

# IPT<sup>®</sup>Charge for Electric Vehicles

**CONDUCTIX**  
wampfler  
Ⓞ DELACHAUX GROUP

**iPT**<sup>®</sup>

Inductive  
Power  
Transfer

by Conductix-Wampfler



# Intervention-Free Battery Charging

IPT®Charge is an inductive coupling system which provides automated, that is fully intervention free, and efficient battery charging for all kinds of vehicles, for instance electric cars and buses, industrial trucks and most other similar vehicles.



## Convenience

- Automated, intervention-free charging
- Unobtrusive
- Full integration in urban environments
- Uses available electrical infrastructure
- Makes Zero-Emission realistic today

## Efficiency

- No specific operator skills required
- Reduced onboard battery capacity
- Increased battery life time
- Increased vehicle efficiency

## Safety

- Safe operation, no plugs to handle
- Charging under all weather conditions
- The primary coil is buried, preventing any damage from dirt and vandalism

# The challenge

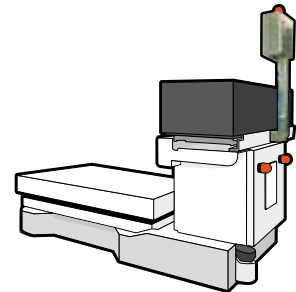
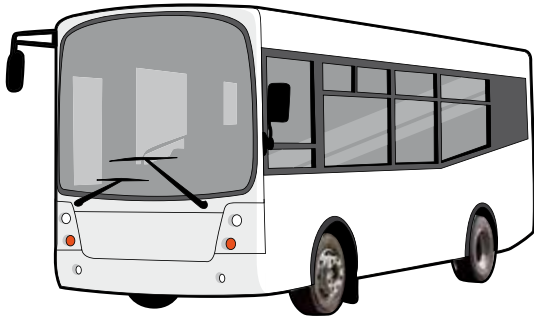
Today's vehicles, especially road vehicles, are almost exclusively powered by internal combustion engines, operating on fossil fuel. The increasing demand on mobility of a growing world population and global markets only intensifies the situation.

Therefore:

- Emissions (e.g. CO<sub>2</sub>) must be drastically reduced or better avoided
- Noise must be reduced
- Energy must be used more efficiently

Only the responsible and efficient use of energy will guarantee long-term economic and environmental viability.





Modern concepts of electric mobility are characterized by:

- Zero Emissions
- High Energy Efficiency
- High Driving Comfort
- Quiet Operation
- Cost Saving Operation

Electric drives fulfill most of these points already today. Their weak point is the onboard storage of energy.

Meeting the challenge of onboard energy storage means to make economic and environmentally friendly driving a reality.

Charging is usually realized in the “conventional way”. The operator must plug a connection into the vehicle.

This process is inconvenient for the operator in many ways and can cause stress to the plug itself.

Contactless, intervention free power transfer enhances the efficiency and suppresses all kinds of operational risks. This will significantly increase the acceptance of electric vehicles.

Having the primary coil beneath the ground also prevents any vandalism and the build-up of dirt.

Combining modern charging algorithms, energy regeneration and intervention free opportunity charging, IPT®Charge overcomes conventional problems of onboard energy storage with today's technology.

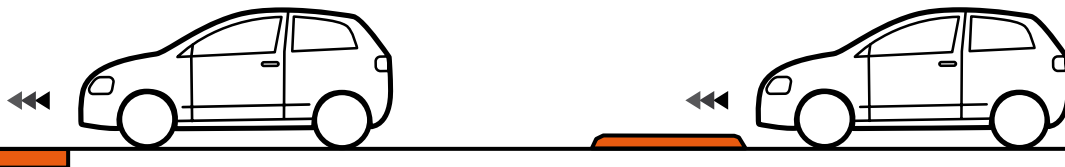




## The Solution

### Principle of Operation

IPT<sup>®</sup>Charge is a contactless power transfer system that allows electrical energy to be supplied to consumers without any electrical or mechanical contact or intervention. Charging can be made possible at virtually any opportunity.



### Optimized Charging

The charging process is optimized by a constant interaction between the onboard battery management system and the track supply. The track supply only provides the instantaneously required power.

