



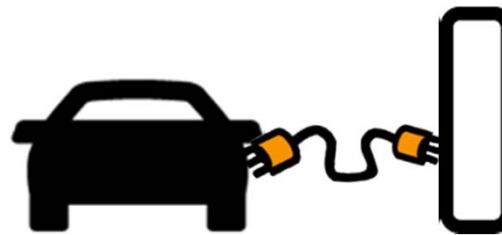
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## Combined Charging the universal charging system

### Key Features and Major Benefits

Ralf Milke, Volkswagen



# Design Requirements for the Combined Charging System



AC national standards remain the same.

Two additional Pins allow DC charging in the same vehicle inlet while accepting the legacy AC connector.



How to speed up from up to 8 h charging to 20 min?

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# How the Combined Charging System Responds



AC national standards remain the same.

Two additional Pins allow DC charging in the same vehicle inlet while accepting the legacy AC connector.



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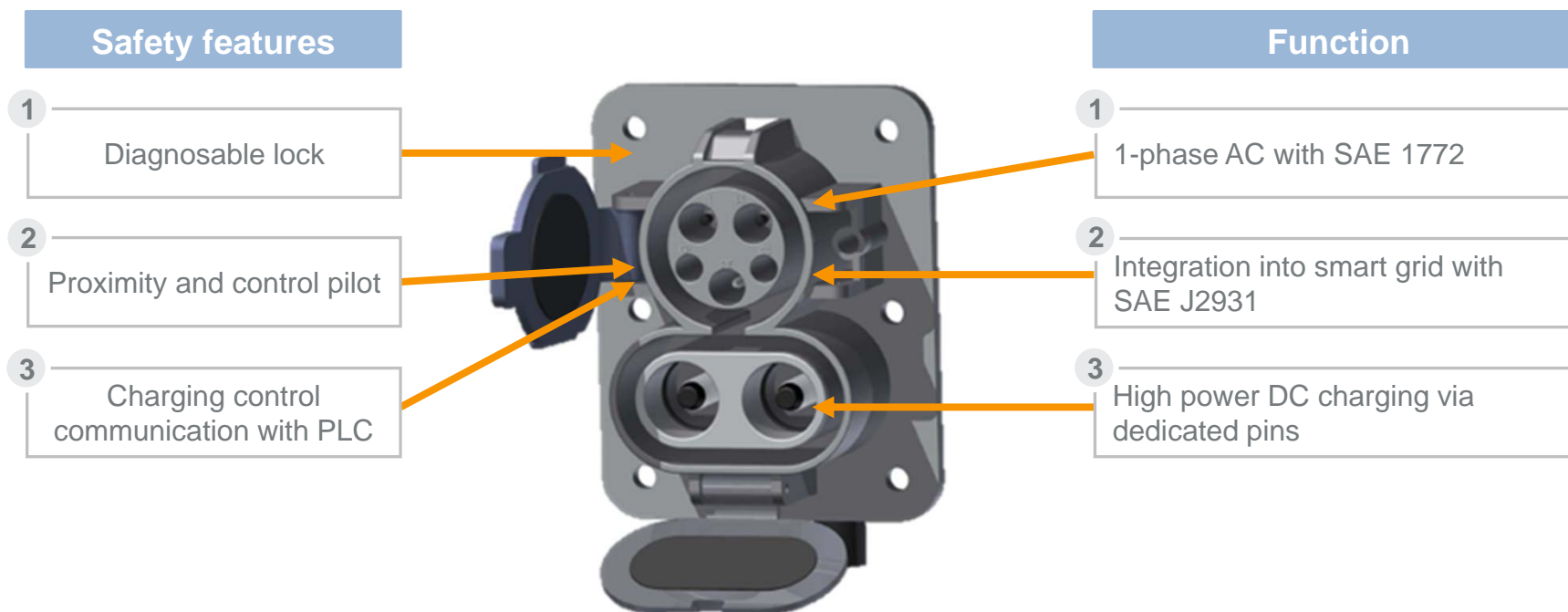


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# Design Combo 1 Inlet

The Combo 1 inlet provides comprehensive functionality at a high level of safety.



