

ZADI S.p.A.

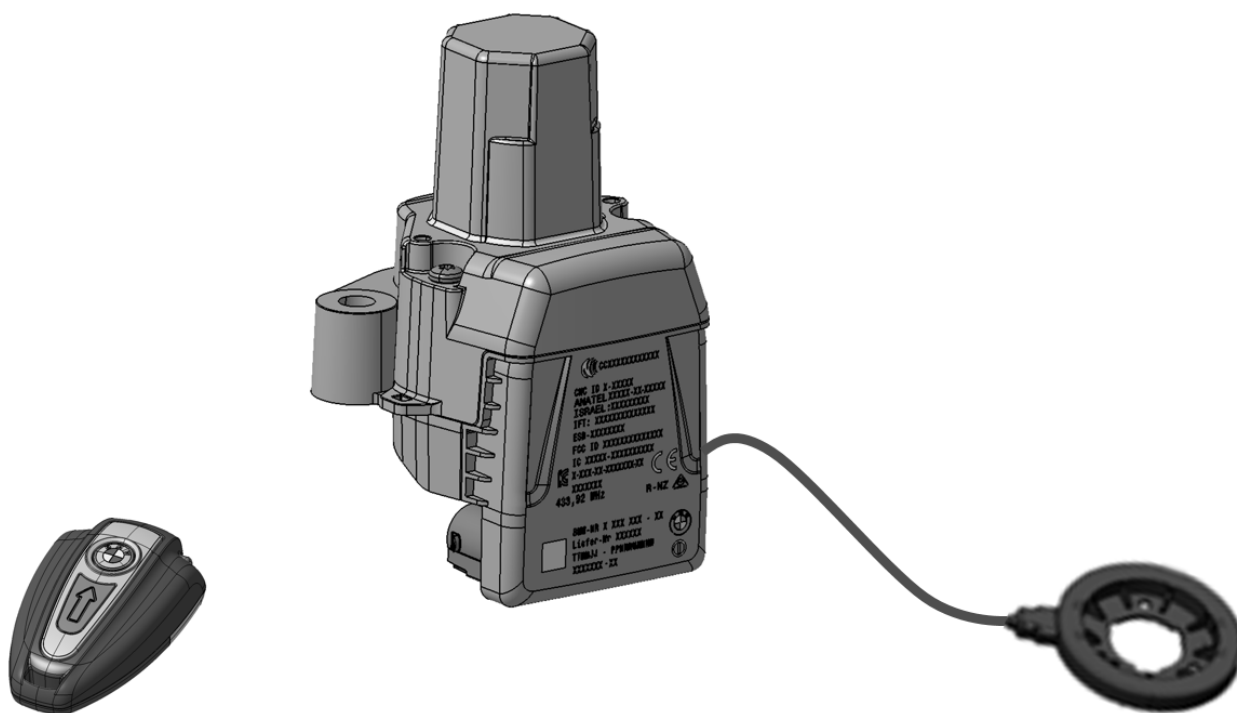


30th August 2019

User Manual

BMW

Keyless Ride System



INDEX OF REVISIONS:

30.08.19: **Rev00** First Release

ORIGINAL INSTRUCTIONS



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1. Abbreviations

KR	Keyless Ride System
Main Unit	Keyless Ride System's base station
User Key / Active Key	Key with transponder and battery used to drive the motorcycle
Transponder / Passive Key	Passive identification electronic device without supply
ECU	Electronic Control Unit
CAN	Controller Area Network
Antenna	Device to transmit and receive RF signals
RF	Radio Frequency
LF	Low Frequency
HF	High Frequency
KL15	Ignition signal
KL30	Vehicle power supply (battery +)
KL31	Vehicle GND (battery -)

