# RIMAC SMD V1.3 Smart Keyless System User Manual



Contents



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## GENERAL

In this document the Smart Keyless System (SKS) is introduced.
Smart Keyless System is the consequent development of well-known Remote Keyless Entry (RKE). The usage of the key fob by pressing the buttons is still possible, but not necessary any more to enter, lock, unlock the vehicle or to start it.
The SKS system consists of Smart Key Device (SKD), RF and LF antennas and Smart Keyless Module (SKM ECUJ. Vehicle equipped with the SKS system provides very convenient and luxury features.

The Model Name of the described ECU is:

- Smart Key Device (SKDJ- Key Fob: SKD V1.3
- Smart Key Module (SKM) – ECU: SKM V1.3

**SKM Smart Key Module ECU**

The SKM unit represents the main unit of the vehicle access system and is installed in the vehicle. Its function is communication, identification and awakening of SKD modules by RKE, PEPS and Immobilizer protocols. Through CAN and LIN buses, it provides secure communication with in-vehicle systems. The integrated Power Management system ensures that the SKM is always in power efficient mode and only raises the sub-systems that are essentially needed for the current system functionality.

**SKD Smart Key Device Unit**

The SKD (Smart Key Device) module is a remote unit of SKS system which enables vehicle locking/unlocking functionality and provides a safe ignition of the vehicle even if the battery is not present in the module. It supports the conventional RKE functionality where the driver unlocks/locks the doors with pressing a button on the module. SKD supports up to 6 mechanical buttons for user vehicle interaction.
In PEPS mode enables hands-free interaction with the vehicle which allows the driver to lock/unlock the vehicle doors and to start/stop the vehicle engine without performing any manual action either with the key fob or a mechanical key.

## KEYLESS OPERATION AND FEATURES

In the SKS (Smart Key System) the SKM ECU is connected with four LF Antennas positioned on the vehicle. Each antenna covers surrounding area providing selective recognition of the key fob location in the vehicle vicinity. Other situations are detected as well, like the user approaching or leaving vehicle, entering vehicle, etc.
The key fob (Smart Key Device) is to be found inside or outside the vehicle including the detection of the zone outside the vehicle (front, rear, left or right side).

**PASSIVE ENTRY (UNLOCK)**

When the driver approaches the vehicle, the fob is identified using secure wireless communication between the Smart Key Module (SKM) and the fob. A driver/passenger event (such as contact with the door handles) triggers this authentication. Once the fob has been authenticated, the doors are automatically unlocked. This function is called passive entry (P). Same operation principle is used for passive exit.
Person with the SKD approaches to the locked vehicle. The side antenna is tronsmitting LF signal. If the magnetic field strength is high enough (a certain border is reached) the SKD stays awake for additional LF communication by the other antennas driven sequentially. The additional LF communication guarantees the functionality, that only the valid key outside the vehicle authenticates the system to unlock the vehicle passively.
The passive entry function allows the driver to unlock the vehicle’s doors without any user action on the key fob. Instead, a user action is needed to trigger the system, such as approaching the door handle, touching the door handle, or pulling on it. When the car has detected this action, it starts the

- Outside fob localization (search for fob outside the vehicle cabin, preferably by LF)
- Fob authentication

Finally, if at least one paired key fob is localized outside the vehicle cobin and authenticated, the vehicle automatically unlocks its doors.
If the magnetic field strength is not high enough (when SKD is too far away from the vehicle), the SKD shuts down and waits for the next LF data. The vehicle remains locked.

**PASSIVE LOCK**

The passive lock function allows the driver to lock the vehicle doors without any user action on the key fob. Before PEPS systems had been introduced, the RKE function was used to lock vehicle doors. A button on the fob was dedicated to door locking. With PEPS systems, a lock button or a sensor is generally added on door handles to avoid fob manipulation. Users only have to push this button or touch the
handle to lock doors.
Once this action is detected, the vehicle initiates:

- Outside fob localization (search for fob outside the vehicle cobin)
- Inside fob localization (search for fob inside vehicle cobin)
- Fob authentication

Finally, if at least one key fob is localized/authenticated outside the cabin and if no paired key fob is localized/authenticated inside the cobin, the vehicle locks its doors.
Person with SKD is leaving the vehicle. The LF antenna is transmitting LF signal, which is recognized and evaluated (RSSI measurement) by the SKD. If the magnetic field strength is high enough the SKD stays active for additional LF communication by the other LF antennos driven sequentially. The additional LF communication guarantees the functionality, that only the valid key outside the vehicle authenticates the system to lock the vehicle passively. If the SKD is left inside the vehicle, it won't lock.