In contrast to conventional charging systems – conductive and “plugged” inductive systems - IPT<sup>®</sup>Charge does not use any plugs or paddles and is fully intervention free.

Positioning the vehicle roughly over the primary coil is the only requirement. Primary coils can be embedded in the ground and are unobtrusive. Charging can be fully automated.

IPT<sup>®</sup>Charge can even be implemented in public areas. This means there would be no need to go to a designated area for charging, e.g. a bus depot.

### Safety Aspects

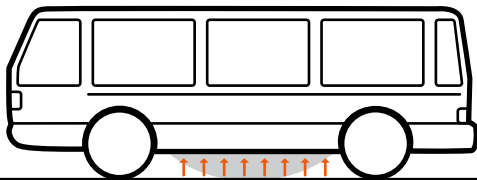
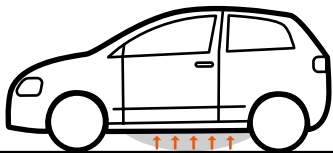
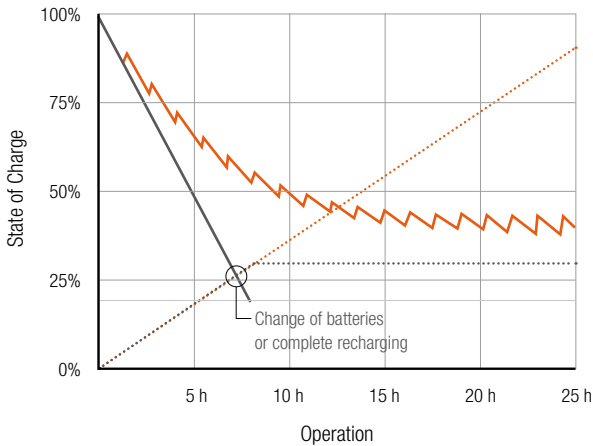
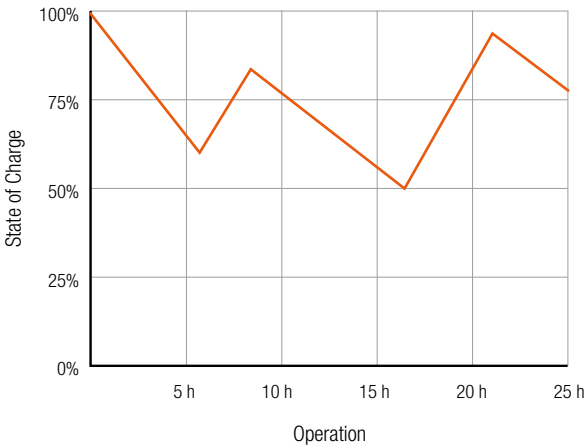
Conductix-Wampfler’s IPT<sup>®</sup>Charge system is intrinsically safe. IPT<sup>®</sup>Charge has been tested and certified by competent, independent institutions. The results demonstrate that the magnetic field values do not exceed the current limits recommended by the safety standard committee for safe human exposure.

The geometry of the Conductix-Wampfler IPT<sup>®</sup>Charge system enables the primary coil and pickup to contain the magnetic field mostly in the air gap between them.