2. Description

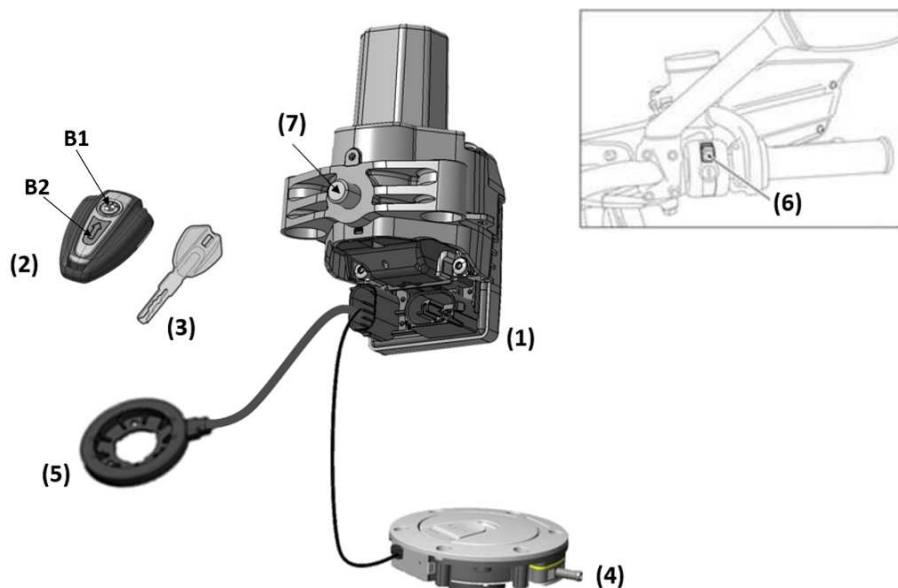
The Keyless Ride System (KLR) is an electronic unit for vehicles, composed by:

- the **main unit** (1), which provides the following functions:
 - user recognizer, by means of an active key (2) or a passive key (3);
 - the enable and disable of the ignition of the bike;
 - the Lock and Unlock of the steering, by moving a bolt (7);
 - the arming and disarming of the anti-theft alarm system;
 - Fuel Tank Cap opening (4);
- the **active key** (2);
- the **passive key**, an RFID transponder (3).

The customer should provide the following connections:

- LF antenna;
- external push button called Lock/Unlock button (6);
- CAN bus;
- fuel tank cap.

The KLR-System combines the transponder functionality (LF, Low Frequency 134.5 kHz) and the radio controller transmission (HF, High Frequency 433.92 MHz) to recognize the right user of the vehicle. The system is integrated on CAN bus to communicate with the other electronic units on the vehicle. Following, a typical mechanical application of the electronic system has been considered in order to explain its functionalities on the vehicle:



1.1 Key ON

1.1.1 Normal Mode

The user recognizing with the active key (2) is performed as described below:

- press the Lock/Unlock button (6) on the handlebar of the vehicle for less than 1 second (customizable parameter);
- the main unit (1) performs the radio frequency authentication of the key (2 or 3) by sending a request on LF band through the LF antenna (5);
- if the active key (2) is within the LF detection range (1.5 m) and the battery is charged, then it replies to the main unit (1) by transmitting its ID via an HF signal;
- the main unit (1) receives the information through an internal HF antenna;
- if the main unit (1) recognizes the active key (2):
 1. starts the transmission of a periodical message on CAN bus;
 2. if the steering is:
 - a. locked: unlocks it by retracting the bolt (7);
 - i. press the Lock/Unlock button (6) on the handlebar of the vehicle for less than 1 second (customizable parameter);
 - ii. if the main unit (1) recognizes the active key (2), then it sets KL15 ON;
 - b. unlocked: sets KL15 ON.

Note: when the battery is discharged, the active key (2) acts like a passive key (3), as reports below.

1.1.2 Emergency Mode

The user recognizing with the passive key (3), or with a discharged active key (2), is performed as described below:

- press the Lock/Unlock button (6) on the handlebar of the vehicle for less than 1 second (customizable parameter);
- the main unit (1) performs the radio frequency authentication of the key (2 or 3) by sending a request on LF band through the LF antenna (5);
- if the passive key (3) is within a range of distance up to 5 cm near the LF antenna (5), then it replies to the main unit (1) by transmitting its ID via a backscattered LF signal;
- the main unit (1) receives the information through the LF antenna (5);
- if the main unit (1) recognizes the passive key (3):
 3. starts the transmission of a periodical message on CAN bus;
 4. if the steering is:
 - a. locked: unlocks it by retracting the bolt (7);
 - i. press the Lock/Unlock button (6) on the handlebar of the vehicle for less than 1 second (customizable parameter);
 - ii. if the main unit (1) recognizes the passive key (3), then it sets KL15 ON;
 - b. unlocked: sets KL15 ON.

1.2 Key OFF

When vehicle speed is equal to zero, by pressing the button (6) on the handlebar for less than 1 second (customizable parameter) the system goes in deactivation state for 2 minutes (customizable parameter); this is the time necessary to be able to open the fuel tank cap (4), after that Key OFF state occurs (KL15 OFF). Neither active key (2) nor passive key (3) are required.

