

# Electric and hybrid vehicle solutions

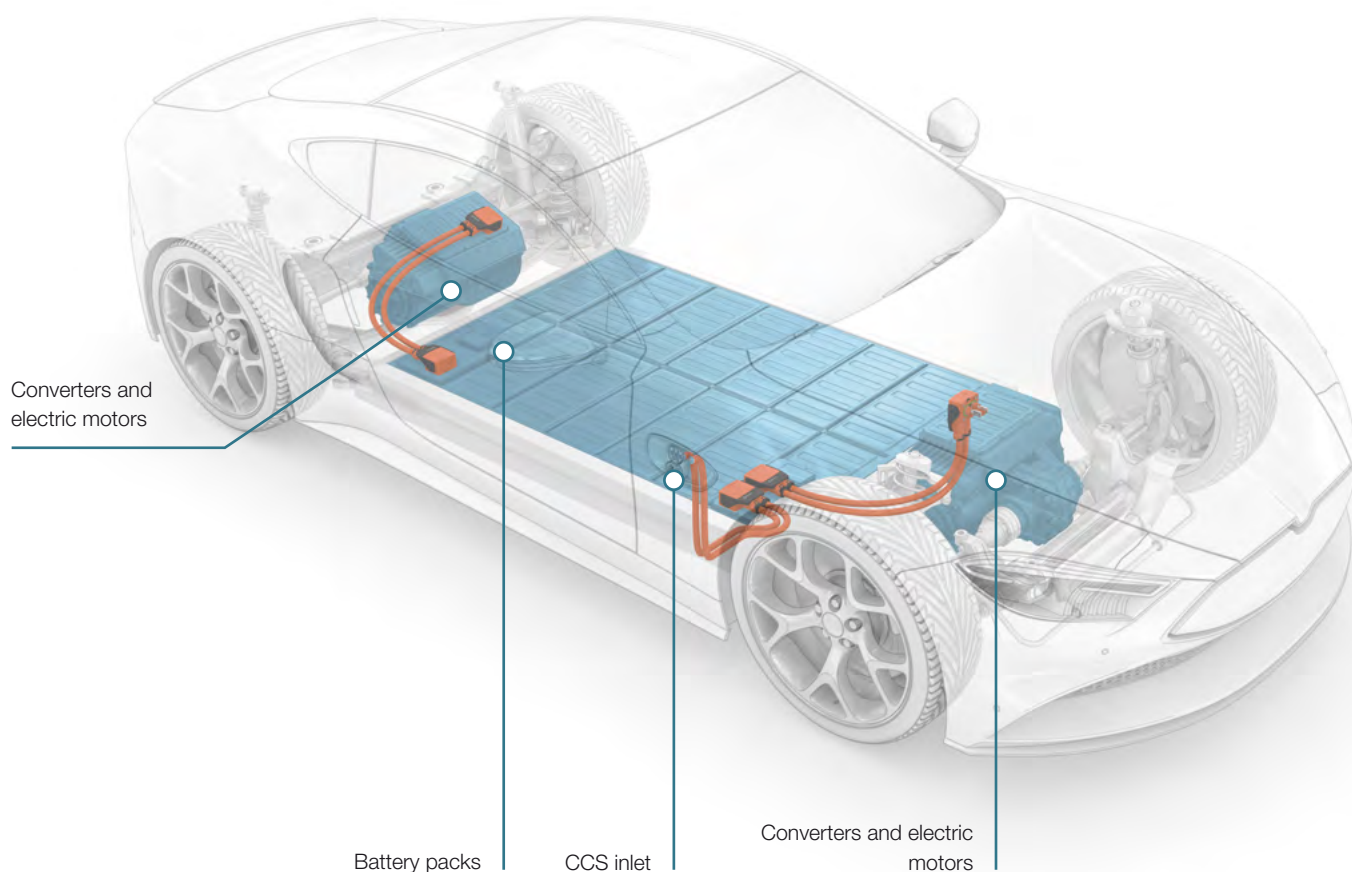
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EN



## OUR APPLICATIONS

# Connections: essential links for e-mobility applications



## Comprehensive expertise and a portfolio specifically for the E-mobility market

E-mobility is at the heart of the transition to renewable energy, reducing CO<sub>2</sub> footprint for every mile driven and improving quality of life for everyone. Our E-mobility connectors are designed to stand up to demanding application requirements and harsh environmental conditions. Our components form the basis for compact solutions with

long-lasting electrical contacts, straightforward maintenance and long service life.

In electric and hybrid drive applications, every component has to meet high standards for quality, reliability, performance and compact design for onboard applications. Stäubli electrical connectors stand out for

their compact design, resistance to vibration and shocks, and ensure constant electrical contact with our unique MULTILAM contact technology. Comprehensive quality tests and external certifications guarantee uninterrupted operation and durability.



