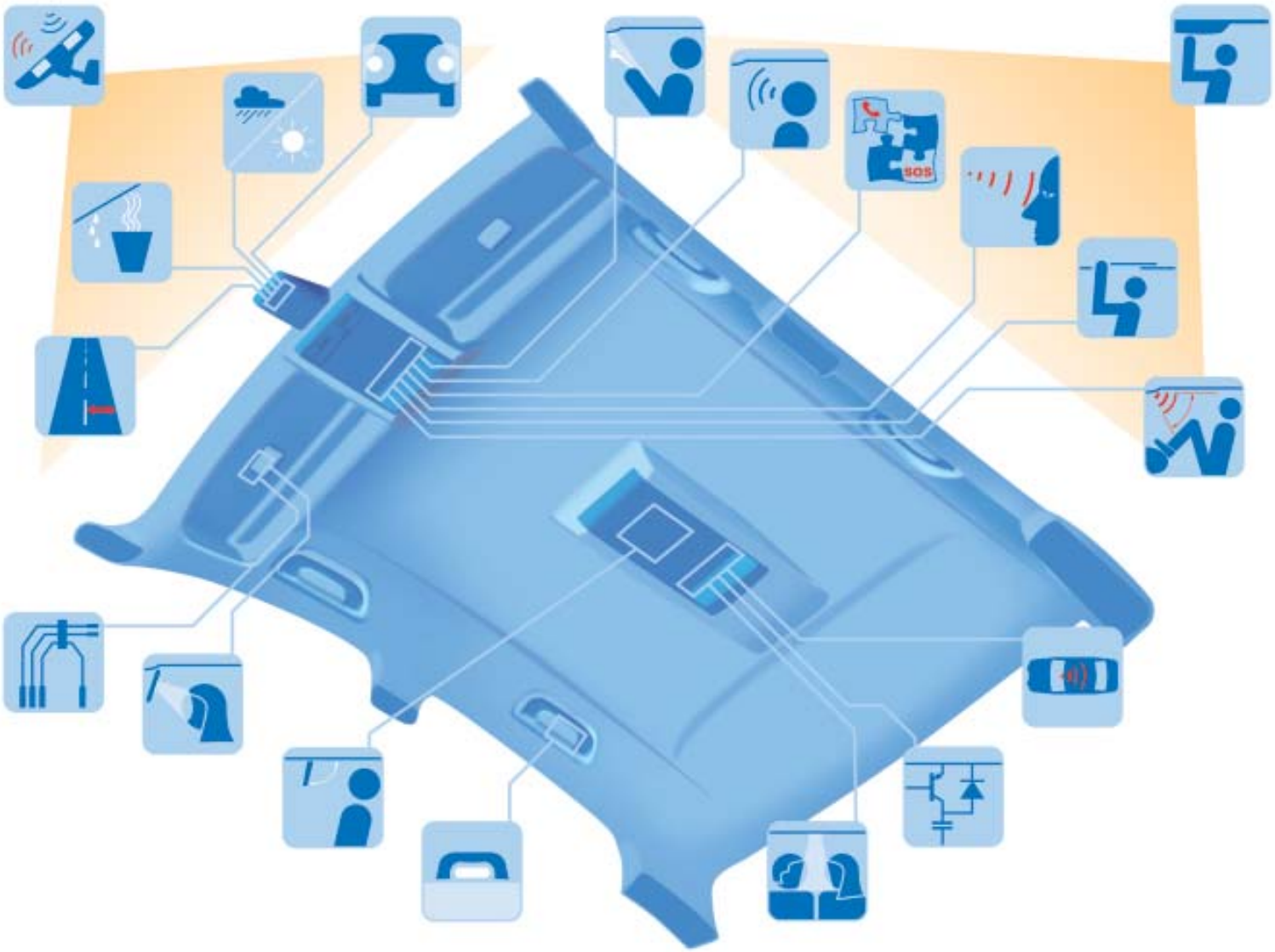
Technical Information

Individual function and integration solutions in the roof



HELLA®

Ideen für das Auto der Zukunft

In recent years, Hella has developed outstanding competence in the field of overhead functions, in particular with regard to overhead control units and interior lamps. Apart from that, the Hella group has additional competence associated with the roof package space.

An increasing number of comfort and safety functions in the vehicle require innovative approaches to provide the customer with an optimally tuned package of services. Hella recognized that trend and has developed the concept of modular overhead electronics.

This has put Hella in a position to provide solutions for the integration and implementation of the new functions without neglecting the synergies resulting from existing competences.

