

Customised wiring systems

Business Unit Commercial Vehicles



The Quality Connection

LEONI

Your global partner



LEONI is a highly successful, international supplier of wires, cables and wiring systems as well as a provider of related development services. In the wiring systems market, the Company has grown to take first place in Europe and is now among world's four largest manufacturers.

LEONI's Wiring Systems division develops and produces complete wiring systems for the international car and commercial vehicle industry. As part of this division and following the principle of being in the closest possible proximity to the customer, the Commercial Vehicles business unit serves four market segments:

- trucks
- farming machinery
- construction machinery
- engines



Key figures of the LEONI Group

Sales of € 2.4 billion (2007)

53,000 employees

110 subsidiaries

More than 80 production facilities

Presence in 34 countries



LEONI is global provider of development services for customised solutions. Our design and development work ranges from built-to-print solutions to optimising existing wiring systems as well as components and through to developing completely new systems. A high degree of delivery reliability, technological expertise and innovative power as well as a global logistics and production network underpin LEONI's leading position in the market.

The Commercial Vehicles business unit specialises in fulfilling specific customer requirements rapidly and efficiently. The quality principle is resolutely applied at LEONI. It is part of our philosophy and firmly embedded in all of the Company's business units.

LEONI – the Quality Connection.

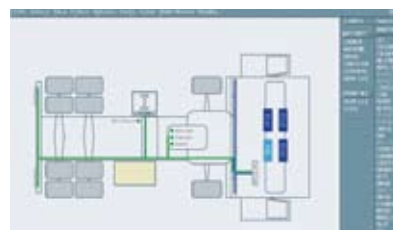
The unique range of products and services for commercial vehicles



Like virtually no other manufacturer, LEONI offers its customers a special range of products and services, the most important element of which is highly developed engineering for customised wiring systems.

Architecture

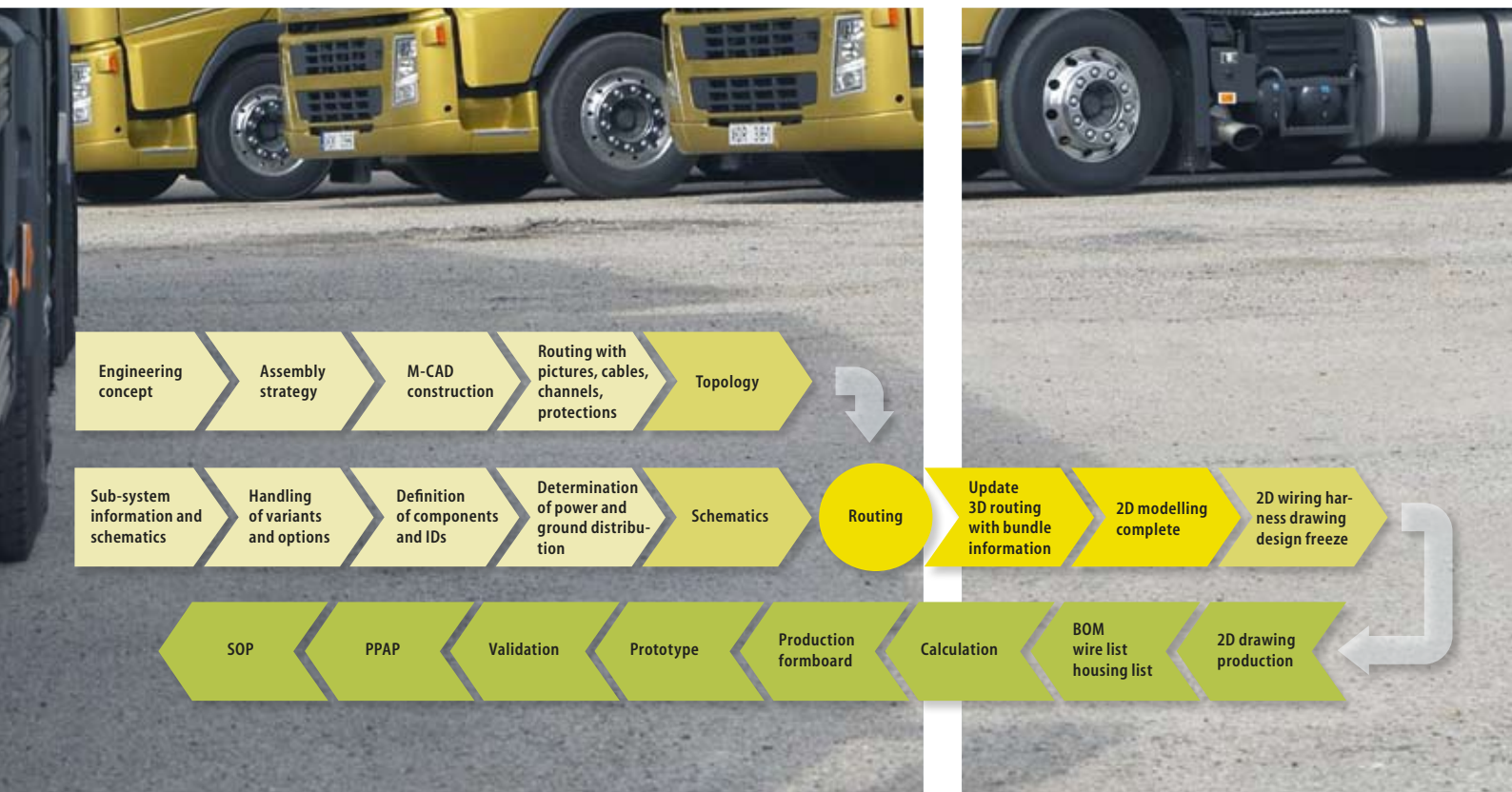
When it comes to determining the wiring system architecture, we support our customers at a very early stage of the vehicle's development already to achieve optimum solutions.