Leak-free fluid couplings



Single-pole circular connectors



PerforMore



Customer-specific solutions

## Onboard

Electric and hybrid drives impose demanding requirements on connector safety, reliability, and performance. With our experience and know-how, we're there to support you as an expert partner for even the most unusual applications.

### Electric motors

- Quick-release couplings for motor cooling systems

- Electrical connectors for power transmission

### Converters

- Quick-release monocouplings and multi-couplings for onboard electronics cooling
- Electrical connectors for converter inputs/outputs

### Battery packs

- Quick-release couplings for battery cooling
- Electrical connectors for battery pack connection and maintenance
- Interface between vehicle charging socket and battery pack



Multicouplings



QCC quick charge connector



Quick hydrogen fueling

## Charging solutions

In the future, automatic charging will become increasingly important in all applications as automation increases and the number of self-driving vehicles grows. With its QCC system, Stäubli already offers a versatile solution that combines high charging performance in the megawatt range with a high level of safety, even under the most demanding environmental conditions.

### Chargers/fuel cells (depending on configuration)

- Quick-release couplings for component cooling
- Electrical connectors for component coupling
- Manual or automatic quick-release couplings for low-pressure gas lines (line between hydrogen storage unit and fuel cell)

- Energy supply
- Rackable multicoupling system for slow charging and quick battery changes
- Automatic conductive system for ultrafast charging on the go (opportunity charging)
- Manual connection for quick charging when vehicle is in use
- Hydrogen tank and pull-out protection for fuel cell electric vehicles

SPACE-SAVING – COMPACT SOLUTION

# PerforMore – the E-mobility connector from Stäubli

**Electric and hybrid drives impose demanding requirements on connector safety, reliability, and performance.**

Stäubli developed the PerforMore connector based on the LV-215 standard and the requirements for plug-in connectors in vehicles. The two-pole version of this connector can be used with high-voltage batteries, in-

verters, and high-voltage distribution units (HVDUs).

Our tried and tested MULTILAM technology is built into the Ø 10 mm contact system; depending on the ambient temperature, it can transfer continuous currents up to 600 A with minimal power loss. MULTILAM also

meets the demanding requirements of electric drive trains, like resistance to vibrations and high operating temperatures.

## Impressive performance, compact dimensions

The connector was designed to provide compact dimensions that comply with all the clearances and creepage distances required for high operating voltages.

Especially when plugged in, the PerforMore's low height offers a clear advantage, allowing for more efficient use of the installation space available in vehicles.



General specifications	
Rated current (LV-215)	600 A @ 40 °C (df 1) <sup>1)</sup> 475 A @ 70° C (df 0.9) <sup>1)</sup> 400 A @ 85 °C (LV-215, df 0.8) <sup>1)2)</sup>
Rated voltage	DC 1000 V
Conductor cross-section	50 mm <sup>2</sup> / 70 mm <sup>2</sup> / 95 mm <sup>2</sup> in accordance with LV-216-2 for shielded, sheathed high-voltage cables for vehicles and their electric drive systems
Protection type, mated unmated	IP68, IP6K9K IP2X
Connection type – plug	Screw-on connection; customer-specific connection available
Connection type – socket	Crimp connection Welded connection
Vibration	Test IX for utility vehicles, unsprung mass (ISO16750-3)
HVIL	Yes



More information on PerforMore

<sup>1)</sup> Depends on cable and connection type, df = derating factor

<sup>2)</sup> According to LV215 which refers to IEC 60512-5-2, df of 0.8 is based on this standard





## QCC QUICK CHARGE CONNECTOR

# Automatic quick-charging solution

Stäubli's hands-free connector for quick-charging systems offers the ability to charge commercial electric vehicles automatically including mining, agricultural, and port logistics material handling equipment, trucks, vessels, trains, and buses. This system allows for power transfer within a short time to recharge batteries quickly.

Fast charging increases efficiency by reducing battery size and weight, enabling more weight capacity to the job at hand. This is an ideal fit for applications that are mission critical, require a high level of power, where hands-free charging is preferred, and demand low cost of ownership. With a reduced need for stored energy, vehicles can be recharged along the route with no impact

on transport operations, or during longer stops at depots as an alternative option.