1.3 Steering lock

To engage the steering lock:

- stop the vehicle (perform a Key OFF);
- keep the active key (2) or the passive key (3) within the recognizing area;
- press the Lock/Unlock button (6) and hold it depressed for more than 3 seconds (customizable parameter) with steering turned completely to the left or to the right: steering lock will be engaged after this time (the bolt of the system (7) goes out).

1.4 Steering unlock

To unlock the steering, perform the Key ON procedure.

1.5 Fuel Tank Cap opening

Stop the vehicle and press the Lock/Unlock button (6).
The fuel tank cap (4) can be opened in two ways:

Variant 1: Within the deactivation time

- Pull the lid of the fuel tank cap (4) slowly upwards;
- Fuel tank cap (4) unlocked;
- Open the fuel tank cap (4) completely.



Variant 2: After the deactivation time

- Keep the active key (2) or the passive key (3) within the recognizing area;
- Slowly pull the lid of the fuel tank cap (4) upwards;
- Wait for the key to be recognized;
- Slowly pull the lid of the fuel tank cap (4) upwards again;
- Fuel tank cap (4) unlocked;
- Open the fuel tank cap (4) completely.

1.6 Anti-theft alarm system

1.6.1 Anti-theft alarm system arming

To arm the anti-theft alarm system:

- Press the Lock/Unlock button (6) to switch off the ignition;
- Press button B1 of the active key (2) twice.

1.6.2 Anti-theft alarm system disarming

The anti-theft system can be interrupted at any time by pressing the button B2 of the active key (2), which should be within the recognizing area.



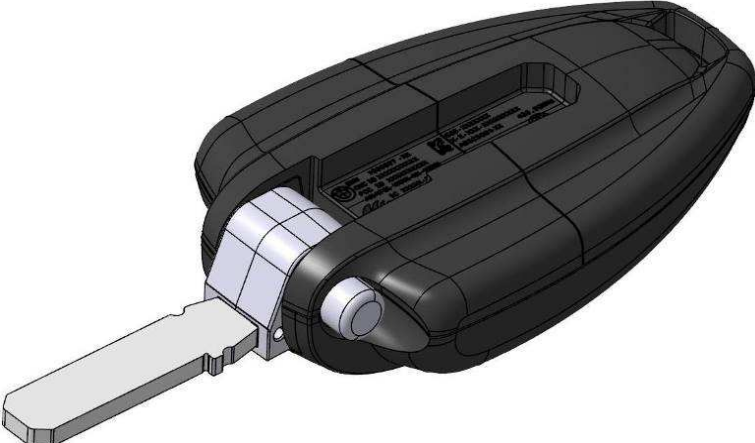
3. Installation notes

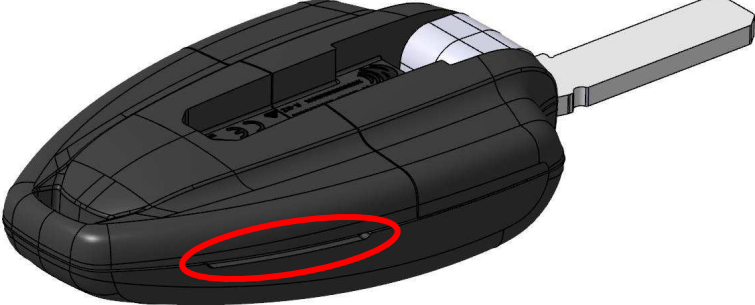
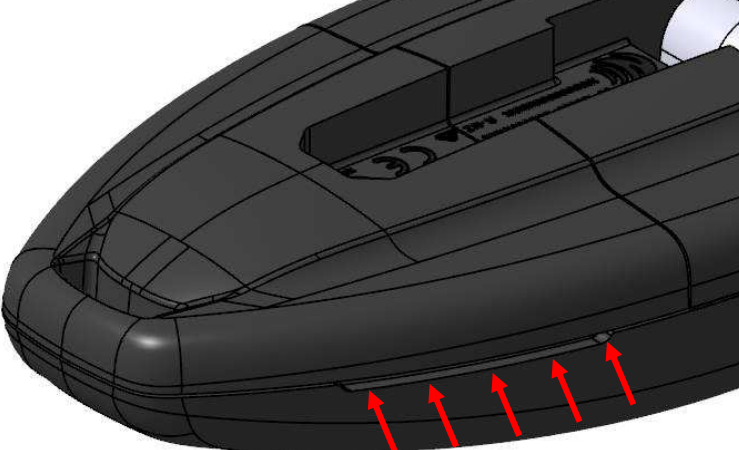