3D routing

We convert our designs and concepts in 3D models and work out the cable harness routing. The data generated in the process also serves as the basis for the process description and workshop handbook data sheets. Furthermore, the cable harness routing includes all the cable harness protection systems, fastening clips as well as cable ducts, conduits and sockets.





System flow diagrams

Via the system flow diagrams we develop the detailed plans for the vehicle as a whole. Cable harness-specific information is in the process incorporated in conceptual flow diagrams.



Design of the wiring system

Based on the information from flow diagrams and digital mock-up, we generate a 2D layout of the cable harness. The data acquired in the process enables comprehensive analyses and evaluations, and forms the basis for later production.



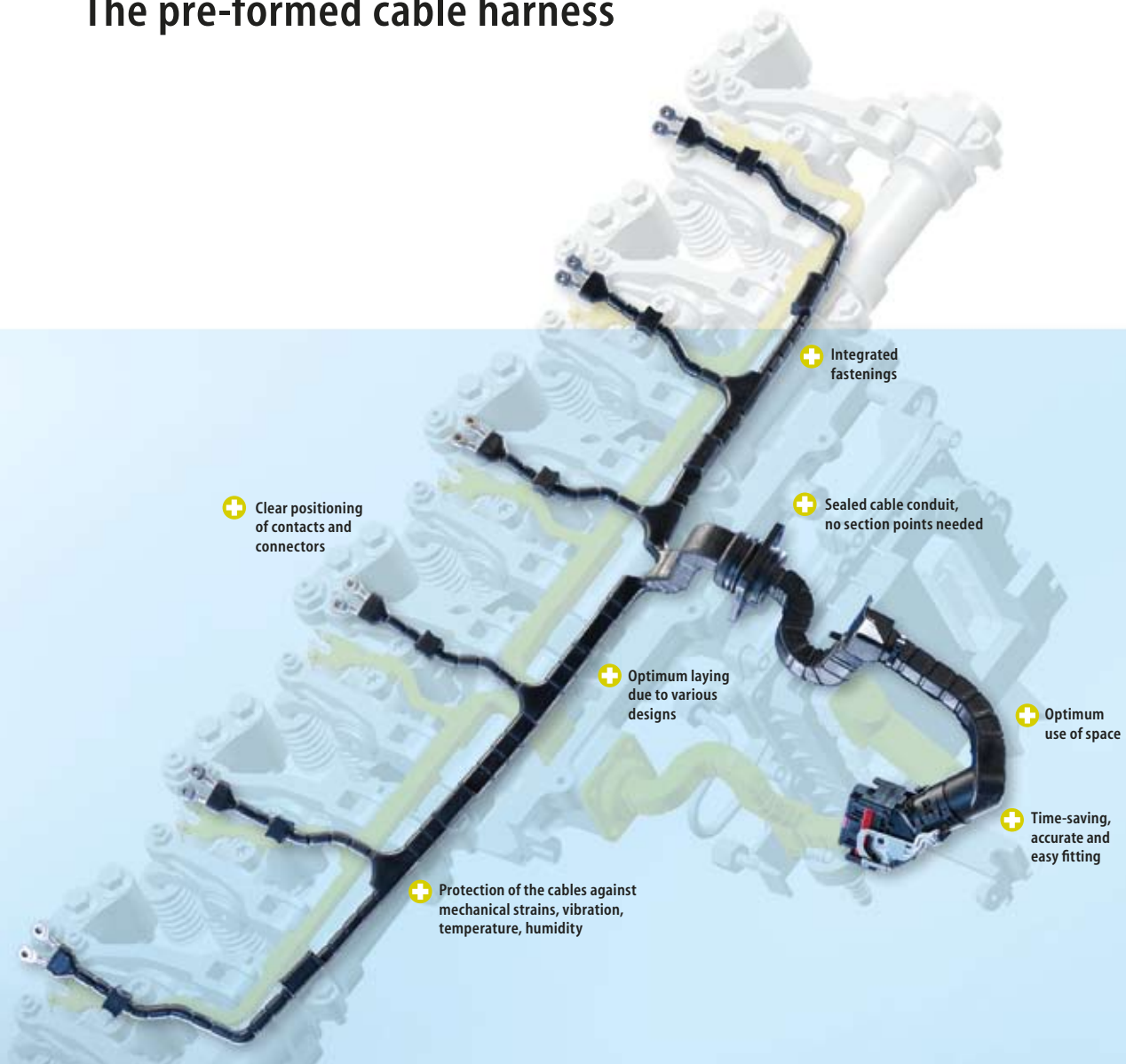
Prototyping

Designs and concepts can, using state-of-the-art software and hardware for rapid prototyping, very quickly be converted into real products.

Testing and validation

LEONI is able to carry out comprehensive tests and validations. To do so, the Company has the best equipped test bays and laboratories with proven and precise measuring devices.

The pre-formed cable harness



LEONI has been producing pre-formed cables harnesses for customers in Europe, Asia and the United States since 1991. Above all in the commercial vehicle sector, this LEONI invention has caused a sensation because of its special advantages. They are used particularly for space and time saving wiring of the engine, transmission and cab.

Pre-formed cable harnesses are even used within the engine. Our technology makes it possible to foam perfectly sealed cable harnesses, thus abandoning with the section points common on conventional cable harnesses. That is not only more cost effective, it also reduces potential sources of defect.

LEONI production facilities in Asia, South America and Europe guarantee rapid and reliable deliveries of pre-formed cable harnesses to our customers, worldwide.

Everything from a single source:

- Design and 3D routing as early as in the concept phase (ProE, CATIA,UG)
- Making prototypes for tools and finished parts
- Designs and tooling concepts individually adapted to customer requirements
- Making production equipment
- Worldwide production facilities

Connection systems for hybrid, fuel cell and electric vehicles



The wiring of components involving higher voltages, as is needed in vehicles with electric or hybrid drive, presents development of the wiring system with a special challenge. For example, connecting the battery with the engines / generators and the power electronics requires shielded cables with higher voltage stability to carry stronger currents.

