Furrer+Frey®
Opbrid charging systems

ALL-IN-ONE CHARGING STATION

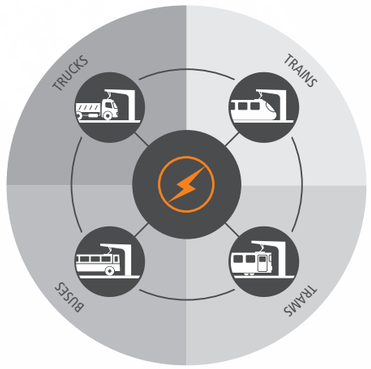
ALL-IN-ONE MULTI-MODAL HIGH POWER CHARGING STATION FOR BATTERY VEHICLES

Welcome to Furrer+Frey's

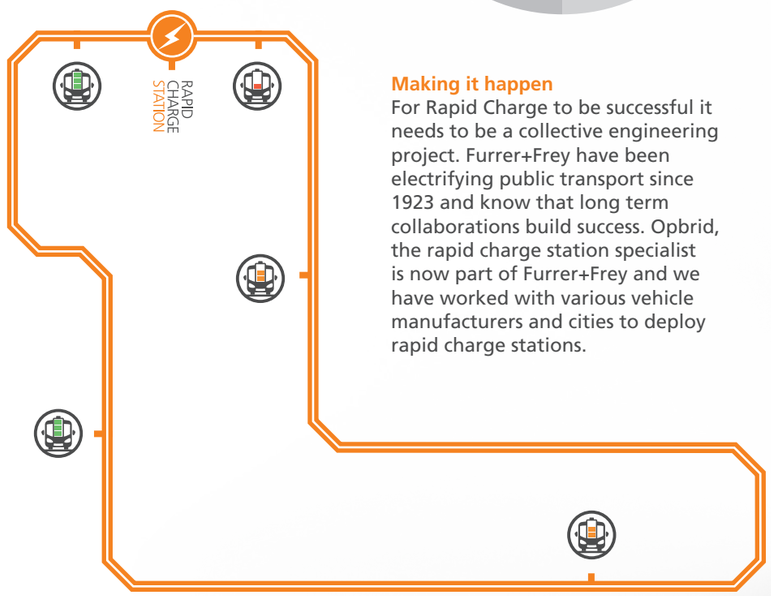
All-In-One Charging Station

Charging systems dramatically expand the scope of battery powered public transport. Using proven technology in place for over 6 years to expand electrification of public transport.

As the electrification of public transport expands, we have looked to exploit innovation and radically change the way power is provided to the vehicles. Furrer+Frey have lead this innovation having installed our first Charging Station in 2010. Charging systems significantly expand the scope and range of battery powered public transport, making the previously impossible possible. This innovation is a game changer, to dramatically reduce use of diesel traction and thus the feasibly of new routes utilising clean energy.



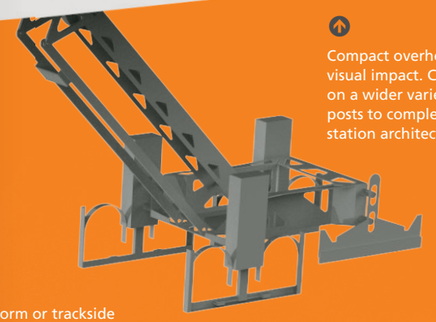
Charging System Concept



Making it happen

For Rapid Charge to be successful it needs to be a collective engineering project. Furrer+Frey have been electrifying public transport since 1923 and know that long term collaborations build success. Opbrid, the rapid charge station specialist is now part of Furrer+Frey and we have worked with various vehicle manufacturers and cities to deploy rapid charge stations.

Charge Station Features



A platform or trackside mechanism with current collector arms that can be lowered to the height of any vehicle or raised to a safe height when not charging.

Compact overhead unit reduces visual impact. Can also be used on a wider variety of mounting posts to complement the existing station architecture.

A safe design composed of four contacts (OPPCharge compatible) designed by Furrer+Frey specifically for the purpose of high power transfer and fast charging, connecting to contact strips on the roof for lowest cost, weight and maintenance on vehicles.