### Advantages at a glance:

- A reliable, fully automated solution
  - Angular and positional misalignment compensation integrated into the geometry
  - No expensive position measuring and position compensation elements needed
- Highly cost-effective
  - Smaller batteries, lower costs
  - Integrated self-cleaning mechanism guarantees reliable, low-maintenance operations and long service life
  - Designed for high numbers of mating cycles
- Excellent safety features

- Complete touch protection
- Waterproof
- Low contact resistance
- Compact, flexible use
  - Easy to retrofit
  - Inconspicuous appearance (e.g. ideal for historic districts)
  - Low impact during construction, no impact on adjacent track or lane
- Easy to integrate

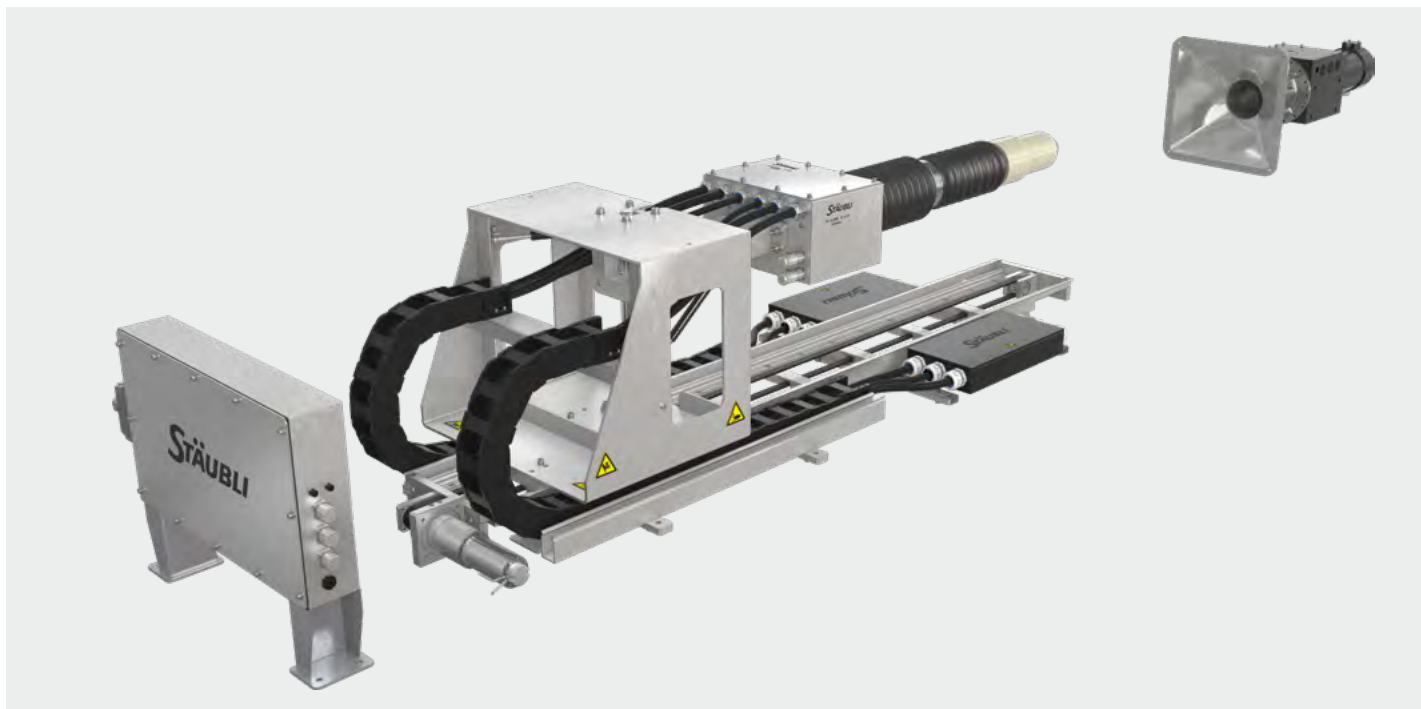
We'll be happy to support you in bringing your project to life (planning, design and integration).

Technical specifications		
	QCC-650	QCC-1500
Rated voltage	DC 1500 V	
Rated current	315 A	670 A
Opportunity charging current (up to 3 minutes)	640 A	1440 A
Number of power contacts	2 + PE	
Number of signal contacts	5	6
Degree of protection, mated and unmated	IP55, IP2X	
Standards	SAE J3105 SAE J3105/3	