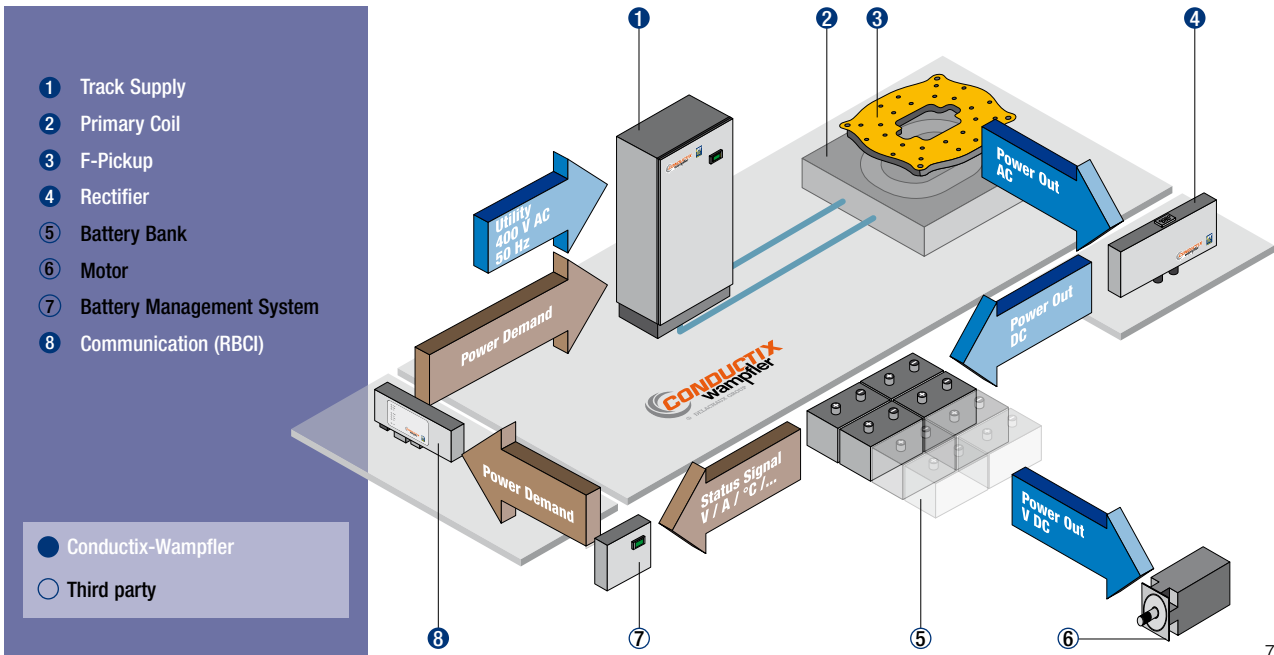
When the vehicle is off the charging position, the track supply de-energizes the primary coil.



— State of charge **with** IPT®Charge  
 — State of charge **without** IPT®Charge



Each IPT®Charge system consists of two parts, primary and secondary, which are magnetically coupled, similar to a conventional transformer. The primary or stationary side consists of a track supply and one or more primary coils. The secondary, or vehicle side, consists of one or more pickups and rectifiers, installed onboard a vehicle. Unlike a conventional transformer, where primary and secondary are mechanically coupled, IPT®Charge is a loosely coupled system operational with an air-gap..



## Opportunity Charging

IPT<sup>®</sup>Charge is a unique system which enables vehicles to operate fully on the principle of opportunity charging.

Opportunity charging, e.g. at bus stops, extends the range of an electric vehicle, e.g. buses.

A minimal onboard energy storage, enough to reach the next charging station, becomes practically sufficient to operate a vehicle optimally.

This offers various practical scenarios:

- Onboard energy storage is reduced to a minimum to gain a higher payload and/or passenger space. Short but frequent re-charging is required, e.g. at bus stops.
- Even if charging opportunities are less frequent and only possible at large intervals, onboard energy storage capacity can be reduced significantly compared with just overnight charging. This results in a significant reduction of weight and increases vehicle efficiency.
- No worries about cables and plugs to handle
- Safe and reliable operation even in areas with public access
- Insensitive to dirt and dust
- Protected from vandalism



## Hands free automated charging serving the future of mobility!

The optimal charging scenario depends on the type of vehicle, the profile of the route and other factors. But common for all scenarios is that IPT<sup>®</sup>Charge offers entirely new perspectives for the operation and design of electric vehicles.

### **IPT<sup>®</sup>Charge enables electric vehicles to operate:**

- highly efficiently
- for longer duty
- at reduced weight
- at increased transport capacity
- at lower cost
- in a familiar way
- three shift operation
- unskilled operators
- at maximum convenience
- at maximum safety







  
ecopowertechnology **E103**

# Product Lines of IPT<sup>®</sup>Charge

## Home Charge

For operation in private homes or parking facilities with limited access to the public

- Charge Pads for on floor or embedded installation
- Wall mounted plug & play Track Supplies
- For, i.e. electric cars

## Public Charge

For charging in parking facilities in the public

- Charge Pads for on the floor or embedded installation
- Wall mounted plug & play Track Supplies (indoor installation without public access)
- For, i.e. electric cars

## Industry Charge

For charging in industrial facilities

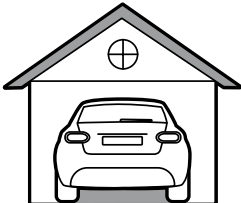
- Charge Pads for on the floor or embedded installation
- For all kinds of industrial trucks, i.e. AGV's in the industry, in-ground infrastructure, etc.

