

Document : **Technical Manual for SMK MSCL**

Model name : **SMKREN**

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## **Operation Guide**

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.

## **Caution !**

Any changes or modifications to the equipment not expressly approved by the party responsible for compliance could void user's authority to operate the equipment.

## ABBREVIATION REGISTER

Abbreviation	Description
ACC	ACCessory
ECU	Electronic Control Unit
GND	GrouND
MSCL	Mechatronic Steering Column Lock
PCB	Printed Circuit Board

### 1. Structure

- 1) The MSCL provides an electronically controlled mechanical release of the steering column lock. The MSCL is integrated in the steering column.

The MSCL physically contains:

- ① a housing with peripheral mechanism components

- MSCL controller as an assembled printed circuit board (PCB)

- 2) The knob rotation shall be in accordance with a rotary type ignition switch having 3 static positions - 'LOCK' / 'ACC' / 'ON' and 1 kinetic position - 'START' as shown in below diagram (see figure 2). The outermost position shall be 'START' position that permits automatic return to 'ON', therefore, when releasing the knob at 'START' position, the knob shall be returned automatically to 'ON' position by the self returning torque of the ignition switch. Thus, the rotation of knob will result in combined electrical output in each 4 positions through the ignition switch. (see circuit diagram of Ignition Switch Specification ES95470-35.)

- 3) The axial movement of knob shall be followed as shown in below diagram (see figure 1) in function with a pressure spring. The knob can be pushed by an external force against a spring force and can be returned to 'UNPUSHED' from '1<sup>st</sup> PUSHED position' in MSCL Lock position or/and '1<sup>st</sup> PUSHED' position from '2<sup>nd</sup> PUSHED' position as soon as a external force eliminated. The knob rotation from 'LOCK' to 'ACC' is possible at '1<sup>st</sup> PUSHED' and '2<sup>nd</sup> PUSHED' positions. Also The knob rotation from 'ACC' to 'LOCK' is possible at '2<sup>nd</sup> PUSHED' positions.

The knob movement at 'LOCK' position will toggle the knob push switch signal which shall be transmitted to Smart Key ECU and MSCL controller for MSCL release and block function.

- 4) The Auto lever shall normally be moved from 'P' position to the other positions at 'ON' . However, at 'ACC' position, the key interlock function shall be only depending on the status of 'P' position switch at the auto lever.
- 5) The turning movement between 'ACC' and 'ON' position will also toggle the knob push switch to Smart Key ECU and MSCL controller for the Pre-Key Interlock function, depending on the status of 'P' position switch at the auto lever and previous key interlock function status.
- 6) FOB key insertion and extraction to knob is only possible in the position 'LOCK' under normal operation. The FOB key shall not be extracted out of MSCL knob unit under minimum 100 N except 'LOCK' position. And, these insertion and extraction will toggle the key-in switch signal which shall be transmitted to Smart Key ECU for Limp home release and block function of MSCL Knob.
- 7) Unlocking of the steering device shall be performed as the knob is rotated from 'LOCK' to 'ACC' position after pushing and unblocking of knob. And, the locking of steering device will be proportionally performed as the knob is rotated from 'ACC' to 'LOCK' with engagement of the lock bolt.
- 8) Electric power supply toward MSCL controller to activate a bistable solenoid shall be used to block and release the knob rotation. And, the solenoid block and release position shall be detected by an optical sensor integrated in MSCL controller, and the status will be transmitted to Smart Key ECU whenever the status is requested. And, due to the quick trial, when the knob rotation is jammed—the knob release or key interlock release, the user shall be able to turn the knob further only with short removal of the torque on the knob and without any operation for system re-triggering.

If the electric power supply is failed towards MSCL controller, it is not possible to release and block the knob rotation. And, the solenoid will keep remained in the current position 'Released' or 'Blocked' . In case the solenoid keep remained in position 'Released' instead of 'Blocked' because of electric failure.