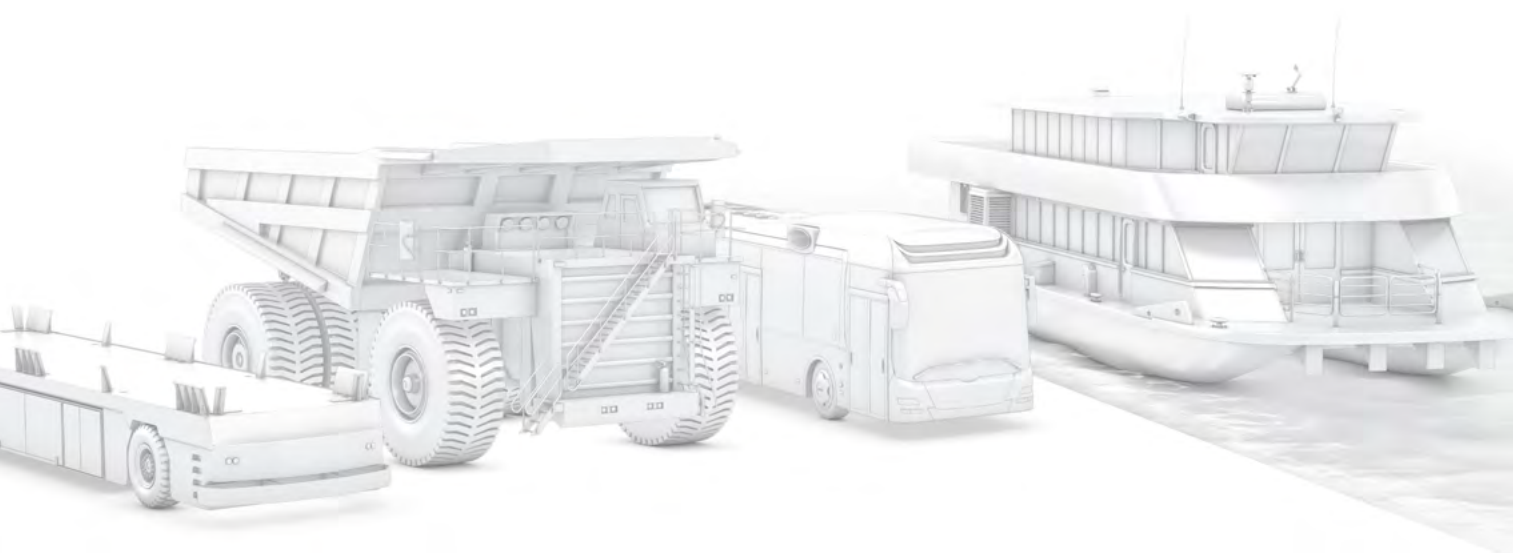


More information on the QCC quick charging system





We offer complete solutions – from initial concept to end product



## ENGINEERING TO ORDER

# Customer-specific electrical connectors

## A solution for every need

One of Stäubli's core skills lies in developing and implementing customer-specific solutions in collaboration with our customers. Your trust has made us a committed partner for customers in almost every industry there is.

We're proud of our many long-term business relationships that have developed over long years of collaboration. We work side-by-side with you, always with a clear customer focus, to develop custom solutions that give you the decisive advantage your business needs. After all, even the smallest high-performance components can have an outsized impact. Our connection solutions are designed to precisely meet your requirements, save time, and help you to save installation space or make assembly easier.

It doesn't matter if it's a solution for a small production series, 100,000 or even millions of components, contact solutions or connectors, or whether your solution calls for low currents or currents over 1000 A. Our MULTILAM contact technology allows for

individual static and dynamic contact solutions that can be mated anywhere from once to a million times. A range of diameters from 0.6 mm to 1000 mm gives engineers the flexibility they need to develop custom-tailored solutions and select the ideal contact materials, contact surfaces, insulation materials and termination types for each solution.

## Cutting-edge manufacturing

Our in-depth knowledge of all specific production processes drives the production process for our high-tech products. We offer custom-tailored assembly and customer-specific labeling to meet your individual needs at our production facilities all around the world. Our machinery and equipment are fully capable of large-scale production, with standardized manufacturing processes and careful inspections to ensure global alignment of our procedures.

## A global perspective

We analyze your needs and requirements, consult with you on-site, and work with you to develop ideas and concepts that are optimally tailored to your requirements. For

complex applications, we test out potential solutions by preparing prototypes and performing tests and optimizations directly in the relevant application. Once the first all-important field test phase is complete, we can start laying the groundwork for series production.