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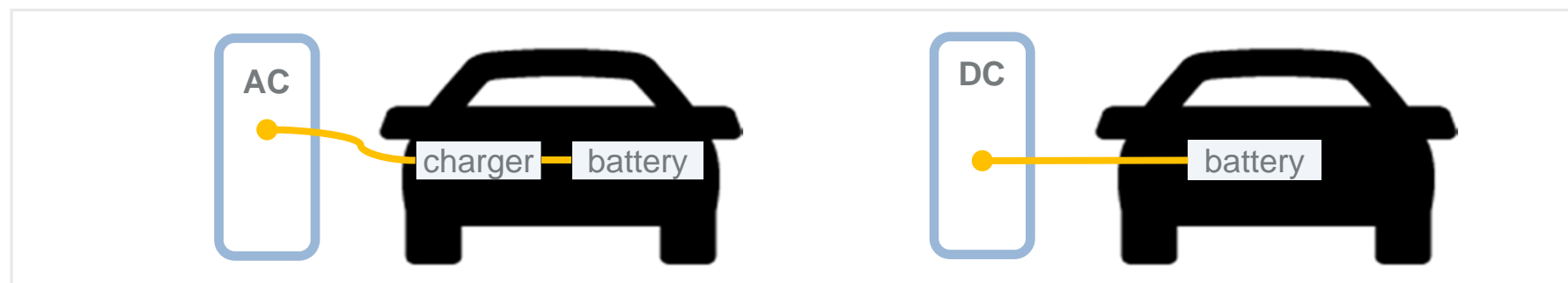
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# Charging Communication for DC Charging



The charging communication between vehicle and charger is standardized in ISO/IEC 15118 in close cooperation with SAE.



## Tasks

- Charging control requires a permanent communication between vehicle and charge pump.
- Current and voltage are adjusted continuously during charging

## Goal

- One communication system for all charging modes, world-wide:
  - Requirements and functionality
  - Transmission technology
  - SW protocols

## Solution

- PLC-based communication ISO/IEC 15118 for all charging modes applying IEEE 1901 HomePlug Greenphy, IPV6 and data security

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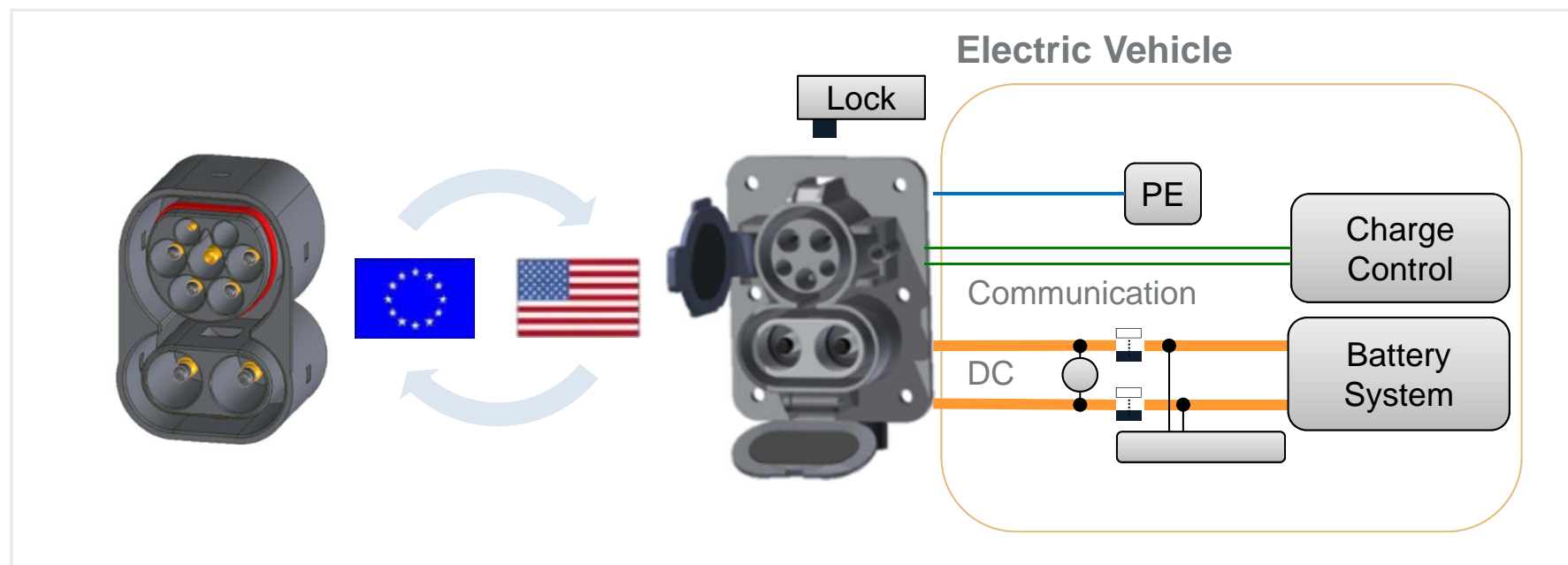


# Combined Charging System



Low Complexity and Cost Optimized:

Cost efficient re-use of multiple parts, resulting in win – win situation.



