up – and helps you keep your schedule. Opportunity charging is a cost-efficient way of operating an electric bus, and it is proven in commercial operation.

Ensuring performance

The main prerequisites for charging electrically powered vehicles are safety, reliability, short charging times and ease of operation. Volvo Opportunity Charging System delivers on all these criteria, thus ensuring uptime and energy efficiency. Virtually all buses have a couple of minutes rest during the operation. We make use of this time and charge the battery of the Electric or Electric Hybrid driveline, hence the name Opportunity Charging.

Simple and safe system structure

The charging station has a minimal impact on the bus stop. All control devices and electronics are gathered in a heavy-duty cabinet, placed in a suitable housing. Underground cabling connects it to the pylon where the charging contact device, the pantograph, is mounted. The pole-mounted pantograph minimises the required number of pantographs for a given bus route, and reduces the overall cost for charging equipment. This simple technical solution makes for a long service life and minimum downtime.

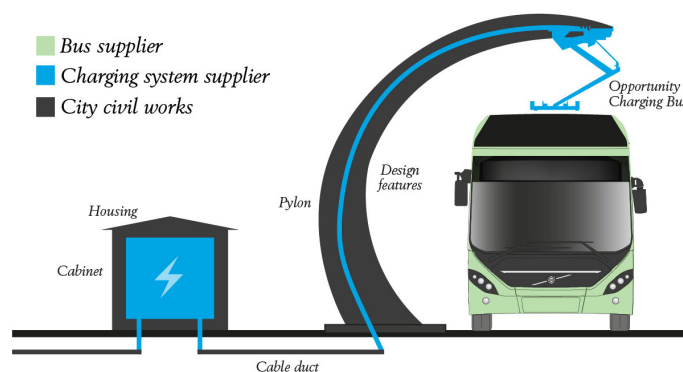
Automated charging sequence

Charging starts automatically after the bus has stopped in the right position at the charging station, and the driver has applied the handbrake. The charging interface connects to the bus from above, which is optimal in terms of safety. All moving parts are

integrated in the pylon, while the contacts on the bus are fixed mounted. This solution minimises the added weight on the bus as well as the need for additional maintenance on the vehicle.

Open architecture - OppCharge

Open architecture means simple adaptations and freedom in choosing supplier/manufacturer of electrical equipment. Volvo is one of the main drivers behind the open architecture OppCharge, a charging system and charging interface agreed on and recommended by the industry. OppCharge is following the ACEA recommendations. Volvo cooperates with several leading suppliers of equipment for electrical power distribution in order to ensure smooth integration in the city's infrastructure.



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Overall dimensions	Typical value
Total height of charging carrier (m)	5.3
Free height under charging interface in stowed position (m)	4.6
Height of charging interface during charging (m)	3.0-3.2
Height of power charger (m)	2.3
Width of power charger (m)	3.8
Depth of power charger (m)	2.3
Distance between charger and charging pylon (m)	0-30

Specifications	
Input voltage (VAC)	Refer to IEC 60038: IEC standard voltages
Frequency (Hz)	50/60 ±2
Total Harmonic Distortion, THD (%)	<8
Maximum charging power level for Electric Hybrid (kW)	150
Maximum charging power level for Electric (kW)	450
Output DC voltage (VDC)	500-750
Max output current at 750 VDC (A)	200/400
Ambient temperature (°C)	-25 - +55
Maximum road inclination	5°
Maximum sideways road inclination	±3°

Charging station for rapid charge

- Open standard – OppCharge
- Connecting interface to power grid and vehicle
- Power charger (converter)
- Earth continuity check
- Isolation resistance monitoring
- Spring loaded pantograph (raise up if power is lost)
- Charger station communications and control
- Control for vehicle interface connection
- Protective housing
- Weatherproof
- Perimeter protection according to applicable regulations

Automatic charging

- The driver stops the bus in the correct position for charging
- Fully automatic connection and start of charging
- Fully automatic end of charging either at full charge or when vehicle needs to leave

Communication with vehicle

- Vehicle sets the requested charging parameters for the charging station

- Connecting is done automatically via Wi-Fi
- Design reference: ISO 15118-1 and IEC 61851

Safety

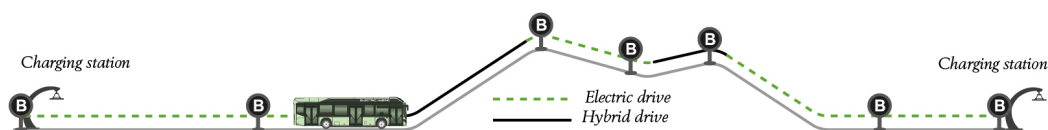
- Embarking and disembarking of vehicle is possible during the charging process
- Emergency stop with stop signal from vehicle or signal device

Performance

- Continuous duty cycle
- Incremental charge current steps available
- Can withstand short circuit current for a limited time
- Supply to the auxiliary electrical loads on the bus is provided as long as the charging interface is connected

Charging interface

- Roof-mounted fixed conductors
- Pantograph mounted on charging station



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