**PASSIVE START**
When the driver presses the vehicle's start/stop button, a new authentication process is executed. If the key fob is identified and localized inside the car, the ignition procedure is started. This function is called passive start (PS). The passive start function allows the driver to start/stop the vehicle engine without the user interacting with the key fob. A start/stop engine button is added in the vehicle cabin (replacing the lock cylinder) which activates the passive start function. Once this action is detected, the vehicle initiates:

- Inside fob localization (search for fob inside vehicle cobin, preferably by LF)
- Fob authentication

Communication between a vehicle and a fob is almost the same as for passive entry. The main difference between these two functions is that passive entry searches for fobs located outside the vehicle cabin, whereas passive start searches for fobs located inside the vehicle cobin. Finally, if at least one paired key fob is localized inside the vehicle cabin and authenticated, the vehicle enable/disable the driving system.

**IMMOBILIZER**
Immobilizer is a feature of the SKS system to provide the SKD authentication in case the SKD is not recognized or SKD battery is low. In this case SKD should be place on an interior LF antenna.

**SHORT RANGE LF COMMUNICATION**
Short-range bidirectional LF communication is used for two different purposes. First, it serves as an immobilizer and second, it is used for system configuration for learning. During the learning process, the relevant data for authentication (secret keys, length of challenge and response) or communication (modulation scheme, data rate) are transferred from the SKM to the key and stored in the SKD key fob. In both coses, the SKD operates with or without battery. The SkM control unit opplies the magnetic field that supplies the circuit with power and is used for bidirectional communication,

**AUTHENTICATION RANGE**
Localization is o key feature of any PE/PS system. Localization means the key is detected when near the vehicle and, depending on the strategy desired, can distinguish if the key is inside or outside the vehicle.
Localization is performed by meosuring the LF signal level (RSS) during communication with the vehicle. The RsSI is acquired by the fob and sent back to the vehicle. The vehicle then analyses the data to determine the fob's

position. Because the spatial orientation of the key fob is not known, the RSSI measurement must be performed for the x, y, and z axes using 3D coil inside the key fob.
The vehicle has four to six LF antennas. These antennas produce an LF magnetic field which covers the vehicle cabin as well as the perimeter near the vehicle. The primary goal is to localize a fob inside or outside the vehicle cabin.

**INSIDE THE VEHICLE COVERAGE**
The antennas inside the vehicle are arranged so that the most common fob locations (such as seats) are covered. Three antennas are placed to cover both sides of the vehicle. In addition, each antenna's LF power is adjustable so that a constant field strength matches the cabin perimeter.

**OUTSIDE THE VEHICLE COVERAGE**
For the passive entry function, LF antennas are positioned to cover vehicle access paths. These paths are:

- The left side of the vehicle
- The right side of the vehicle
- The trunk
- The front

**RKE RMOTE KEY OPERATION**
The RKE functionality support interaction with the vehicle over the six SKD buttons. When approoching or leaving your vehicle carrying the key fob, you do not need to point the key fob at your vehicle as you press a button, but you must be within operating range. Radio equipment on a similar frequency can affect the key. If this happens, move the key at least 30 cm away from other electronic devices (phone, laptop, etc).

**ULOCK BUTTON**

- Briefly press button: unlocking of doors
- Press button with prolonged pressing to automatically open driver and passenger windows.

  Windows STOP immediately when the button is released.

**LOCK BUTTON**

- Briefly press button: locking of doors
- Press button with prolonged pressing to automatically close driver and possenger windows.

Windows STOP immediately when the button is released.