## Power Charge

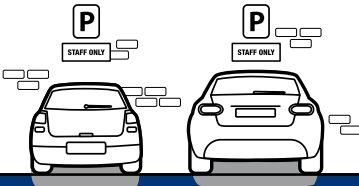
For charging on a higher power level, requiring specific infrastructure

- Embedded Charge Pads
- For buses, transfer cars, tow trucks, ...

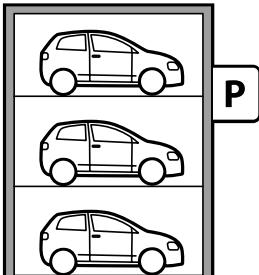
# Where Can Opportunity Charging Take Place?



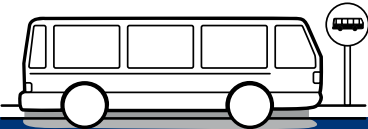
At home



While working or shopping



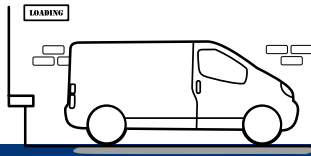
At parking facilities



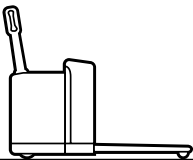
While boarding/de-boarding



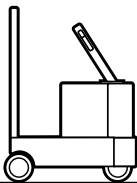
In the city



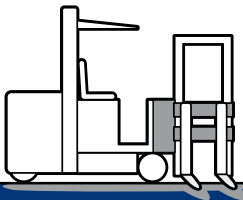
At loading/unloading zones



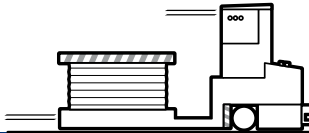
At charging points while waiting for the next job



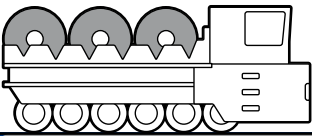
At charging points during breaks



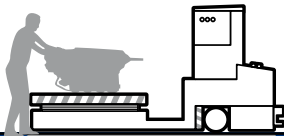
At charging points while in aisle



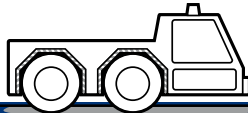
On transfer sections



At charging points



During production process



While waiting for the next job

## IPT<sup>®</sup> - Endless Variety...

... for floor conveyors in gearbox assembly lines



**Customer:** Daimler AG, Germany  
**Solution:** IPT<sup>®</sup>-Floor and iDAT  
**System:** 3 Track Supplies, 35 kW  
 330 m (1082 ft) transit path  
 35 vehicles, 2.2 kW each  
 Installed in 2005

... for electrified monorail systems in final assembly lines



**Customer:** KIA Motors, Slovak Republic  
**Solution:** IPT<sup>®</sup>-Rail and iDAT  
**System:** 6 individual installations totalling 1500 m  
 (4921 ft) in path length  
 97 vehicles, each 750 W or 1500 W  
 Installed in 2005

... for sorting facilities in mail-order houses



**Customer:** Carrefour, France  
**Solution:** IPT<sup>®</sup>-Rail  
**System:** Track Supply 10 kW  
 160 m (525 ft) path length  
 Installed in 2001

... for floor conveyors in truck engine assembly lines



**Customer:** DAF, Netherlands  
**Solution:** IPT<sup>®</sup>-Floor and iDAT-Control  
**System:** 3 installations with 30 kW Track Supply each  
 Total path length 380 m (1247 ft)  
 50 vehicles, 1.8 kW each  
 Installed in 2002

... for electrified monorail systems to transport auto bodies



**Customer:** Mitsubishi, Australia  
**Solution:** IPT®-Rail and iDAT  
**System:** 7 Track Supplies, 30 kW each  
 500 m (1640 ft) path length  
 20 vehicles with 1.5 kW  
 Installed in 2004

