

Document : **User Manual for Smart Key ECU**

Model : **SMK 2.0**

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# 1. System configuration

## 1.1 scope of SMART KEY SYSTEM

The System offers the following features:

- passive access for two doors, driver side and passenger side as well as trunk/tailgate
- passive start after interior detection of the SMART KEY FOB (without interior trunk and hat shelf detection)
- LF-RF communication (based on Continental's SMART KEY system)
- passive access/locking of the two front doors via a toggle push button in the door handles
- passive access trunk/tailgate via the trunk lid switch at the trunk
- max. 2 SMART KEY FOBs can be handled by the system
- immobilizer backup solution integrated into Fob-Holder.
- communication to the engine management system via a single line interface
- communication to the ESCL via a single line interface
- block of the steering column by the ESCL device

## 1.2 short description of the SYSTEM

### 1.2.1 General Definition of SMART KEY

The SMART KEY system is a system that allows the user to access and operate a vehicle in a very convenient way. To access the vehicle no traditional key or remote control unit is needed.

The user carries a SMART KEY FOB which itself does not require any conscious actions by the user (e.g. operate a button). The SMART KEY system is triggered by pressing a push button in the door handle.

After being triggered the vehicle sends out a request in a limited range. If the SMART KEY FOB receives this request, it automatically sends a response to the vehicle. Then the system decides whether to perform a particular action (unlocking, locking...) or remain inactive.

In a similar manner the vehicle's Electrical Steering Colume Lock (ESCL) is released. Again, a communication between the vehicle and the SMART KEY FOB is needed before any actions will be performed.

### 1.2.2 Wireless Communication

Electromagnetic waves are used to exchange information between the vehicle and the SMART KEY FOB. Both, vehicle and SMART KEY FOB are equipped with a transmitter, a receiver and several antennas.

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### 1.2.3 concept Description

With this concept it is possible to have a set of interior antennas that covers the vehicle's interior and a set of exterior antennas that covers the vehicle's exterior.

For an unambiguous separation between the vehicle's interior and exterior it is sufficient that at least one area is covered exactly by the corresponding operating ranges of the antennas.

The functions of the SMART KEY system have to be provided in a clearly defined and limited range. For the up-link from the vehicle to the SMART KEY FOB, a magnetic field with a frequency of 125 kHz and ASK modulation is used. Inductive antennas in and at the vehicle radiate the electromagnetic energy.

Technical aspects of 125 kHz – magnetic field:

- virtually no reflections,
- cubical decrease of field strength → allows good range control,
- released frequency band (ISM),
- high penetration,
- low quiescent current demand due to 125 kHz input stage (SMART KEY FOB),
- less sensitive for detuning compared to higher frequency.

For the down-link from the SMART KEY FOB to the vehicle, the standard radio frequency (RF) is used (similar to the classic remote control functions) with FSK modulation.

### 1.2.4 System Architecture

The system is designed as an optional system, making it possible to equip vehicles of the same car-Line with different levels of access control systems.

The system is suitable to be integrated into an existing architecture that provides central locking functions with standard remote control. This proposal assumes that the following functions / devices are already present in the vehicle's architecture.

- Central locking system (latch / motor – drivers etc.)
- Standard body control functions
- Warning buzzer

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### 1.2.5 Main Functions

- The system allows the user to access and exit (unlock and lock) the vehicle without performing any actions with the SMART KEY FOB.
- The system allows the user to control ESCL lock/unlock and operate relay to provide power(Off, Accessory, Ignition) to other ECU, as well as to start and stop the vehicle's engine without performing any actions with the SMART KEY FOB.
- Additionally, the system offers the user can operate all vehicle functions by inserting the Fob into the Fob holder or by inserting the mechanical key blade into the door lock.