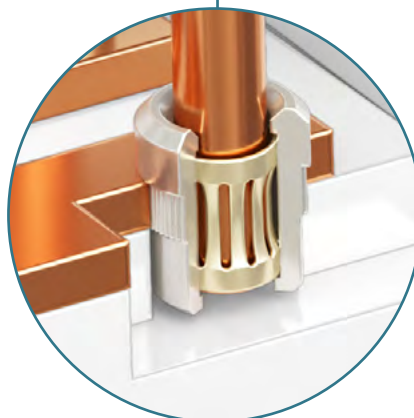
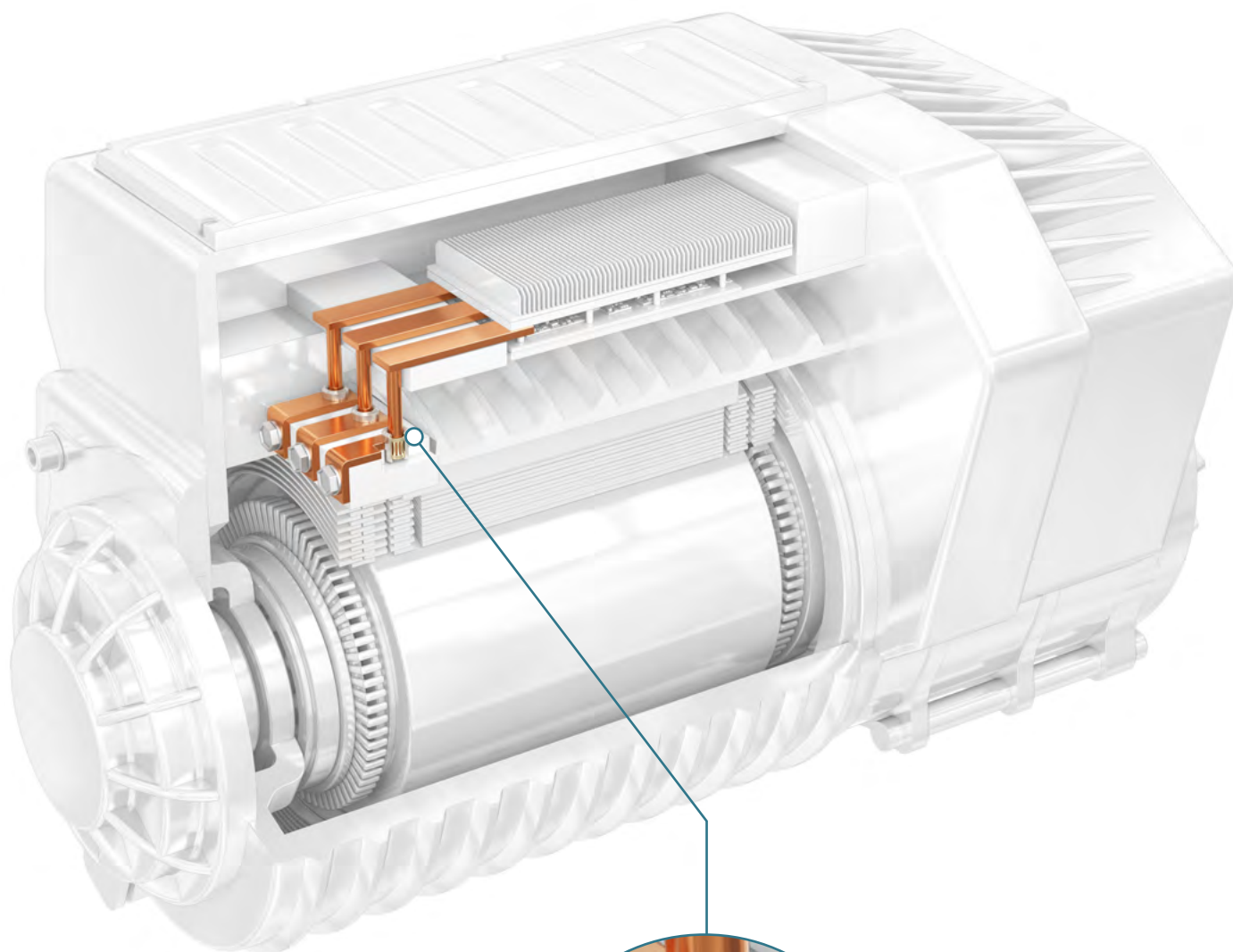
We offer technologically advanced solutions and develop light, compact and custom-tailored connections for fluid, data, high-current and signal transmission that can stand up to both strong vibrations and tough usage conditions, designed for long-term operation even in the harshest, most demanding environments.