... for inclined elevators in construction projects



**Customer:** Docklands, Germany  
**Solution:** IPT®-Rail  
**System:** 2 elevators, each 60 m (197 ft)  
 each with 1 car, supplied with 8 kW  
 Installed in 2005

... for electric buses



**Customer:** AMT, Torino, Italy  
**Solution:** IPT®Charge  
**System:** 20 buses each charged  
 with 60 kW maximum  
 Installed in 2003

... in amusement parks



**Customer:** Walibi World, Netherlands  
**Solution:** IPT®-Rail  
**System:** 180 m (591 ft) system with  
 10 vehicles, 4 kW each  
 Installed in 2005



## IPT<sup>®</sup> Service

### Industry Specific Competence

The range and scope of Conductix-Wampfler's customer service focuses on customers' requirements and requests. Everything from project planning to long term service contracts is possible. The greater the complexity of a system and the expectations for lifetime and operation, the more important the involvement of our trained service team becomes.

### Project planning

- Review of application parameters
- Selection of the most appropriate solution in consultation with the customer, taking into consideration the conditions on site, surroundings and the usage.



### Installation | Supervision

- Complete installation or installation supervision by our trained personnel
- Joint acceptance
- On site training

### Commissioning

- The resonant frequency of each system must be individually tuned.
- Launch support, if desired, during start-up of operations.

### Maintenance & Service

- Regular maintenance and inspections increase the lifetime of a system and ensure its long term operational availability.
- Conductix-Wampfler service agreements, the „Totally Worry-Free Packages“



# Your Applications – our Solutions

IPT® systems from Conductix-Wampfler represent only one of the many solutions made possible by the broad spectrum of Conductix-Wampfler components for the transport of energy, data and fluid media. The solutions we deliver for your applications are based on your specific requirements. In many cases, a combination of several different Conductix-Wampfler systems can prove advantageous. You can count on all of Conductix-Wampfler's Business Units for hands-on engineering support - coupled with the perfect solution to meet your energy management and control needs.



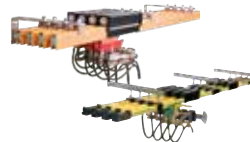
## Cable reels

Motorized reels and spring reels by Conductix-Wampfler hold their own wherever energy, data and media have to cover the most diverse distances within a short amount of time - in all directions, fast and safe.



## Festoon systems

It's hard to imagine Conductix-Wampfler cable trolleys not being used in virtually every industrial application. They're reliable and robust and available in an enormous variety of dimensions and designs.



## Conductor rails

Whether they're enclosed conductor rails or expandable single-pole systems, the proven conductor rails by Conductix-Wampfler reliably move people and material.



## Non-insulated conductor rails

Extremely robust, non-insulated conductor rails with copper heads or stainless steel surfaces provide the ideal basis for rough applications, for example in steel mills or shipyards.



## Energy guiding chains

The "Jack of all trades" when it comes to transferring energy, data, air and fluid hoses. With their wide range, these energy guiding chains are the ideal solution for many industrial applications.



## Slip ring assemblies

Whenever things are really "moving in circles", the proven slip ring assemblies by Conductix-Wampfler ensure the flawless transfer of energy and data. Here, everything revolves around flexibility and reliability!



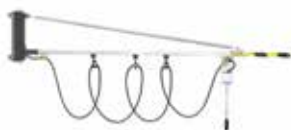
## Inductive Power Transfer IPT®

The no-contact system for transferring energy and data. For all tasks that depend on high speeds and absolute resistance to wear.



## Reels, retractors and balancers

Whether for hoses or cables, as classical reels or high-precision positioning aids for tools, our range of reels and spring balancers take the load off your shoulders.



## Jib boom

Complete with tool transporters, reels, or an entire media supply system - here, safety and flexibility are key to the completion of difficult tasks.



## Conveyor systems

Whether manual, semiautomatic or with Power & Free – flexibility is achieved with full customization concerning layout and location.

[www.conductix.com](http://www.conductix.com)

**Conductix-Wampfler** has just one critical mission: To provide you with energy and data transmission systems that will keep your operations up and running 24/7/365.

[charge@conductix.com](mailto:charge@conductix.com)

[www.conductix.com](http://www.conductix.com)



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