

Technical Information

*Electronics – Access and Driving
Authorization Systems*



*Ideas today for
the cars of tomorrow*

Until a few years ago, functions such as central locking and radio remote control were reserved for upper to middle vehicle classes. Today the use of such components and systems has become part of the standard equipment for practically all vehicle segments. Whereas, in the past, various functions were realized by a large number of individual control units, Hella has pursued the economic integration of various standard functions in CAN-networked comfort control units since the development of the very first prototype. At high equipment levels, these comfort control units also take over the function of the receiver for the radio remote control. The transmitters themselves are also developed by Hella and produced on an automatic assembly line. Extended system features of the comfort control unit, such as electric steering-wheel locking and integration of the immobilizer (latest generation) contribute to optimized safety.

While active locking and unlocking of the vehicle by remote control makes a considerable contribution to added comfort and safety, this is enhanced even further by using the new access and driving authorization system, Passive Entry/Go.

Furthermore, Hella plays a major role in the research, conception and development of future access and driving authorization systems, corresponding components and personalized authentication systems (biometric procedures).

Conventional access systems/ radio remote control

Conventional access systems for active unlocking and locking of vehicles consist today of radio-operated keys and receiver units. Active button control is used to trigger various comfort functions, such as unlocking and locking vehicle doors and the trunk. The range for active radio remote control is usually min. 20 m. Comfort control units contain the modules for receiving the signals from the radio remote control; they evaluate these signals and also perform further additional functions.

Comfort control units

from Hella are devices within the network of the vehicle's electrical central locking system. Originally designed as control units for the central locking system only, the current generation of CAN-networked comfort control units is responsible for a multitude of tasks over and beyond this function:

Main functions:

- Receiver unit for radio remote control
- Master for the central locking system (comfort operation)
- Performs the central task of electric steering-wheel locking
- Latest generation immobilizer

Additional functions:

- TPMS software integration possible
- Master for the alarm system
- Comfort activation of the power windows (opening/closing)
- Comfort activation of the sunroof
- Control of the interior lighting
- Control of the exit warning lights
- Diagnosis

Safety

Today, numerous vehicles are equipped with electronic immobilizers based on transponder technology. The latest generation immobilizers prevent unwanted third-party use of the vehicle. This is illustrated by the significant decline in car theft rates.

Comfort

Apart from the obvious advantage that the use of radio remote control systems makes iced-up door lock mechanisms a thing of the past, devices for the North American market also include a so-called “panic button” that can be used to activate the alarm system.

Technical features

Radio remote controls from Hella stand out due to the range they achieve and their benchmark quality standards. On the basis of long years of experience in development and production in this field, Hella is currently working on innovative concepts which place more emphasis on aspects of design and haptics as well as taking state-of-the-art architectures and radio technologies into account.

Depending on vehicle equipment, an additional interface in Hella’s comfort control units makes it possible to operate further alarm-system components, such as interior compartment monitoring using ultrasonic or movement sensing with a tilt sensor. There are also reserves for integrating additional functions, e. g. TPMS. Compact integration of functions in already existing control units offers considerable cost saving potential.

Conventional access systems Components

Overview

System features:

- UHF frequencies: 315/433 MHz
- 868 MHz available as a function sample
- Data rate: 1kBaude to 1.7 kBaude
- Modulation: amplitude shift keying or frequency shift keying
- Cryptographic data encryption

Radio remote controls:

- 3V technology
- PLL frequency generation
- Min. 2 years battery service-life
- 4 buttons and more



Comfort control units



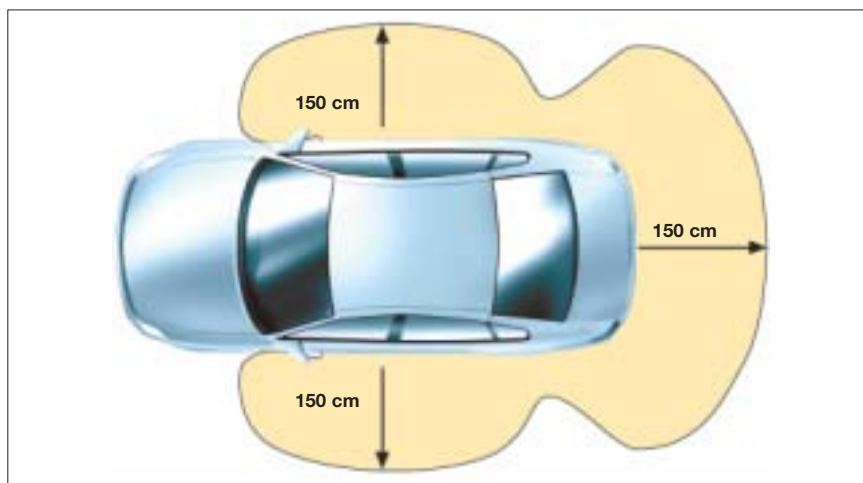
Radio remote control

Passive Entry/Go

Based on many years of experience in the development and production of radio remote controls and comfort control units, the portfolio has been expanded to include the passive access and driving authorization system. The number of series orders received for these systems underlines the trust enjoyed by Hella today for established access and driving authorization systems and also for the corresponding follow-up technologies.