Advantages

+ All-in-one charging station, no separate electronics box so requires only small space.
+ **OPPCharge Compatible: the new industry standard.** So is compatible with all standard rapid charge vehicles.
+ Standardised OPPCharge & ISO 15118 communication protocol.
+ Can be designed to fit almost any public transport vehicle due to its small rooftop footprint.
+ Designed to provide a pathway to future ultra-high power transfer requirements.
+ Safety features that always ensure correct connection, even with vehicles and charging stations from different manufacturers and with differing power requirements.
+ Cover for an additional layer of safety.
+ Designed for very large standstill current and power.
+ Plug & Play' principle, charging modules can be easily replaced, added to or upgraded.

Technical Details

Charging Infrastructure

+ Route-End platform-side charging station.
+ DC conductive charging.

Charger Capacity

+ 150kW AIO charger is field upgradeable to 300kW capacity
+ Charging stations 150kW to 1MW

Charging Times

+ Varying from 3 mins to 30mins for full charge, depending on battery size, type and charger power. Or 90 seconds for top-up charge.
+ Smaller battery size (eg 120kW) can be fully charged in 15min.

Grid Capacity

+ The grid capacity consideration is important as the charging takes large amount of power.
+ Can be equipped with a battery buffer to reduce grid requirements.
+ No UPS needed
+ OPPCharge contact sequence

Charging Infrastructure

+ 24/7 depot charger for night time charging.
+ Coordinated charging to min. grid loads.

Automatic Connection System (ACS) Details

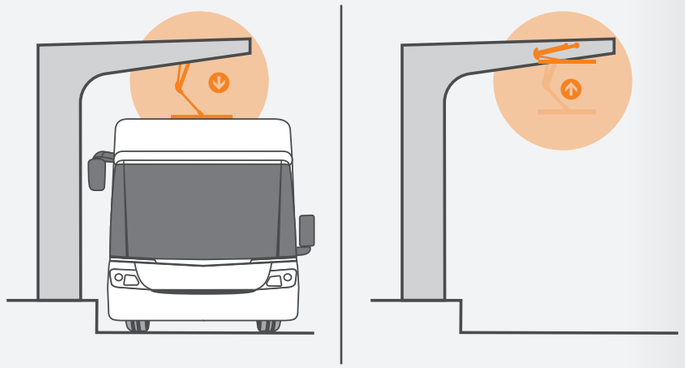
+ Mechanical lowering rails / contacts
+ Four Contacts
+ Lowering time <5s (from height of ~5m)
+ Design life – 20 yrs / 1Million charge cycles
+ Contact force – 150N
+ Max voltage – 750V DC
+ **Temperature operating range:** -25 to +55 degree C
+ Footprint only 1.00sqm
+ De-icing heaters provided

Visualisation – Final structure and layout of unit subject to project requirements and constraints.

An Innovative Design

The All-In-One Charging Station platform side has an innovative design. The system is visually appealing with all of the moving parts contained within the protective hood. This means that the Charging Station can be mounted on a wide variety of supports, allowing designers the freedom to visually blend the Charging Station into the station concourse.

The Charging Station can also be attached to existing structures, such as terminal buildings, platform shelters, and even inside of buildings. Stations can also be integrated with cameras, street lights and passenger information displays. The mechanism has a fast connection speed allowing more time for the vehicle to charge.



Battery vehicle arrives at All-In-One charging station, the current collector arm lowers on to the contact strips on the vehicle and charges for a few minutes. Current collector arm then retracts to safe de-energized state and the vehicle departs.

Benefits

Lower system cost, higher capacity, better ROI and increased safety. These are all reasons why Charging Stations are an important part of public transport projects

The All-In-One Charging Station is switched off when not in use. The All-In-One Charging Station gantry automatically lowers the current collector onto the contact strips mounted on the vehicle roof. Before the vehicle moves away the All-In-One Charging Station safely moves the current collectors away. Fail-safe, in the event of power failure arm still automatically raises to resting position.

The charger has high availability owing to its modular design. Even if one power module fails, the rest continue to function with just a small reduction in total available power.

Ultrafast charging during the day allows the use of smaller, lighter, less expensive batteries. This means lower battery cost, reduced weight, and more room for passengers.

Initial vehicle cost is lower because of the reduction in the number of batteries and no additional mechanical parts on the vehicle.

Low Weight, Cost and Maintenance on the Vehicle: The All-In-One Charging Station has no moving parts on the vehicle, which reduces cost and weight to the absolute minimum. Reducing the weight is a critical consideration, since lower weight translates directly into increased passenger capacity. Reducing vehicle cost also improves the overall system cost, since, in most cases, there are many more vehicles than charging stations. Vehicle maintenance costs are also reduced substantially.

All-In-One is easier to install and commission or even relocate due to its high level of integration.