Overhead control units

Overhead control units in the headliner are a special kind of control unit in the field of body electronics. These control units are central nodes in the network of modern vehicle electric systems, like Smart Junction Boxes to give just one example. However, their special place of installation in the passenger compartment roof zone presents certain challenges with regard to design, haptics and packaging.

In contrast to interior lamps, overhead control units in the headliner stand out due to the considerably higher density of functions and integration: in addition to the various interior lighting functions, they provide numerous electrical comfort and safety functions.

Overhead control unit for the Mercedes S-Class

These functions include:

- Driver assistance systems (e. g. camera for lane detection)
- Evaluation of the signals from the rain/light/solar sensor (RLSS)
- Interior temperature sensor for optimal automatic control of the air conditioning system
- Passenger compartment monitoring sensors for the alarm control system
- Control of the tilt/slide sun roof with anti-pinch
- Dimmable interior and reading lamps
- Console lighting/ambient lighting
- Displays
- Service emergency call
- Garage-door opener
- Components of the hands-free equipment
- Programmable and automatic interior mirror adjustment
- Radio/infrared receiver for vehicle access systems

Overhead control unit for the Mercedes SLK

What makes Hella so successful in this area? Hella is in an advantageous position, possessing both core competences necessary for the realization of such devices: lighting and electronics. In the field of car body electronics, Hella has been developing overhead control units since the mid-90s.

Building on this long-standing development and production expertise, Hella also has the necessary system interface knowledge with regard to any component or area connected or controlled.

This includes:

- The wiring in the roof zone
- Interior mirrors
- Optical sensors
- Reusable software modules

The devices are connected to other control units in the vehicle electric system via a CAN bus. Due to this networking, they are called central overhead consoles. The bus function provides a gateway in the roof zone for connecting various peripheral devices. The connection of the components to a CAN interface considerably reduces the wiring at this location in the vehicle which is critical with regard to package space. The basically modular design of the devices may in the future enable both the replacement of individual components of the overhead control unit and the gradual extension by additional components. This modularity may make a considerable contribution to reducing the number of variants and as a consequence, reduce costs.

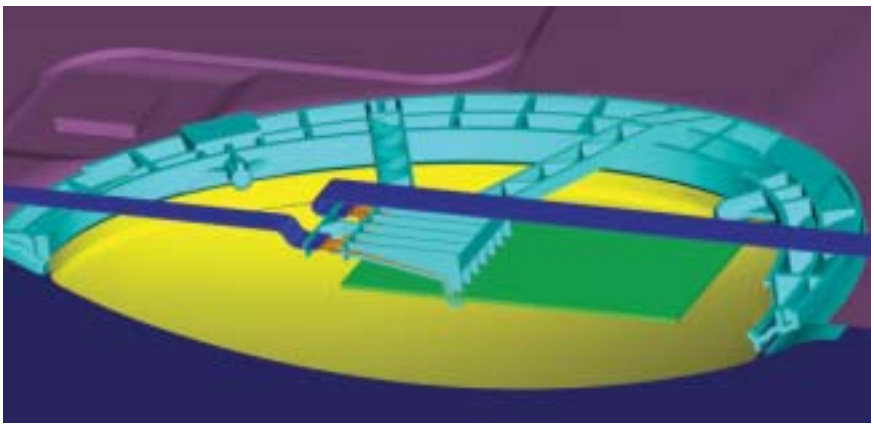
Headliner Systems

With the Intedis joint venture by Hella-Leoni, the conceptual design, preliminary development and eventual realization of integral systems in the vehicle roof zone, also with inclusion of overhead-module suppliers, can be realized.

The integral development of headliner systems incorporates electronic, lighting and wiring set components which are optimally matched especially at the interfaces. In this way, the electrical contacting of the modular overhead electronics with the vehicle electric system can be realized with a “click-in” method in the headliner. This simple contacting method avoids expensive over-head installation activities in automobile final assembly. The click-in method is likewise suitable for exchangeable modules in the overhead electronics.

Three differently interchangeable modules in the overhead electronics

The lamps and electronics components are wired on the large surface of the back of the headliner using extruded flat conductors (FFC). With the low profile of the wiring, the headliner nestles up closely to the sheet-metal vehicle roof, increasing the size of the passenger compartment. Contacting protected by Hella optimizes the electrical connection between the flat conductor wiring and the overhead electronics.



Click-in contacting for overhead electronics

Interior lamps, reading lamps, make-up lamps, overhead electronics and sensors are located in the front area of the vehicle roof. The use of flexible printed circuit boards (FPC) may save internal wiring and inter-component contacting for some components. An interesting example of this is the make-up mirror lamp with capacitive proximity switch and light dimming function.