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Even though these new drive concepts are found primarily in passenger cars, they will in the future also grow rapidly in the commercial vehicle sector.

Be they purely electric vehicles, fuel cell vehicles or hybrid vehicles – LEONI can look back on many years of experience in developing and supplying high voltage connection systems. This applies both to the conductors

In the high voltage segment LEONI provides

- cables
- connectors
- cable ducts
- sealing systems
- power distributors
- development of customer-specific components



themselves and also to ready-to-install cables harnesses. On the North American market, for instance, LEONI already supplies a high voltage battery cable harness for a hybrid-drive SUV.

Customer-specific development of the HV wiring system is necessary especially in the case of commercial vehicles. LEONI has therefore already developed its own connector concepts. This involved cables and connectors being optimally adapted to the specific requirements using powerful tools and methods, such as thermoanalysis, for example.

Connectors for maximum demands



Electrical connection systems in vehicles are frequently subject to high and maximum demands. Extreme conditions prevail around the engine, transmission, exhaust system and suspension. High and low temperatures, humidity, oil, fuels, brake fluid and vibrations affect connectors and cables. Fitted connector

systems quickly reach their limits here. Only directly extruded connectors ensure, under all circumstances and across the vehicle's entire lifecycle, undiminished, very good contact quality, which is essential particularly for sensors.



Example 1: Extruded sensor
for brake wear indicator

Example 2: Multi-polar ABS connector

LEONI has been producing extruded connectors and cable conduits for more than 20 years – for engine-management sensor systems, for transmission control systems, for ABS systems and for brake wear indicators. LEONI's product line-up in this respect ranges from standard connectors through to specially adapted connector systems for the toughest operating conditions.

Example 1:

Using highly sophisticated production equipment, LEONI seals and toughens brake wear and temperature sensors for conditions involving operating temperatures above 260 °C and extreme vibrations.

