

# Innovation for the Future

## Vehicle cabling solutions

Edition 2012



Reliably efficient





### **Your partner for in-vehicle connectivity solutions**

HUBER+SUHNER is a leading international manufacturer and supplier of components and systems for electrical and optical connectivity. HUBER+SUHNER unites core competencies in radio frequency, fiber optic and low frequency technologies under one roof and offers a high-quality product range for the communication, transport and industrial markets.

### **Customised solutions**

We excel with a steady stream of innovations to satisfy the needs of our customers around the world. Our core competency lies in offering a wide range of consistently high-quality products while also providing rapid, flexible and reliable customer service across the globe. We focus on demanding applications where our valuable additional services, such as special product functionalities, customised innovations, engineering and other services, distinguish us from our competitors.

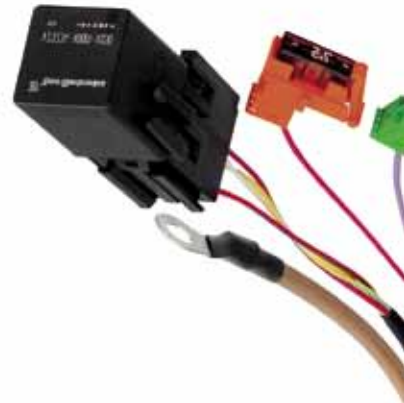
# Innovative solutions for demanding requirements

## Outstanding quality and performance

Increasing efficiency and lower energy consumption in conjunction with compact designs are giving rise to higher temperatures in the engine compartment. Temperatures ranging from  $-70\text{ }^{\circ}\text{C}$  to  $+200\text{ }^{\circ}\text{C}$  (3000 h) are now commonplace. Cable connections not only have to withstand these temperatures, they also continue to offer resistance against a wide range of fluids such as fuels, oils, battery acid, salt water and cleaning agents.

To meet the demands of this harsh and challenging environment, HUBER+SUHNER has developed a broad spectrum of RADOX® cables that guarantees durable and reliable connections in the engine compartment. All our products comply with European Directive 2002/95/EC (RoHS).

The use of electrical energy as the driving force in electric and hybrid vehicles presents an entirely new challenge to the reliable distribution of electricity between the batteries and the electrical assemblies. Our highly specialised engineering team provides support throughout the entire project, starting with the planning phase and prototype production right through to series production. All our work is built on a foundation of extensive experience in the automotive industry amassed over many years, a proven product portfolio and prototype/series production systems.



Our connectivity strengths are most evident in the following sectors:

## Wires and cables

- Engine cabling
- Anticapillary cables
- Battery cables
- High voltage cables
- Sensor cables
- Databus cables

## Customised cable systems

- High voltage connectivity systems
- High voltage distribution systems
- High voltage adapter plates for power electronics

## Reliable connections in a harsh environment

RADOX® insulation material from HUBER+SUHNER provides the perfect cabling solution in this demanding environment. The RADOX cable family comprises single-core, battery, sensor and data bus cables.

RADOX is an electron-beam cross-linked insulation material that offers exceptionally high resistance against thermal, chemical, electrical and mechanical loads. Even extreme humidity and vehicle fluids have no effect on cable service life.

RADOX cables provide all the specific properties desired, and as they have thinner walls than conventional solutions, weight and space can be both dramatically reduced. In addition, resistance to mechanical wear – even at extreme temperatures – provides an added safeguard for reliable operation.





### Single core cables

RADOX wiring has been developed to meet the increasing demand for reliable, high quality signal transmission between various sensors and the control system. Thanks to the characteristic properties of RADOX, these cables can be used in areas where temperatures may even briefly exceed 150 °C.

- Single core cables for motor vehicles, class D and F (ETFE), as per ISO 6722
- Operating temperatures of -55 °C to +200 °C
- Reduced outer diameter
- Resistant to oils, fuels and thermal pressure
- Hydrolysis resistant
- High abrasion resistant, flame retardant
- Excellent electrical properties



### RADOX® battery cables

RADOX battery cables are extremely temperature-resistant products with a reduced outer diameter. The cables are class D certified, but can withstand brief exposure to considerably higher temperature ranges.

- Power cables for motor vehicles, class D, as per ISO 6722
- Operating temperatures of -70 °C to +150 °C
- Exceptional flexibility
- Reduced outer diameter
- Resistant to battery acids, coolant, oils and fuels
- High resistance to thermal pressure
- Extremely abrasion resistant, flame retardant

### RADOX® sensor cables

RADOX sensor cables are suitable for low and high temperatures, are extremely flame-resistant, flexible, resistant to the media commonly used in the automotive industry and may be ordered preassembled to individual requirements. They guarantee optimum functionality of safety-critical connections, even in this most challenging of environments.