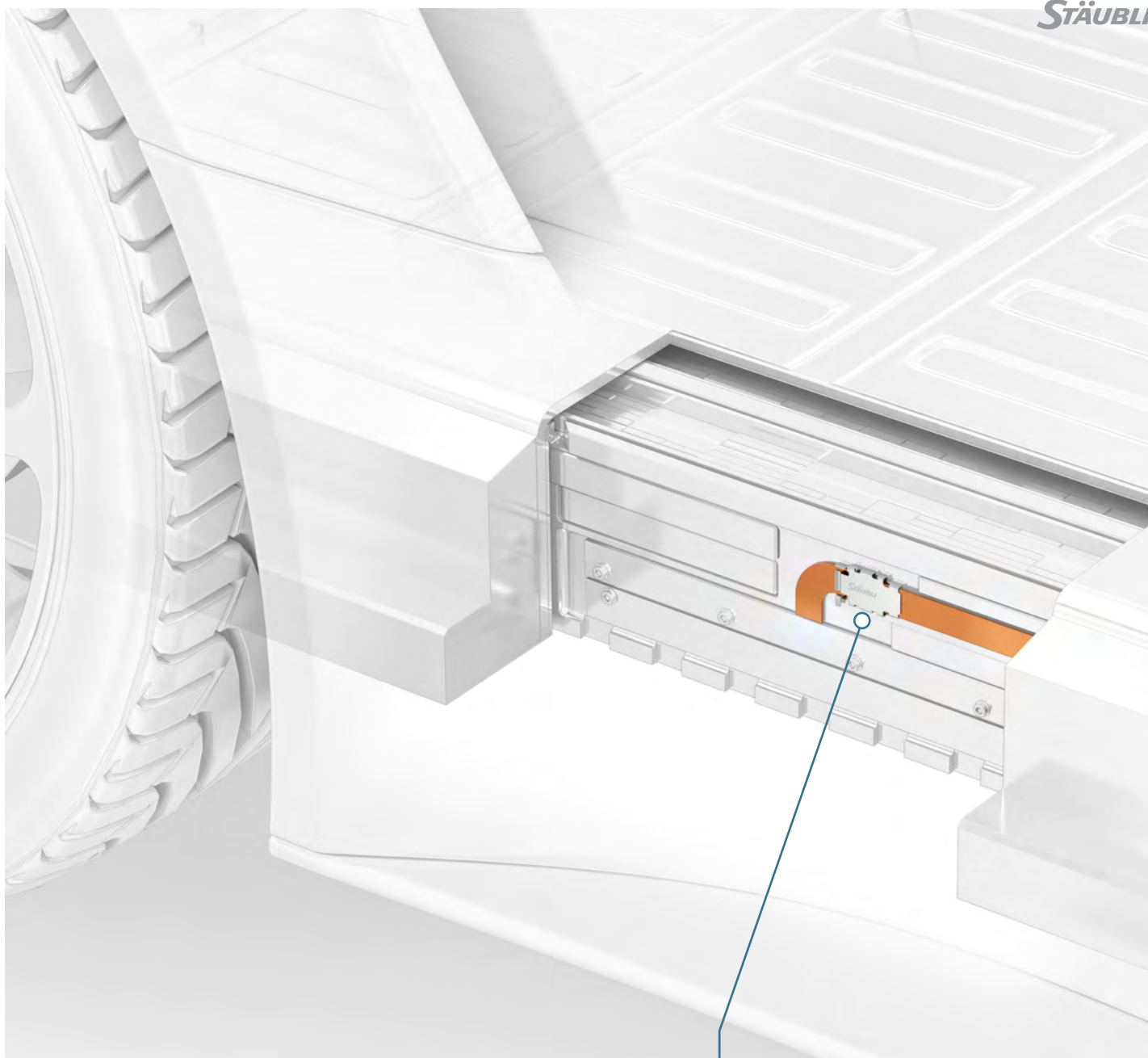
Customer-specific socket solutions



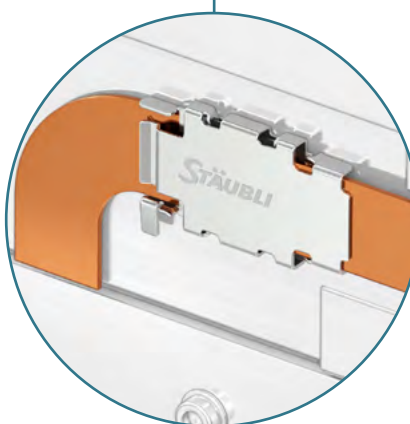
Example: Round connection for inverter/electric motor interface



Customer-specific  
press-in socket with  
proven MULTILAM  
contact technology



FLK busbar connector



## Examples of customer-specific flat connections

Our proven MULTILAM contact technology isn't limited to use in round connections. Our MULTILAM types also offer excellent

performance for flat and fork-plug connections, with exceptional and constant current-carrying capacity and minimal contact

resistance thanks to a sophisticated design that incorporates robust, specially shaped contact elements.



Various busbar connections

### GSR fork plug connectors

A fork plug profile is scalable to a wide range of current-carrying capacities.

Stäubli can modify the design to support the required current capacity, external geometry or connection type, either based on existing profiles or by developing a new profile.

Customers can select from multiple different base materials, a variety of coating options, and different MULTILAM types.