1. Zadi reserves of approve the installation activities on the vehicles.
2. The bolt, in rest position, must allow the overall/complete movements of the steering.
3. LF Antenna Installation: the item must be put in air, far from metallic parts. Every single installation must be agreed and approved by/with Zadi.
4. It is strictly forbidden modify, tamper the harness, antenna and any other part of the system.
5. Harness installation: the harness must be put in place far from the metallic parts and every single installation must be agreed and approved by Zadi.
6. Every single device damaged, MUST be replaced.
7. Active key: it is strictly forbidden have access to the inner electrical component of the active key, except for the battery compartment (to replace the battery exhausted).

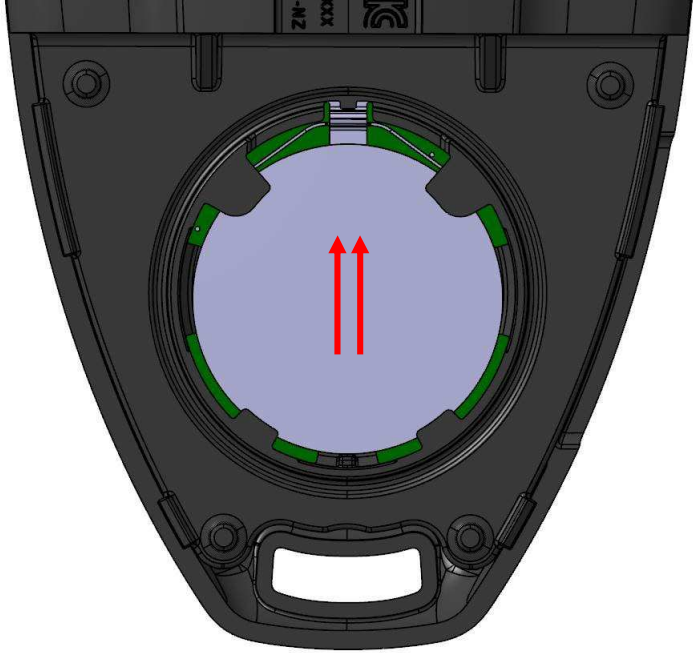
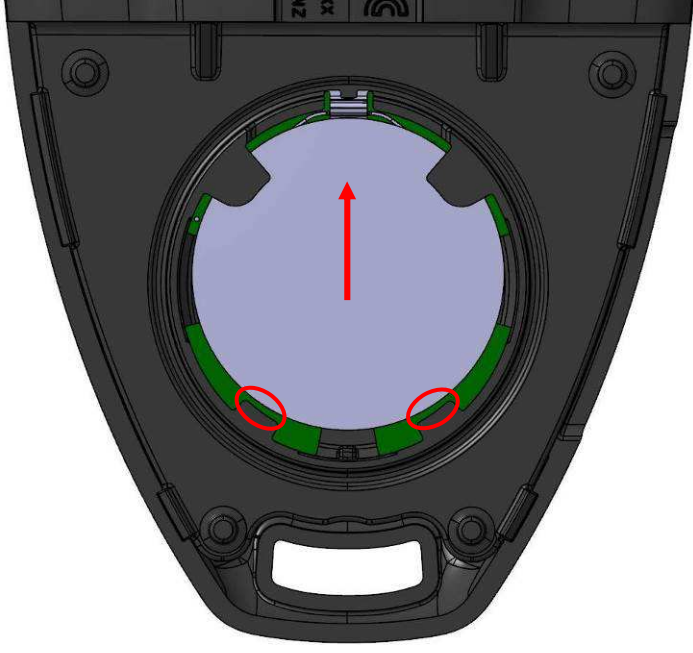
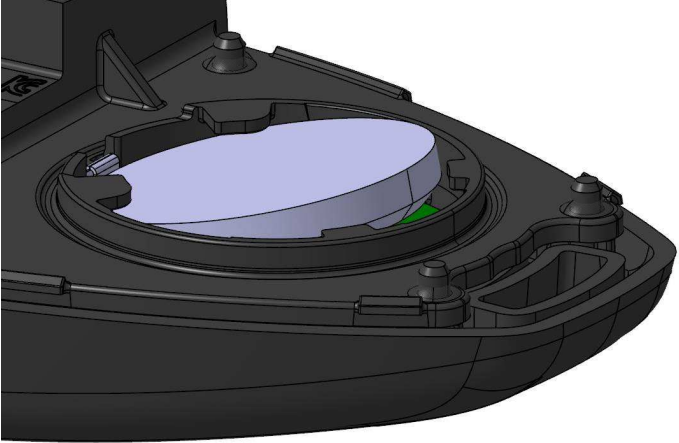
3.1 Replacing the battery in the active key