## Benefits

- One inlet
- No extra design required
- DC re-uses the complete AC communication and adds only DC specific data
- Extensive use of same parts

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## Design Combo Inlet

Easy Handling and Widely Spread User Acceptance: Single car design concept that enables fuel tank as well as combined AC/ DC charging inlet.



The combo inlet fits behind typical fuel doors  
No need for variants



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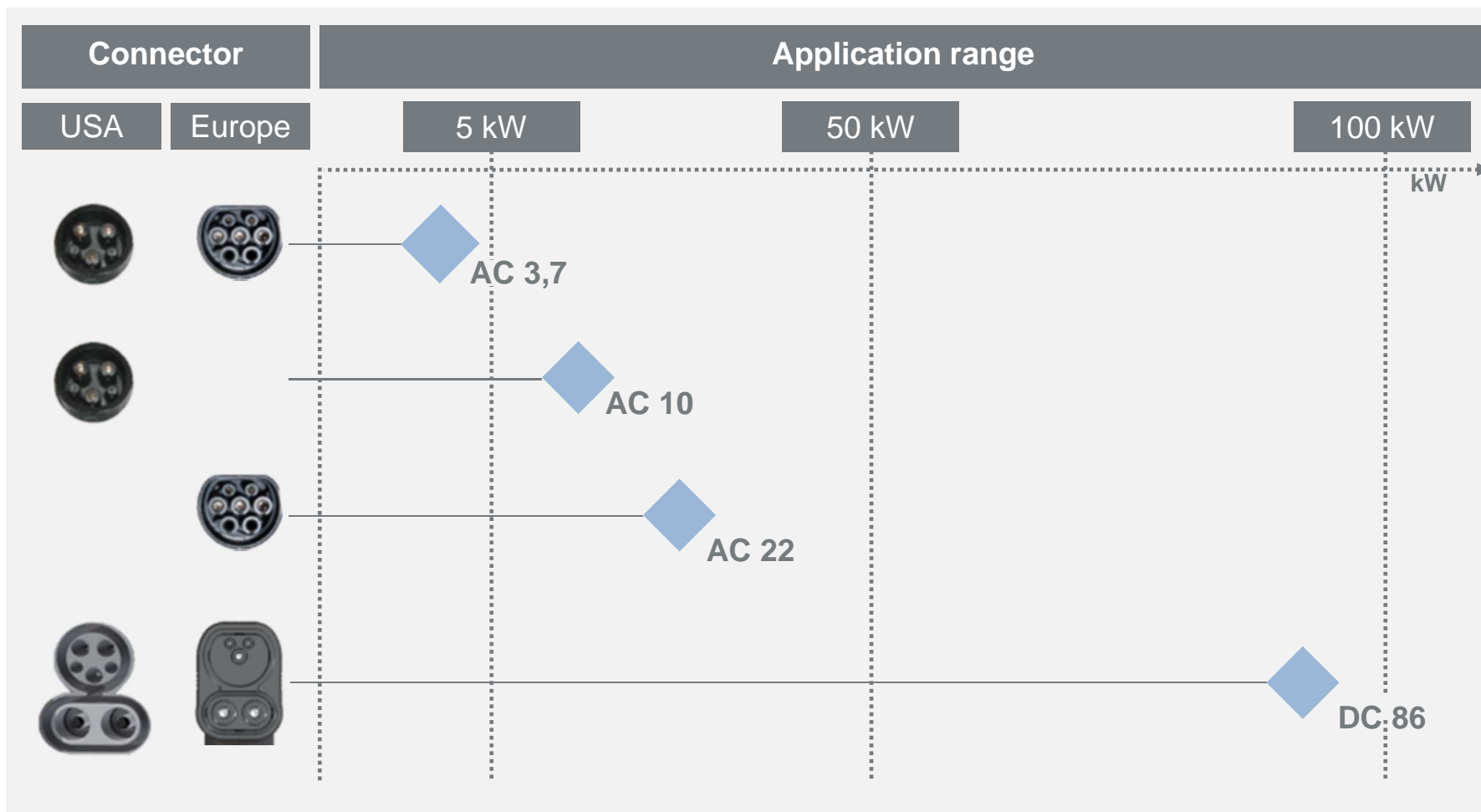
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# Combined Charging Connector Concept



The Combined Charging System integrates the existing AC connectors, allowing for one standard global vehicle interface for AC and DC charging.



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