**STATE OF CHARGE BUTTON**

- Press button to display vehicle HV battery state of charge on the cravat light and taillight RGB lights

**FUNCTION KEY**

- The user con define the function on the button press of the function key on the infotainment system. The functions available for the function key are Country flag animation, Preheat/Precool, Lightshow, Horn (honk), Hazard lights (toggle)

**TRUNK UNLOCK**

- Prolonged pressing of button: the vehicle will unlatch (pop) the trunk glass

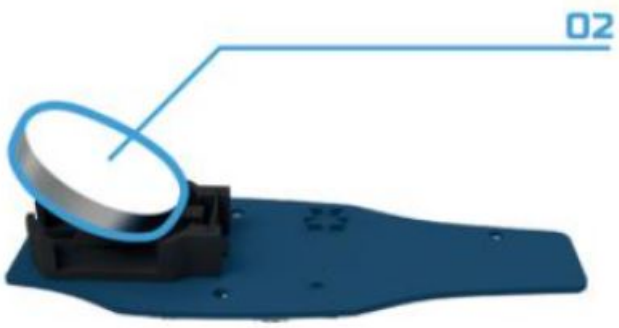
**STOP/RESUME CHARGING**

- Prolonged pressing of button (during vehicle charging): the vehicle will stop chorging and unlock the charging cable.
- Prolonged pressing of button (while the vehicle is not charging, and the charging cable is plugged in the charging socket): the vehicle will lock the charging cable and start charging.

## REPLACING THE SKD BATTERY

**IMPORTANT:** The battery replacement operation must be carried out with care, in order not to damage the electronic key. You are responsible for possible damages during replocing key bottery procedure
If you need help you can take the key fob to a Dealership for battery replacement

1. with the key fob placed button side down on a soft surface, use the screwdriver to extract the cover by unscrewing the lower housing
2. Remove the Key fob circuit board (SKD)
3. Remove battery 2 from its slot and replace it with a new one of the same type




When installing the new coin battery into the remote, please pay attention to inserting the battery with the correct polarity orientation and not damaging the battery contact. Insert battery 2 in the correct order as is shown on the picture to not damage the battery contacts.

- Re-position the battery holder using guiding pins:

4. While avoiding touching the battery's flat surfaces, insert the new battery (type CR2032) with the '+ side facing up.
   **Note:** CR2032 batteries can be purchased through online retailers, local supermarkets, and drug stores.
5. Proceed in reverse order to reassemble the key

The electronic components inside the key may be damaged if the key is subjected to strong shocks. To ensure the complete efficiency of the electronic devices inside the key, they should never be exposed

I to direct sunlight.
Used batteries may be harmful to the environment if not disposed of correctly.
They must be disposed of as specified by law in the special containers or taken to a Dealership, which will take care oftheir disposal.

Always take the key with you when you leave your vehicle to prevent someone from accidentally operating the controls.
Never leave children unattended in the vehicle. A child could activate the electric window winders, other controls or even start the vehicle.

## FCC AND IC CERTIFICATION

| **Component** | **Manufacturer** | **Model** | **Operating Frequency** | FCCIO |
|---|---|---|---|---|
| Smart Key Device<br>SKD | Rimoc<br>Technology | SMD Vl3 | 125KHz<br>914.2MHz – 915.4MHz | 2A2HN-RIM14O4 |
| Smart Key Module<br>SKM | Rimoc<br>Technology | SKM Vl3 | 125KHz<br>914.2MHz – 915.4MHz | 2A2HN-RIM1142 |

The devices listed above comply with Part 15 of the FCC rules and Industry Canada's license-exempt RSS Standard(s) and EU Directive 2014/53/EU.

Operation is subject to the following two conditions:

1. This device may not cause harmful interference; and
2. his device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by Rimac Technology could void your authority to operate the equipment.

**RADIOFREQUENCY INFORMATION- ALL REGIONS**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and con radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician to help.