The All-In-One Charging Station can be shared by multiple operating vehicles, making the cost per vehicle of the charging station very low, with an excellent return on investment (ROI).

Easy integration with existing network that uses vehicles with current collector arranged in the OppCharge standard scheme, with four contacts in two parallel bars.

Sustainable mode of travel as it is also possible to recover braking energy in the accumulators and accelerate away from the station under grid power, further saving energy.

The galvanically isolated DC power lines are monitored for earth faults. If a fault is detected, charging is shut down and this information is passed both to the vehicle and to the remote monitoring system.

Proven Technology

Furrer+Frey Charge Stations are proven technology: used on public transport projects around the world since 2010.

Volvo Plug in Bus
Gothenburg, Sweden

CAF Bus
Spain

Hybricon City Bus
Umea, Sweden

Ebusco Bus
Netherlands

About Furrer+Frey & Opbrid

Opbrid is now part of Furrer+Frey. The two companies have come together to offer our ultra high power Rapid Charging Station for public transport vehicles.

Furrer+Frey® Overhead contact lines

Opbrid

Furrer + Frey AG
90 years experience in high power transfer to vehicles (trains, trams, trolleybuses), worldwide presence.

Emil Furrer and Arnold Frey founded the electrical overhead line company in 1923 during the period of electrification of Switzerland's railroads. The company has been making overhead contact line systems ever since and has grown significantly to meet ever increasing global demand. Furrer+Frey is a medium sized family-owned company with excellent financial stability, global distribution, and extraordinary experience with overhead conductive infrastructure for vehicles.

Having always been known for embracing and developing innovation, rapid charge stations are a logical step into the future of public transport.

Opbrid SL
Focused solely on fast charge stations for heavy duty vehicles since 2009, providing IP, marketing, electronics and software.

Opbrid was founded by Roger Bedell in 2009 in Granada, Spain, with the sole aim of providing automatic conductive charging stations for electrical and hybrid urban buses. Opbrid saw the value in leveraging knowledge, components and experience from the European electric rail industry. Opbrid's partner Furrer+Frey has many years of experience providing high power transfer to trains, trams and buses.

Milestones

2007 — Initial compelling concept of fast charging buses at route ends.

2008 — Research and travel: "Why isn't anyone doing this?"

2009 — Opbrid SL founded and presents the paper "A Practical, 70-90% Electric Bus Without Overhead Wires", at EVS-24 in Stavanger, Norway.

2010 — Prototype Rapid Charge Station V1 built in Granada with Furrer+Frey.

2011 — Arctic Whisper project success in Umea, Sweden using the Rapid Charge Station V1. Hybricon wins Elmia Future Transport Award for this Project.

2012 — V2 Rapid Charge Station chosen for Volvo HyperBus Project. Partnership Agreement signed with Furrer+Frey. Hybricon begins airport passenger service in Umea with 300kW Schaefer charger and Rapid Charge Station V1.

2013 — May 28th, 3 Hyperbus Volvo Plug in Hybrid buses go into passenger service in Gothenburg. Charging at 900A demonstrated in Umea.

2014 — Rapid Charge Station V3 introduced at IAA show in Hanover. First V3 Rapid Charge Stations go into service in Umea, Sweden. Opbrid receives ISO9001/14001 certification.
—
New Flyer Bus Project, Canada

2016 — 4th Generation rapid charge - now all-in-one

2017 — AIO Charging Station for CAF, Spain
—
AIO Charging Station – Ebusea, Netherlands

Furrer+Frey®
Opbrid charging systems

For more information contact
chargingsystems@furrerfrey.ch

Global Head Office
Furrer+Frey AG
Thunstrasse 35
Postfach 182
3000 Bern 6
Switzerland

T +41 31 357 61 11
E schweiz@furrerfrey.ch

GB Head Office
Furrer+Frey GB Ltd
Winchester House
19 Bedford Row
London WC1R 4EB
United Kingdom

T +44 203 740 5455
E gb@furrerfrey.co.uk

Italy Office
Furrer+Frey Italia S.R.L
Piazza S. Leonardoda
Porto Maurizio
1600125 Roma
Italy

T +39 06 98 93 70 98
E italia@furrerfrey.it

www.furrerfrey.ch

Germany Office
Furrer+Frey
Deutschland GmbH
Groß-Berliner-Damm
96-9812487 Berlin
Germany

T +49 30 322 93 15 10E
E deutschland@furrerfrey.de