The key component of the passive function principle includes among others the ID transmitter. This consists of an integrated transmission and receiver unit, which combines the passive function with active radio remote control for unlocking and locking the vehicle from larger distances. The range for passive entry operation is approx. 1.5 m and for active operation min. 20 m.

Exterior aerials detect the approach of the ID transmitter and “wake” the system. This is followed by identification of the ID transmitter with subsequent user authentication. While active unlocking and locking entails manual activation of the buttons on the key fob, passive unlocking and locking takes place automatically upon touching integrated proximity and locking sensors in the door handle.



Positioning of the exterior aerials including variable field adjustment allow for safe access even when approaching the vehicle from an unfavorable angle

Driving authorization

As soon as the interior aerials detect that the valid ID transmitter is inside the vehicle, driving authorization preparations begin, followed by automatic driver authorization. The engine is started and stopped via the ignition switch.

Safety

Precise interior/ exterior detection with integrated aerials ensures high system reliability and safety. Optimum theft protection is achieved by integrating the electronic immobilizer (latest generation). The whole concept builds on the basis of a safety architecture which ensures theft protection and safeguards system functionality. ID transmitters mistakenly left in the vehicle are recognized by the system, so that it is not possible to lock the ID transmitter in the vehicle unintentionally. In an emergency, it is still possible to open the doors using a mechanical key and transponder.

Surely the greatest comfort at a high technological level – from Hella!

Technical system features

The aeriels are designed according to the intended frequency range (315/433/868 MHz). A bi-directional UHF range ensures fast system reaction times. In addition, the system stands out with its low quiescent current consumption.

Enhanced comfort

Use of a conventional key for unlocking and locking the doors and for starting/stopping the engine is superfluous. There is no need to search for the key.

Experience/know-how

The many years of development and production expertise in producing large quantities of radio remote controls/comfort control units together with current series orders for the passive system and immobilizers make Hella a qualified partner.

Integration competence

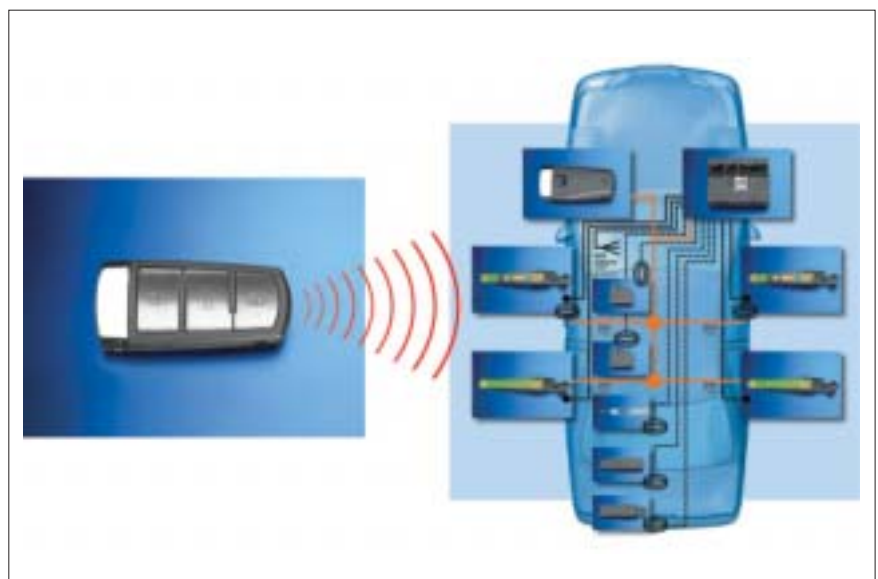
Integration know-how with Hella's internal and external features such as TPMS or third-party software makes an essential contribution to **optimizing costs**.

Modularity

The possibility of customizing the system offers a wide range of different system/equipment and function variations. High **flexibility** in terms of the product development process and high **variability** in development scopes make a major contribution to implementing these optional variations.

Passive Entry/Go – Components

Overview



System components – Passive Entry/Go



Comfort control unit

Comfort control unit:

- UHF transceiver
- Supports amplitude shift keying and frequency shift keying modulation
- Data rate in FFB operation: 1.7 kbit/s
- Data rate in keyless operation: 20 kbit/s
- Semi-duplex operation (full-duplex operation undergoing testing)
- UHF frequencies: 315/433/868 MHz
- Performs central tasks of electrical steering wheel locking
- Latest generation immobilizer
- Central, integrated LF transmitter
- Phase shift keying modulation
- LF frequency: 125 kHz
- Necessary error detection (short-circuit, idle mode, overtemperature, ...)
- Aerial connections with individually parameterized output