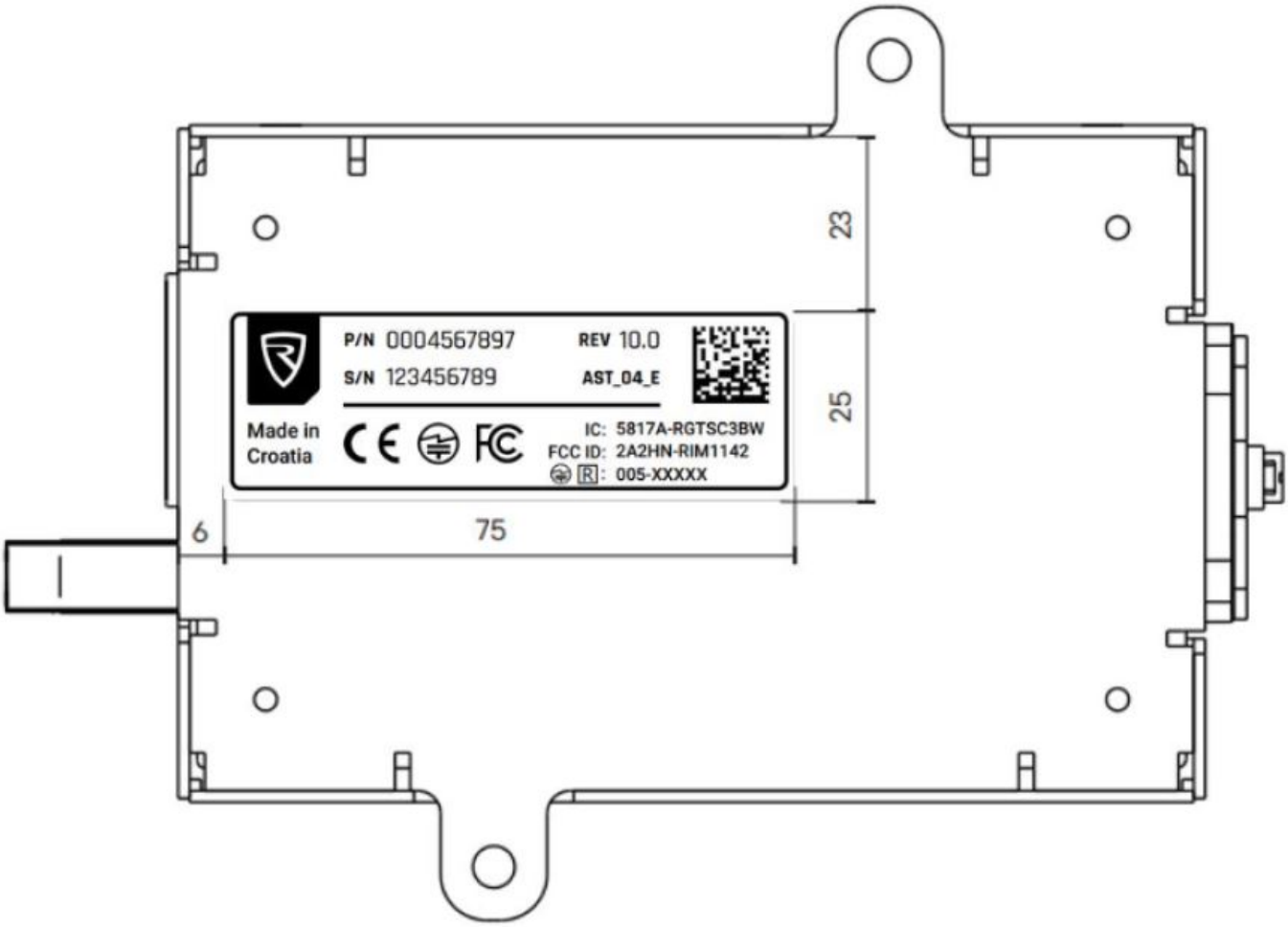
The user's manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes, or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

CANADA – NORTH AMERICA ONLY
CAN ICES-3 (BJ/NMB-3(B)