- Sensor cables for motor vehicles
- Operating temperatures of  $-55\text{ °C}$  to  $+150\text{ °C}$
- Resistant to oils, fuels and hydrolysis
- Do not melt at high temperatures
- Suitable for automated processes
- Resistant to potting and overmoulding
- Compact and flexible



### RADOX® databus cables

HUBER+SUHNER combines extensive data communication expertise with electron-beam cross-linked technology to offer products that conform to SAE J1939-11, -15, ISO 11898-2 (CAN) and Flexray specifications.

- Excellent dielectric properties
- Operating temperatures of  $-55\text{ °C}$  to  $+150\text{ °C}$
- Flame retardant insulation, does not melt when exposed to high temperatures
- Outstanding data transmission properties
- Suitable for use in the engine compartment







## RADOX® cable systems

Extensive experience in the design and construction of complete cable systems makes HUBER+SUHNER a professional partner in the development and manufacture of dedicated cable harnesses and demanding cable systems for the automotive industry. Right from the planning phase and through to the development of customised cable system solutions – including the global production of small, pilot and large batches – HUBER+SUHNER provides turnkey solutions from a single source. We also provide the operative flexibility which comes from having several production sites worldwide.

### High voltage distribution systems

The distribution of electrical energy in electric and hybrid vehicles represents a major challenge in the design and construction of distribution systems, especially in terms of safety and shielding. This is due to the extremely high and potentially fatal currents that are generated when the vehicle is in use. Consequently, the systems not only have to be perfectly shielded to prevent interference with the complex on-board electronics, but also to avoid delivering electric shocks in the event of an accident.





## High voltage distribution units for electric vehicles

The HVDU (High Voltage Distribution Unit) distributes energy between the battery, alternator, engine and secondary units. HUBER+SUHNER develops customised HVDUs and can even deliver the preassembled cabling as part of the service. The distribution systems themselves exhibit the following properties:

- EMC protected
- Integration of different components as per customer requirements, e.g. capacitors, fuses, insulation monitors, inertia switches, etc.
- Protected by an interlock system
- Materials and components with the lowest electrical resistance
- Protection mode IP 69 K
- Validated by several renowned customers in accordance with DIN 40050-9, IEC 60068-2-6/11/38/6/64/70, JIS D 0207

## Adapter plates for hybrid vehicles

The optimum transfer of energy is a critical factor for the energy efficiency of hybrid vehicles. HUBER+SUHNER provides customised add-on components for power electronics to ensure a reliable transfer of energy between the vehicle battery and engine/alternator. The main strengths of these adapter plates are:

- Screened HV connection
- Dimensions, interface and connectors all to customer requirements. Available with integrated fuses on request.
- Minimum needed space
- Low electrical resistance
- Earthed through shield
- High ampacity
- Protected by an interlock system
- Protection mode IP 69 K



## RACS high voltage connectivity systems

Drawing on years of experience in connectivity technology for high voltage systems, HUBER+SUHNER has developed the innovative RACS connection system (RADOX® Automotive Connection System). Combine RACS with HVDU to benefit from considerably smaller space requirements together with a safer and more efficient connection between the HVDU and high voltage units. These high voltage cable systems are available as made-to-order assemblies or pigtails.

The main benefits of this connectivity system are:

- Screened HV connection
- Low electrical resistance < 10 mΩ
- High ampacity
- Minimum needed space
- Protection mode IP 69 K
- Validated by several renowned customers



## Cable system solutions

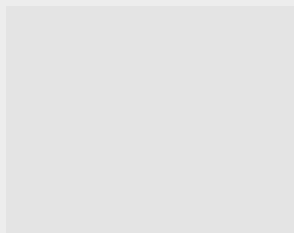
The development of complex and customised cable systems for passenger cars and commercial vehicles is based on years of experience in working with leading global manufacturers of all types of vehicle. The following properties of HUBER+SUHNER cable systems are particularly desirable:

- Injection moulding for cables and connectors
- Injection moulded connections
- Waterproof system solutions
- Longitudinal water tightness
- Modules with integrated PCBs, resistors, etc.

HUBER+SUHNER is certified according to  
ISO 9001, ISO 14001, ISO/TS 16949 and IRIS.

**WAIVER**

It is exclusively in written agreements that we provide our customers with warrants and representations as to the technical specifications and/or the fitness for any particular purpose. The facts and figures contained herein are carefully compiled to the best of our knowledge, but they are intended for general informational purposes only.



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