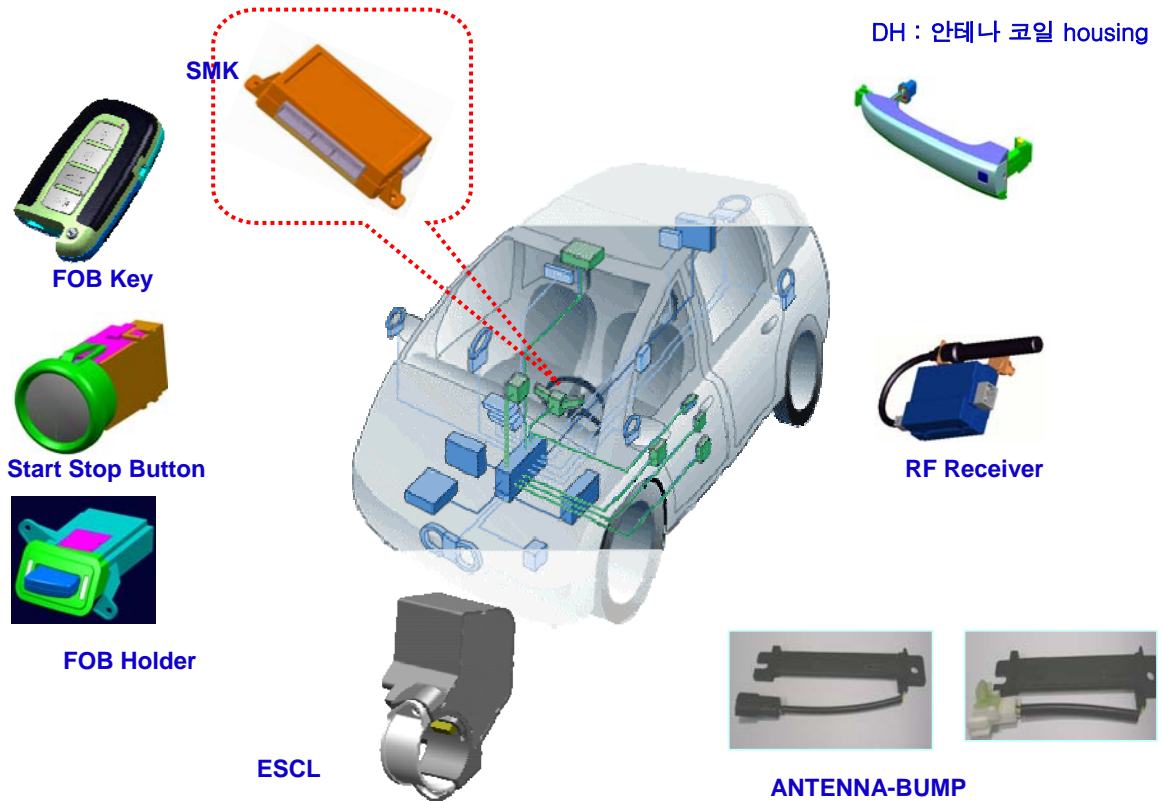
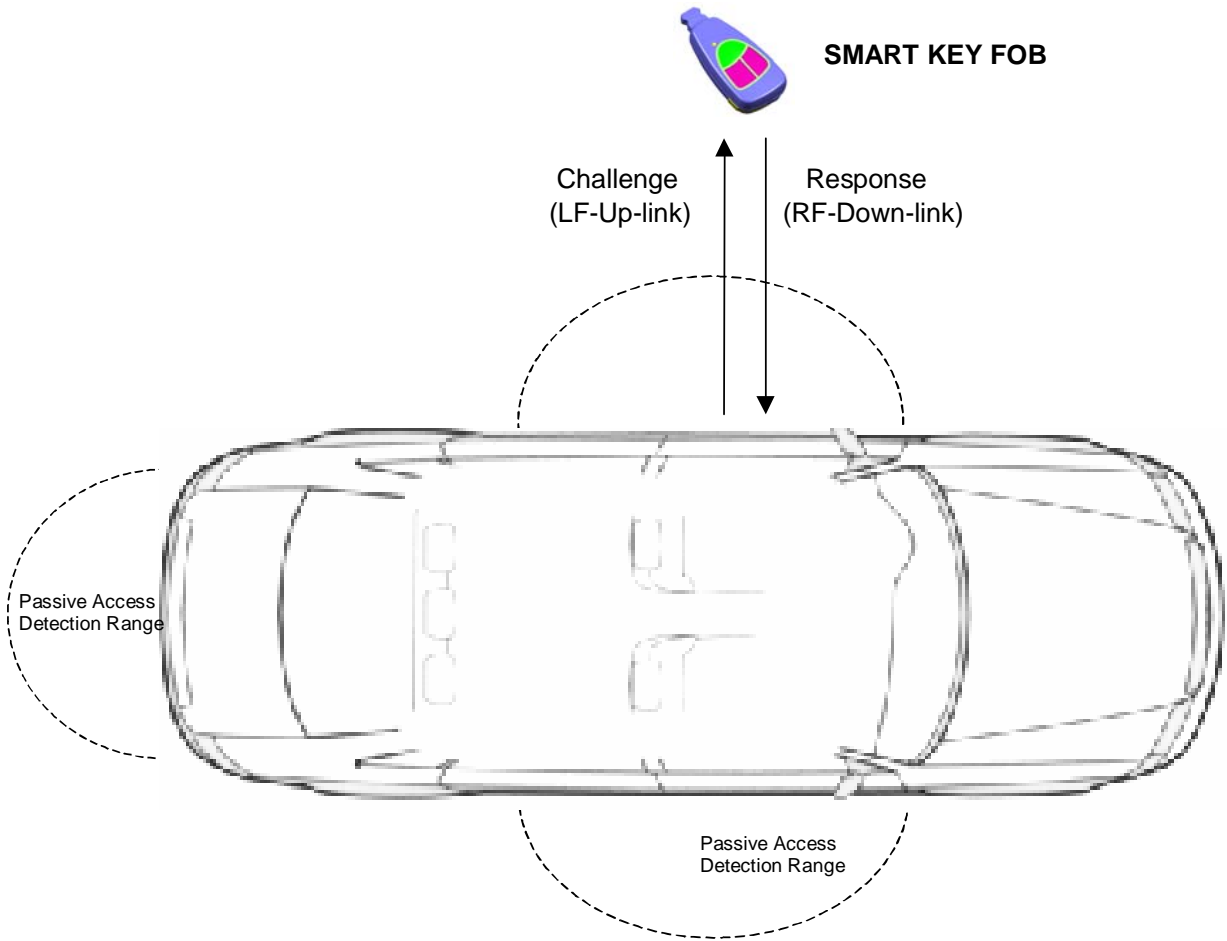


Figure 1: Offered System Components

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### 1.3 System Overview



**Figure 2: Principle of Communication**

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### FCC ID: SY5SMK20

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference.
- (2) This device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications (including the antennas) made to this device that are not expressly approved by the manufacturer may void the user's authority to operate the equipment.

FCC RF Radiation Exposure Statement: This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This device and its antenna must not be co-located or operating in conjunction with any other antenna or transmitter.

### IC:8325A-SMK20

Operation is subject to the following two conditions: (1) This device may not cause interference and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

The term "IC:" before the certification/registration number only signifies that registration was performed based on a Declaration of Conformity indicating that Industry Canada technical specifications were met. It does not imply that Industry Canada approved the equipment.

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