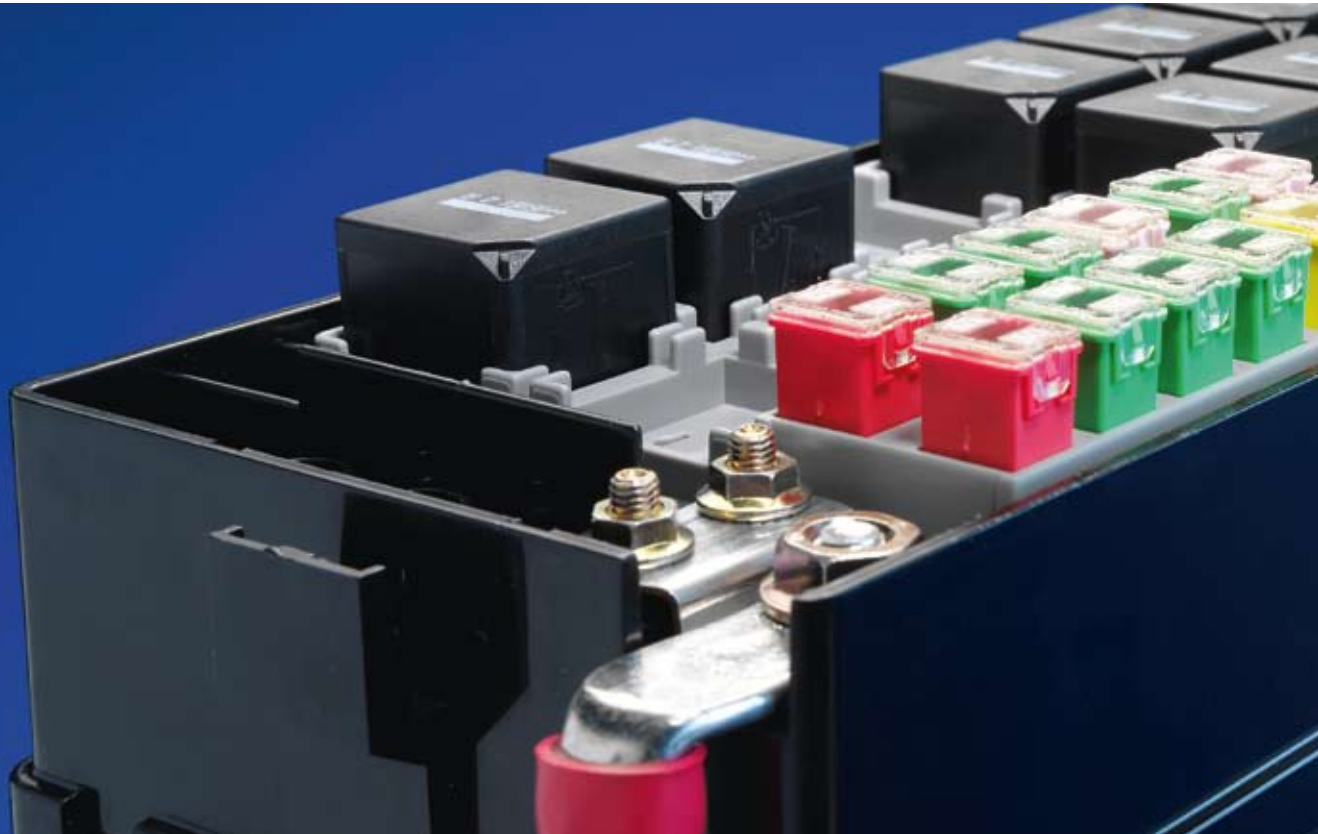
Example 2:

From use in safety systems such as ABS through to connecting the sensor to the cable harness – LEONI develops and produces reliable connection systems and does so worldwide; always as near to the customer as possible.

**The special benefit
for LEONI customers**

From the initial idea to prototype making and through to validation – our customers will only have to deal with a single contact. Everything is from a single source. A head-quarter-based development department that is closely linked with experts at the various LEONI locations and our customers ensures that LEONI contact systems are developed to the latest standards and prove themselves in everyday operation.

Power distributors and power management



LEONI has been successfully developing and producing power distributors for many years. Numerous products are already in use. LEONI foresees wider usage for circuit boards and hybrid architectures as combinations of lead-frame layers with modularly fitted, directly wired components. This will enable functional enhancements also for instance through the use of pyro fuses as well as high current and soldered relays.

Contacts and conductors alone do not enable power distribution in vehicles. Power distribution components perform this function. Generally speaking, such complex components and systems are fitted with fuses and relays. Distributor boxes, so-called BECs (body electrical centres), fuse and relay boxes, power distributor modules as well as pre-fuse boxes are examples of such components.

LEONI already boasts a whole range of innovations in this specialist area.

Pre-fuse box with LEONI Multifuse

The advantages of the LEONI multifuse versus single fuses are that it replaces expensive bus bars, simplifies the fitting processes, realizes plug-in solutions, reduces the weight and makes it possible to individually set the fuse value to the respective requirements and areas of operation.



LEONI 8-pole Multifuse



Fuse and relay box with circuit board

Power distribution can also be achieved with circuit board tracks. This involves thick copper tracks being fitted directly to the circuit boards. This technology is especially beneficial when using numerous fuses and relays, when integrating control functions, where there is limited space requirement as well as for saving weight.

Multi-layer construction power distributors

This involves several lead frames being used for power distribution. This technology boasts very high packing density, high current carrying capacity and temperature resistance capacity.

Hardwired fuse and relay boxes

Modularity, scalability and the use of standard components are nowadays among the most important parameters when developing and optimising wiring systems with low content and add-on solutions.

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