Make-up mirror lamp with capacitive proximity switch

The pre-assembly of the components in a headliner module means saved time and space for the automotive manufacturer in final assembly. During module development, all electrical components receive optimal electronics equipment (without interface, with LIN/CAN interface). When the modules are optimized, the flat and circular conductor wiring such as special cables for aerials, microphones, cameras and supply cables for loads are selected in accordance with function, cost, weight and package space requirements. Adhesive tapes, hot-melt adhesive and fastening elements are available for quick and cost-effective fastening of components with flexible printed circuit boards (FPC) and wiring with extruded flat conductors (FFC).

Front view: Pre-assembled headliner

Rear view: Flat conductor wiring for headliner

Anti-pinch

The increasing number of comfort functions in the vehicle increases the number of power-driven moving body components, in particular window lifts and sun roofs. Additionally, sliding doors, trunk lids and other components also are more often power-driven. However, automatically moving body parts present a danger of persons getting trapped. That danger is defused by suitable anti-pinch systems which are designed in accordance with internationally applicable guidelines and standards.

The anti-pinch developed by Hella is installed in various vehicles and offers the advantages of an optimal relation between functional reliability and costs. A motor-current-based anti-pinch system is used to control sun roofs. This indirect method uses the signals available in the control unit and evaluates them in the overhead control unit at a high sampling rate. The anti-pinch thus affords the necessary protection of the passengers without the expensive integration of additional sensors for the sun roof.

The model-based development of the evaluation software supports the adaptation of the system to different mechanical sun roof concepts. External influences on the sun roof mechanism such as temperature, vehicle electric system or driving influences are compensated by appropriate sets of parameters.

Alterations of the mechanism caused by soiling or aging are accounted for by the anti-pinch system through adaptation.

In connection with the sun roof control, the anti-pinch system can be used as a module in various products. The integration of additional functions from the roof zone in overhead control units results in cost-optimized solutions.

With the consistent further development of the direct anti-pinch and of the sensory anti-pinch method, Hella is working on solutions for future developments with increasing system complexity, electronics integration and function modularity.

Sensor integration in the interior mirror base

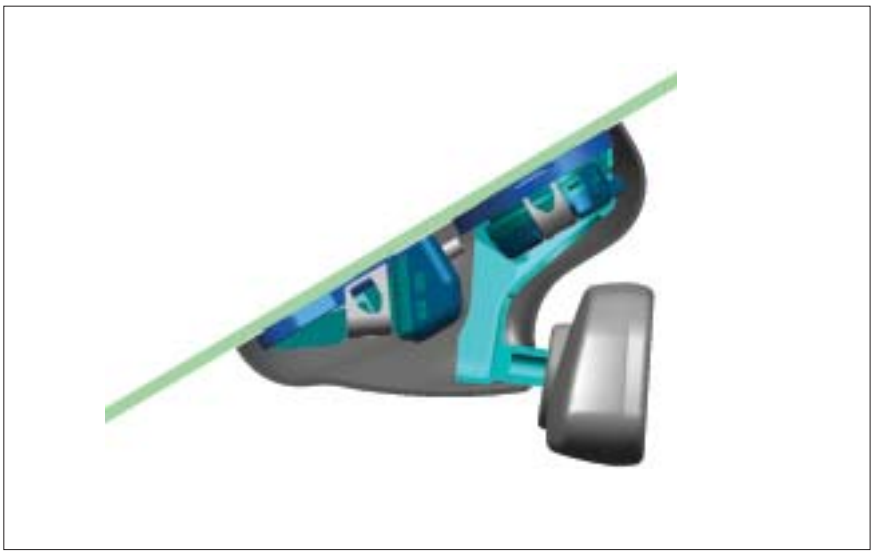
A large number of components such as mirror, sensors and camera systems are already arranged in the interior mirror which has considerably increased the space consumed in that area. Taking account of function, costs, package space and design, Hella is developing favorable overall systems in cooperation with various partners.

The integration of the rain/light/solar sensor (RLSS) into the mirror base is a way of optimally integrating the technology into the vehicle infrastructure under design and cost reduction parameters. Both the mirror and the rain/light/solar sensor are, for example, snapped onto a joint-fastening ring and form a mechanical unit. The ring may be fitted to the windshield at the windshield manufacturer.