Door handle modules

- Printed circuit board integrated into the door handle, including equipping
- Integrated aerial module as series vibration circuit
- Optimum adaptation and adjustment of the LF fields through aerials integrated into the door handles
- Integrated proximity and locking sensors in all 4 door handles
- Two-stage proximity sensors (“approach” and “unlocking”)
- Low power consumption (450 μ A)
- Gradual switching off of the door handles possible



Front door handle aerial/sensor technology



Rear door handle sensor technology

Aerials:

Interior and trunk aerials

- Ferrite coil with capacitor as series vibration circuit
- Two-pole connector skirt
- Sealed housing
- Example installation locations: center console or trunk



Interior aerial



Trunk aerial

Rear aerial with humidity-protected connector skirt

- Installation location: rear bumper



Rear aerial

Parcel shelf aerial:

- Flex printed circuit board with conductor loop as field generator
- Mounted on the sheet metal of the parcel shelf using mounting clips
- Parallel circuit connection to interior aerial 1



Parcel shelf aerial

ID transmitter and start/stop button:

- Combination of “simple” remote control and “intelligent” ID transmitter
- Different waking patterns can be programmed (e. g. for standard operation and servicing)
- Up to 4 buttons (unlocking/locking/trunk lid/panic)
- 3V technology with standard cell battery
- Battery status monitoring including warning on the vehicle display
- UHF transceiver
- UHF aerial integrated into printed circuit board
- Bi-directional radio communication to the control unit to prevent relay attacks
- 3D LF aerial and frontend for precise interior/exterior differentiation
- Waterproof with protection mode IPX8
- Integrated emergency key
- Battery service-life >2 years



ID transmitter



Start/Stop button

Outlook on future components and systems

When it comes to pure research, Hella is already working on the development of future access and driving authorization systems. Current activities range from design and haptic studies to testing new coding and transmission technologies, through to on-going optimization of architectural technology. In addition, work also encompasses the concepts for extended functional scopes of key systems and personalized total systems using new biometric procedures.

Multi-Purpose-Key

Parallel to the on-going further development of systems, expectations are increasing when it comes to the key as system component. Whereas in the past the key was used primarily for active/passive unlocking and locking, and starting/stopping of the engine, in future it will be considered as a mature lifestyle product. Hella has recognized this trend. Upgrading the optical features and the use of new technologies to expand functional scopes are essential elements of the overall concept and are described with examples below.

Design

More individuality through alternative, replaceable casings

Multimedia

Extended infotainment through OLED display. MP3 memory/playback

Energy supply

Optimization through integrated battery in the housing, piezo-electrics or lithium cell.

Memory

Extended data storage in the internal memory or a memory card.

Other functions

Depiction of specific vehicle data, display of battery status, remote control for heating/air-conditioning, electronic logbook, display of status for central locking and alarm system, alarm system forwarding, alarms given on the key, etc.



Multi-Purpose-Key

Biometric procedures – personalization

Biometry-based identification offers great potential for extended comfort functions in the vehicle. In recent years, numerous developments have resulted in huge growth in the reliability of such systems. The largest group works on the basis of physiological features of the iris, the face or the finger. Face detection and fingerprints are ideal particularly for use in the vehicle.

Together with comfort functions, biometric procedures can also be used for access and driving authorization.

Examples

Comfort:

Saving user profiles in all comfort components, e. g.

- Automatic seat, mirror and steering wheel adjustment
- Air-conditioning adjustment
- Infotainment (radio station, volume)

Access and driving authorization

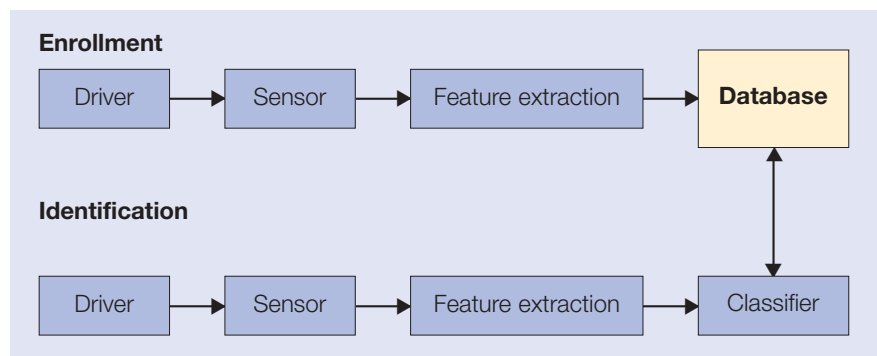
Identification of authorized users for enabling:

- Immobilizer
- Engine start
- Alarm system
- Central locking

In cooperation with ENKO, Hella has developed the EFS Embedded Fingerprint System as a flexible, modular system concept.

The use of an interior camera aimed at the driver for face detection also opens up further possible uses including fatigue detection or alertness monitoring which make a major contribution to safety in road traffic.

Regardless of which biometric procedure is being used, the systems differentiate between the initial enrollment of the drive in the system and subsequent identification on the basis of the examined features. This identification process can be designed to remain essentially transparent for the driver, thus guaranteeing the greatest possible additional comfort.



Block diagram of a biometric system

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