### FLK busbar connectors

Even in the tightest spaces, busbar connectors make it possible to connect busbars quickly, safely and easily within electric drive train components – whether it's to

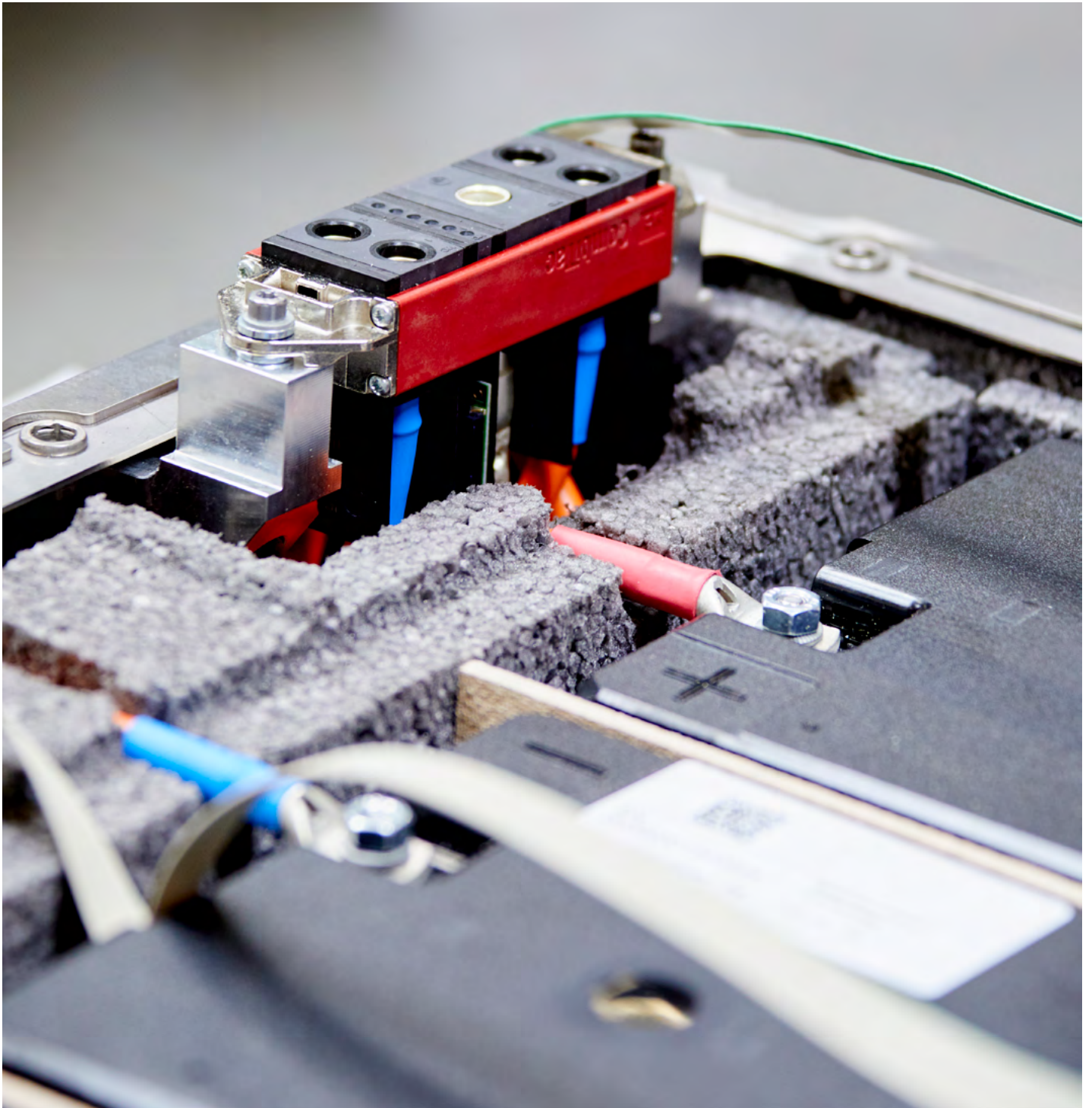
compensate for length differences, extend busbars, or (in components with a modular structure) to connect individual components to one another.

### Advantages:

- Low contact resistance
- Extremely flat design
- Easy to integrate into existing designs
- Fast, intuitive connection

General specifications	
Contact element dimensions (L x W x H)	27 mm x 34 mm x 5 mm
Busbar dimensions	16 mm x 1 mm
Current (30 K warming)	115 A <sup>1)</sup>
Current (50 K warming)	150 A <sup>1)</sup>

<sup>1)</sup> Busbar dimensions are the limiting factor. Other current values are possible with different dimensions.



## THE WORLD OF COMBITAC

# Plug into more possibilities

Experience combined with quality and modularity leads to durable, cost-efficient solutions. The CombiTac modular connector system can be configured online and adapt to even the most demanding requirements.

Reliability when you need it, flexibility when you want it: Whatever your needs are, the CombiTac modular connector system can meet them.



## Transport and logistics

CombiTac is an especially reliable interface for robust applications like power distribution or plug-in connectors for power electronic modules (PEMs), e.g. power converters.

### Battery packs and power distribution

CombiTac can be used with onboard battery systems.

- Complete solution for limited-space applications
- High-density configurations
- Quick, safe connection and disconnection

- Ideal for environments with high shock and vibration levels
- Connections between the main distributor and onboard LRU equipment (power converter, rectifier, etc.)