Hella coordinates the cooperation of the manufacturers selected by the customer for mirror, windshield, fastening ring etc. To this end, the technical functional requirements of all components are determined beforehand. Taking account of the customer's equipment strategy, an optimized overall system is developed. In relation to the integration concept, Hella sees itself as the central interface for the customer's various departments.

Even more functions are integrated in the interior mirror, e. g. camera systems and fogging sensors. A combination of the functions in a small number of control units will be the next step. With the further development of the individual components and consistent integration, Hella will offer concepts for pre-assembled overhead modules.

Based on the customer's equipment strategy, advantages result to provide more designer freedom, reduce costs and guarantee trouble-free installation of the complex overall system during vehicle assembly.



Rain/light/solar sensor (RLSS)

Interior lighting

It is a well-proved fact that people are spending ever more time in their cars. As a consequence of this, the requirements for comfort and safety in motor vehicles are becoming more demanding. In particular, this applies to driving at night which accounts for approximately one quarter of all driving. With respect to this, a low-stress and low-fatiguing driver ambience is of great importance. In order to meet the increasing demands made on passenger compartment lighting, Hella has established Hella Innenleuchten-Systeme GmbH in 1998 as the competence center for interior lighting within the globally active Hella group.

Features and objectives:

- First-class development partner of all well-known automobile manufacturers and their suppliers
- Use of state-of-the-art technologies
- Outstanding know-how
- Exemplary customer service

Interior lighting systems made by Hella Innenleuchten-Systeme meet all demands made on the lighting function and satisfy the customer's desire for individualization. The competence is based on our knowledge of the human eye's physiology, lighting competence with regard to optics and light sources, and integration of complex bus control systems. With this extensive know-how, purposefully using knowledge from the whole group, the vision of "light experienced in the vehicle" is pursued. The increasing demand for ambient lighting functions in the passenger compartment is also taken account of by using Hella's light guide and LED competence.

Reading lamp

The interior lighting in vehicles supports central tasks in and at the vehicle:

- Orientation and well-being
- Searching and finding
- Reading and working
- Safety and comfort

When developing, designing and optimizing its products, Hella provides additional benefits apart from functionality:

- Low-glare lighting
- Physiological aspects
- Legal requirements and customer specifications

Overhead console

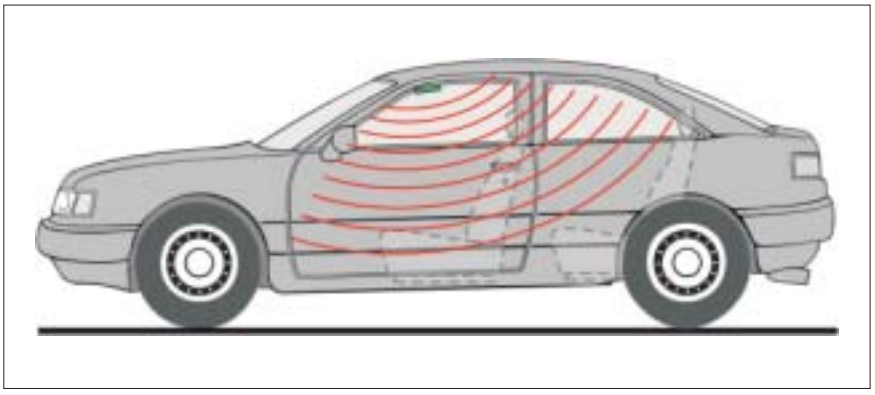
Passenger compartment sensor systems

Modular overhead electronics is an interesting integration platform for passenger compartment sensors on the levels of design integration, electronics and software. The integration combines sophisticated design with cost-optimized functionality of the sensors and their signal processing.

The bandwidth of the current activities relating to the efficient use of overhead electronics ranges from passenger compartment monitoring for alarm control systems to sensors for the measurement of variables in the control circuit of the air conditioning system.

The modular design of the interior lighting enables an extension of function on the basis of simple interior lamps. This advantage becomes especially clear if optical sensors are to be integrated. Optical sensors for seat-occupancy monitoring are in the future to make an important contribution to improving passenger protection. As a competent partner, Hella, together with vehicle manufacturers and sensor suppliers, is pursuing the goal of designing an overall concept which is optimal with regard to technical and commercial aspects.

The development of semiconductor and sensor technology will, in future vehicles, enable new integration solutions. In a continuous innovation process based on many years of series production experience, Hella is working on new solutions in the field of physical sensors and biometry. In the process, customer-specific solutions for high quality targets can be developed at the concept planning phase, due to the knowledge of the electronic and design boundary conditions in the vehicle.



Sensor integration in the overhead control unit

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