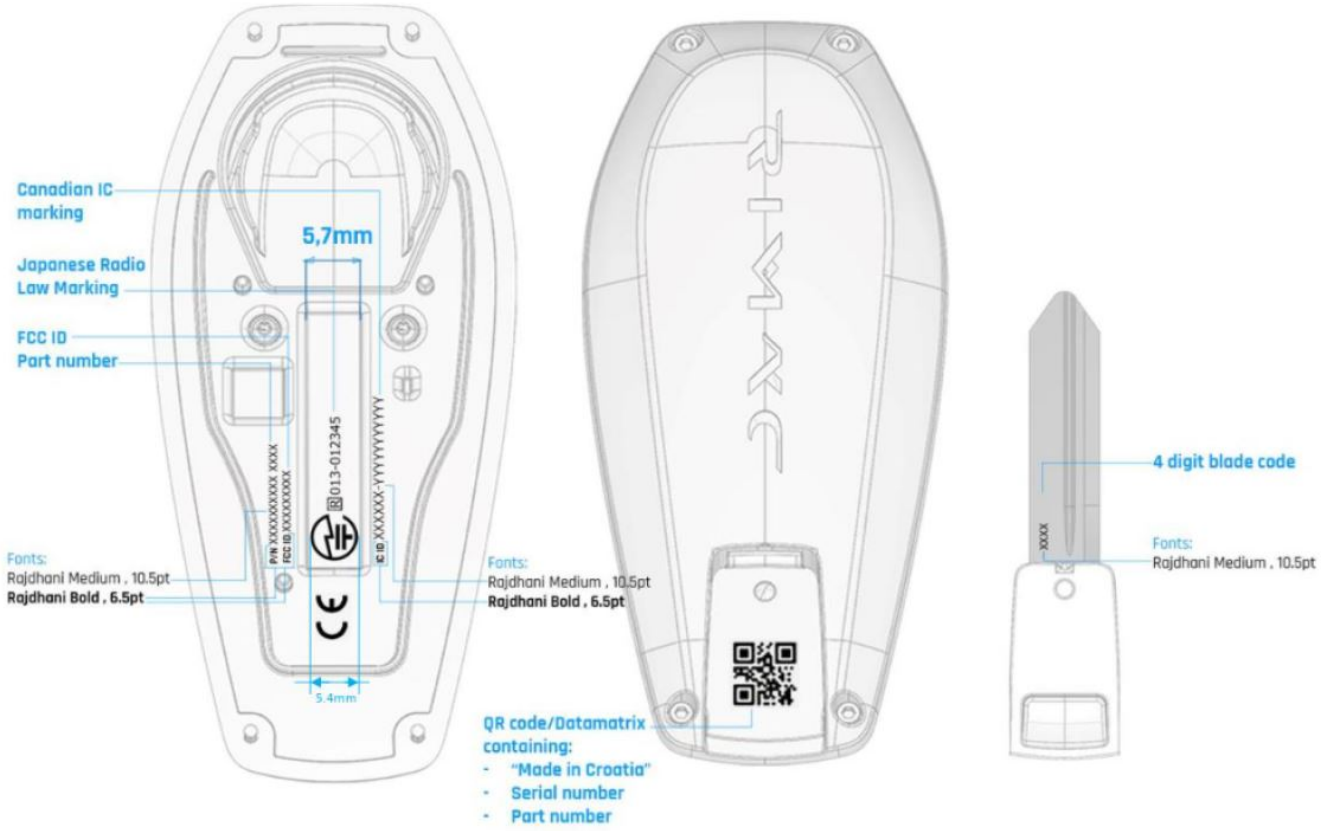
**Radiation Exposure Statement:**
The product complies with RF exposure IC for wireless power transfer of low power consumers. The RF exposure limit set for an uncontrolled environment is safe for intended operation as described in this manual. Additional RF exposure compliance has been demonstrated to 20cm and over separation from the user's body or putting the device at lower power output if such a function is available.

## LOCATION OF PRODUCT LABEL

**SKM**
The label is positioned on the back side of the SkM housing as it shown on the bottom picture.




**SKD**
The certification ID's are laser engraved in Key fob housing and there are located inside the Key fob housing as it shown on the bottom picture.

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## Documents / Resources

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|---|---|
|  | RIMAC SMD V1.3 Smart Keyless System [pdf] User Manual<br>2A2HN-RIM1142, 2A2HNRIM1142, SMD V1.3, SMD V1.3 Smart Keyless System, Smart Keyless System, Keyless System |