## Customer-specific solutions

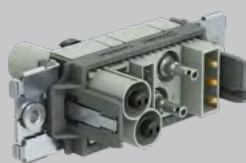
Every CombiTac connector is equipped with individual contact modules that are configured within a single size-adjustable frame or housing.

The modular CombiTac connectors are 100 % individually adjustable.

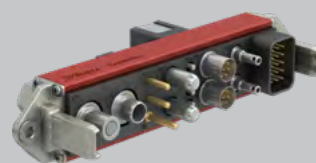
We prepare 3D STEP files and samples of your future CombiTac solution for you, and make all adjustments needed to ensure that your final product precisely corresponds to your design expectations.

CombiTac's modularity is ideal for matching the customer's size specifications precisely. We can even deliver a complete solution that includes cable assembly.

### CombiTac direct



### CombiTac uniq



	CombiTac direct	CombiTac uniq
Sizes – panel mounted	4	18 mm to 180 mm (in 2-mm increments)
Housing sizes	6	6
Aluminum housing IP65, IP67, IP68/69K	✓	✓
Plastic housing IP65	✓	✓
Lightweight housing		✓
PEM housing		✓
Rated current	✓ up to 350 A	✓ up to 300 A, 430 A upon request
High voltage (up to 5 kV)		✓
Signal	✓	✓
Last Mate First Break contacts (monitoring)		✓
Data/Ethernet	✓ up to 1 Gbit	✓ up to 10 Gbit
Coaxial		✓
Fiber-optic cable		✓
Thermocouple		✓
Pneumatic	✓	✓
Fluid		✓
Mating cycles	10,000	100,000
Temperature range (°C)	-40 to +125	-40 to +90
Compliant with fire and smoke regulations for rail vehicles	✓	✓
Vibration and shock resistance	✓	✓
Contact connection type	Crimping	Crimping, PCB, screws

PRODUCT PORTFOLIO

# Cross-industry solutions

## DuraDock power: High-performance connector for docking applications

Automated industrial applications with high numbers of mating cycles require constant and safe power transmission, especially for high currents and voltages. Stäubli delivers suitable high-performance connectors for advanced automation technology.

DuraDock power single-pole connectors were developed for safe transmission of even the highest energies and currents. They are designed for test applications with up to 100,000 mating cycles, where the highest standards of service life, reliability, and safety are critical, but can also be used in battery-swapping applications.

**Areas of application**

The connectors are suitable for a variety of industrial applications, e.g., in E-mobility, railways, and mechanical engineering.

**Advantages:**

- Unparalleled advanced contact reliability thanks to MULTILAM contact technology
- Robust, reliable and user-friendly – up to 100,000 mating cycles
- High current-carrying capacity with minimal contact resistance for a long life span
- Numerous possible combinations with other connectors of the DuraDock multi series for almost any application, in four different sizes with up to 72 poles.

**Test systems:**

- Automatic docking in test benches and production processes
- Test bench technology in E-mobility and battery production or for wind turbines

**Manufacturing:**

- Test systems for in-line testing with high currents

**Plant engineering:**

- Interface in manufacturing modules of modular production lines
- Docking station to supply mobile machines, e.g. mobile smelting furnaces



More information on DuraDock power





## EvoTrak lite – modular connectors for harsh applications

This modular connector with a metal housing, which was originally developed for railway applications, can also be used in trucks as well as farming, mining and construction equipment – anywhere that reliable power transmission is required in highly demanding environments with very heavy loads and stresses.

Regardless of the vehicle type, the robust, versatile connection design of the EvoTrak lite series meets the strict requirements of the railway technology market:

- Railway standards
- Use in harsh environments
- Compact construction
- Easy assembly and maintenance
- Vibration and shock resistance

Designed with our unique, proven MULTILAM technology, the connectors in the EvoTrak lite series provide long service life and the highest level of reliability – even under the most demanding conditions of use.

### Advantages

- Unparalleled advanced contact reliability thanks to MULTILAM contact technology
- IP2X protection ensures safe handling
- 1 to 4 poles, up to 300 A
- Suitable for shielded cables, up to 500 mating cycles
- Cable cross sections from 10 mm<sup>2</sup> – 70 mm<sup>2</sup>
- Voltages up to 1500 V

### Areas of application for EvoTrak lite

This compact and flexible solution is suitable for use throughout the traction chain:

- Auxiliary power supplies (air conditioning systems, converters, transformers, etc.)
- Battery interfaces
- Connection from electric motor to inverter
- High-power transmission interface
- Motor coupling joint

### Different configurations available

- Straight-straight connectors
- Straight connectors to panel receptacles

### Other EvoTrak lite configurations in development

- Right-angle connectors



● Stäubli Units    ○ Representatives/Agents

# Global presence of the Stäubli Group

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