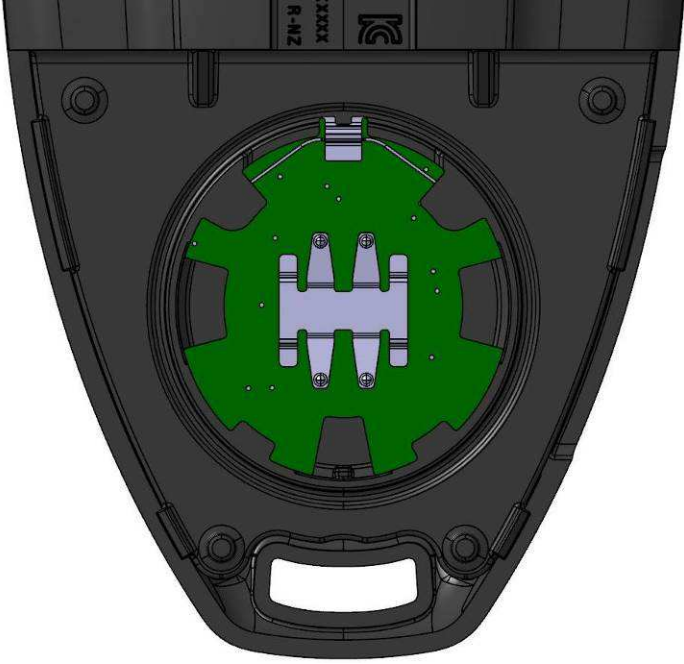

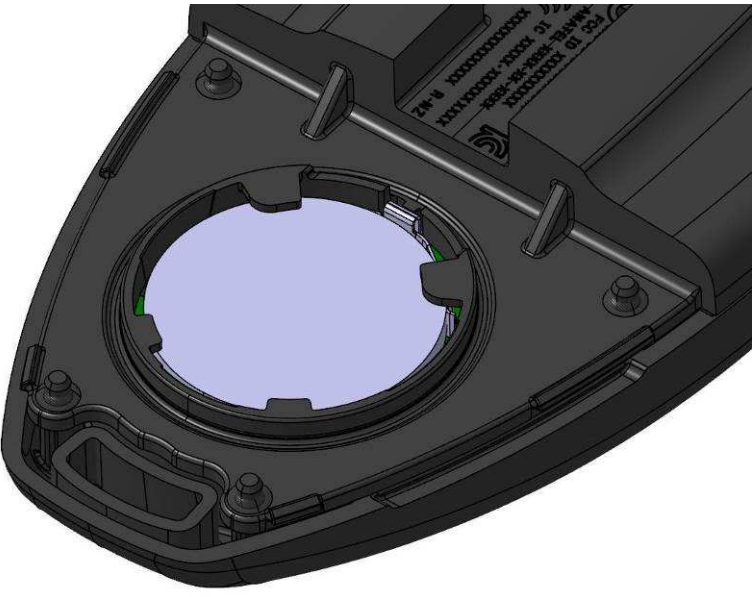
It is strictly forbidden have access to the inner electrical component of the user key, except for the battery compartment in order to replace the battery exhausted.


To replace the battery in the user key follow the procedure described below:

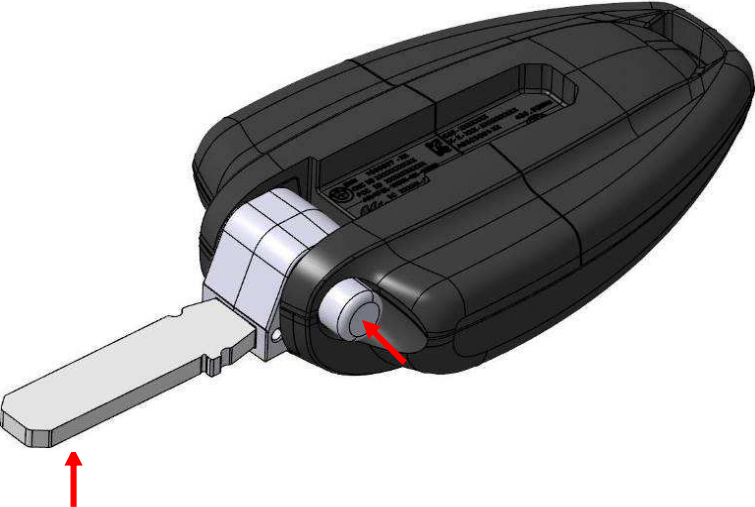

NR.	DECRPTION	ILLUSTRATION
1	Turn the key upside down	 <p>An isometric illustration of a black car key with a silver blade, shown upside down. The key is oriented vertically with the blade pointing downwards.</p>
2	Push the release key blade button	 <p>An isometric illustration of the key upside down, similar to the first step. Two red arrows point to a small, circular button on the back of the key, indicating it should be pushed.</p>
3	Key blade open	 <p>An isometric illustration of the key upside down, showing the silver blade fully extended from its housing.</p>

NR.	DESCRIPTION	ILLUSTRATION
3	<p>Identify on the right side of the key the battery cover release cut</p>	
4	<p>Using the nail (or a plastic leverage) apply a pressure to remove the battery cover</p> <p><i>Note:</i> DO NOT use a screwdriver or a knife or a metal leverage</p>	
5	<p>Open the battery cover and place it in a safe place (pay attention to the o-ring gasket)</p>	

NR.	DECRPTION	ILLUSTRATION
6	Using the thumb push gently down and to the front part of the key	
6.1	Previous phase will free the battery to be removed	
6.2	Push in the upper side of the battery to release it	

NR.	DESCRIPTION	ILLUSTRATION
7	<p>Battery removal complete</p> <p>Note: Old batteries must be lodged at a collecting point or at a service center </p>	
8	<p>Compatible batteries Type: CR2032 3V 225-235mAh Manufacturers:</p> <ul style="list-style-type: none"> • Energizer(ECR2032); • Fujitsu(CR2032); • Toshiba(CR2032); • Panasonic(CR2032); • Duracell(DL2032); • Varta(CR2032) 	
9	<p>Insert the new battery in the reverse way of the removal procedure, check that the battery is correct inserted ("+" is to the external side of the key, "-" is to the internal of the key) and locked</p>	

NR.	DESCRIPTION	ILLUSTRATION
10	Check that the o-ring gasket is positioned correctly	 <p>The illustration shows a top-down view of the black battery cover. A red o-ring gasket is highlighted around the inner perimeter of the cover. In the center of the cover, there is a small cross-shaped symbol.</p>
11	To close the battery cover repeat the "Point n°5" in the reverse way	 <p>The illustration shows the battery cover being lowered onto the battery compartment. The cover is tilted, and the red o-ring gasket is visible as it makes contact with the compartment's rim.</p>
12	Apply a pressure in the right side of the battery cover until you hear a "click"	 <p>The illustration shows the battery cover fully seated on the battery compartment. Four red arrows point downwards from the right side of the cover, indicating the direction of pressure to be applied to ensure it is properly closed.</p>

NR.	DESCRIPTION	ILLUSTRATION
<p>13</p>	<p>Push the release button and close the key blade</p>	
<p>14</p>	<p>Replacement completed. Enjoy your ride!!!</p>	

4. Technical Specification

4.1 KLR Main Unit

4.1.1 Electrical features

Nominal voltage	13.5V
Operating voltage	7.5-16V
Operating temperature	-25°C @ +60°C
Storage temperature	-40°C @ +85°C
Operating Current consumption	≤ 150 mA @ 12 V
Stand-by Current consumption	< 1 mA @ 12 V
Key supply output (+15)	2 A
2 nd Output supply	2 A
Operating Frequency LF	134.5 KHz
Operating Frequency HF	433.92 MHz
RF Power	< 66 dBμA/m @10 m (129.6 – 135 kHz)
Modulation Type	FSK for UHF and for LF uplink ASK for LF downlink

4.1.2 Mechanical features

Dimensions (with bolt for steering inside)	74 x 85 x 123 mm
Dimensions (with bolt for steering outside)	84 x 85 x 123 mm
Weight	431 g
Bolt PUSH / PULL load	≤ 50 N
External Housing	Aluminium
Protection grade	IP45 (mechanical part)-IP67 (electronic part)
Vibration resistance	Sine on Random Random: 100÷800 Hz @0.1 (m/s ²) ² /Hz Sine: X: 100÷2000 Hz peak 181 m/s ² @424 Hz Y: 100÷2000 Hz peak 147 m/s ² @182.06 Hz 182.07÷331.45 Hz peak 312 m/s ² @240 Hz Z: 100÷2000 Hz peak 162 m/s ² @416 Hz

4.2 Active Key – Remote control

4.2.1 Electrical features

Battery type	CR2032
Nominal voltage	3V
Operating voltage	2.5-3.16V
Operating temperature	-20°C @ +60°C
Storage temperature	-30°C @ +60°C
Battery life	> 12 months
Operating distance for Key-Card	10-150 cm (on air)
Operating distance for passive key	1-5 cm (on air)
Operating Frequency LF	134.5 KHz
Operating Frequency HF	433.92 MHz
RF Power	< 10 mW e.r.p. (433,050 MHz – 434,790 MHz)
Modulation Type	FSK for UHF and for LF downlink ASK for LF uplink

4.2.2 Mechanical features

Dimensions (with closed blade)	45 x 73 x 22 mm
Dimensions (with opened blade)	45 x 108 x 22 mm
Weight	52 g
External Housing	Plastic
Protection grade	IP67

5. Certification

5.1 USA Certification

Product name: Keyless Ride System Main Unit
FCC ID: VFZKLRMZB001

Product name: Keyless Ride System Active key
FCC ID: VFZKLRKZB002

Warnings

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, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC § 15.105 Information to the user statements

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 can 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, the user is encouraged to 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 for help.*

FCC § 15.21 - Information to user. *“Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.”*

5.2 Canada Certification

5.2.1 Main Unit Certification

Product name: Keyless Ride System Main Unit (ZB001)
IC: 22239-KLRMZB001

This device complies with Industry Canada licence-exempt RSS standard(s). 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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

5.2.2 Active Key Certification

Product name: Keyless Ride System Active key (ZB002)
IC: 22239-KLRKZB002

This device complies with Industry Canada licence-exempt RSS standard(s). 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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

5.3 Technical details for China market

BMW Keyless Ride System composed by:

- (1) **Main Unit ZB001** (134.5 kHz)
General transmitting SRDs; Category A equipment
Operating frequency: 134.5 kHz (band 9-190 kHz)
EMF emission: < 72 dB μ A/m (at 10 m) (-3 dB/octave) (quasi-peak)
Extreme environment condition: -25 °C + 60 °C

- (2) **Active Key ZB002** (433.92 MHz)
Radio control device for various kinds of civilian equipment
Operating frequency: 433.00-434.79 MHz
Transmit power limit: <10 mW (e.r.p)
Occupied bandwidth: \leq 400 kHz
Extreme environment condition: -20 °C + 60 °C

is in conformity with the requirements specified in the Technical Requirements for micro-power (Short range) Devices, MIIT Notification no. 423,2005 when used within the Extreme environment conditions listed above.

Information:

- 1) 不得擅自更改发射频率、加大发射功率（包括额外加装射频功率放大器）；不得擅自外接天线或改用其它发射天线。
(Do not change the designed parameters (e.g. operating frequency, transmit power or antenna) without permission or connect the device to external RF power amplifier or antenna).
- 2) 使用时不得对各种合法的无线通信业务产生有害干扰；一旦发现有干扰现象时，应立即停止使用，并采取措施消除干扰后方可继续使用。
(Stop the operation of the device immediately, if it causes any harmful interference to the existing radio communication operations or systems).
- 3) 使用微功率无线设备，必须忍受各种无线电业务的干扰或工业、科学及医疗应用设备的辐射干扰。
(The operation of the device shall tolerate interferences form the radio communication system or radiated interferences from the ISM devices).
- 4) 不得在飞机或机场附近使用。
(Do not use the device near aircrafts or airports).

Sources:

- 1) 信部无[2005]423号:微功率(短距离)无线设备的技术要求
Technical requirements for micro-power (short-range) devices, MIIT notification no. 423, 2005.
- 2) 信部[1998]178号:微功率(短距离)无线电设备管理暂行规定
Provisional regulations for the management of micro-power (short-range) radio devices, MIIT notification no. 178, 1998.