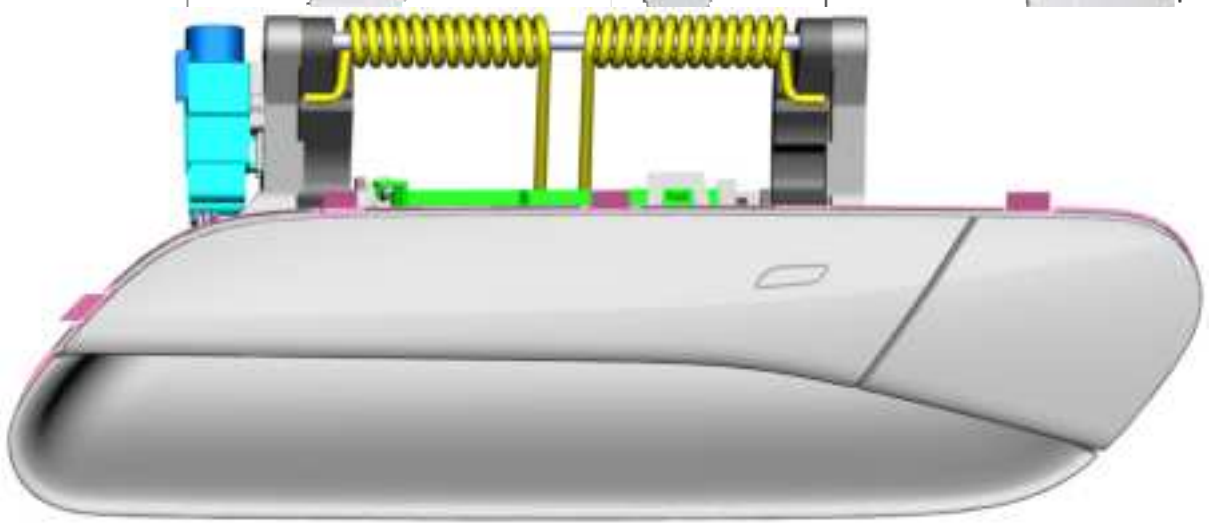
User Manual for Homologation: FLUSHNFC

Huf project number.:	8000.499
Huf project name:	Volkswagen / MQB A/B SUVe ID C-CUV SUV - 4D / OBW ODH Electronics - VW316/Reneval of NFC Sensor development with MDK2.x
Brand:	Huf
Component:	FLUSHNFC
HW-Version:	H32
SW-Version:	ANFCREADERLIBRARY_VW_380_V18



I. Change History

Index	Changes	Date
000	Initial version	22.02.2024

II. Table of Contents

III. List of figures

IV. List of abbreviations

AM	Amplitudenmodulation
ASK	Amplitude shift keying
CW	Continuous wave
ECU	Electronic Control Unit
eTSG	eTür-Steuer-Gerät
ETSI	European Telecommunications Standards Institute
Huf	Huf Hülsbeck & Fürst GmbH & Co. KG
IEC	International Electro technical Commission
ISO	International Organization for Standardization
LPCD	Low Power Card Detection
MECVD	Multipuls Enhanced Capacitive Voltage Divider
NFC	Near Field Communication
OEM	Original Equipment Manufacturer
OOK	On/ Off Keying
PCB	Printed Circuit Board
PCBA	Printed Circuit Board Assembly
PCD	Proximity coupling device
PICC	Proximity integrated circuit card
RED	Radio Equipment Directive
RF	Radio-Frequency

1 Product Overview

1.1 Intendent Use

The intendet use for the end user is to unlock or lock the car by using the capacity sensors (unlock sensor / lock sensor) of the Door Handle or via the NFC Interface in combination with a valid NFC device.

1.2 Product variants

The door handle electronics consists of one PCB with Kessy+NFC function – which can be potted in a left-hand driver and also in a right-hand-driver doorhandle.

- Sensor Kessy+ NFC: (6pol.)
  - Electronics with two capacitive sensors (Lock/ Unlock), NFC and CAN interface

1.2.1 Function capacative sensors:

There are two different capacitive sensors. The first sensor is used for unlock function and designed as an approach sensor. The second sensor is used for lock function and is designed as a touch sensor.
Keyless access is enabled by activating the sensors on the door handle in combination with the door handle-ECU, whereby the vehicle can be unlocked or locked.

1.2.2 Function NFC:

To enable communication with an NFC device, the door handle electronics CA+NFC has a highly integrated transceiver IC for contactless communication at 13,56MHz for automotive applications. This reader has a gateway function, the possibility to buffer required data and various diagnostic information can be provided as well.
The data is transferred to the NFC device according to ISO/IEC 14443-A. The data transmission to the vehicle is realized via CAN-Bus interface. ECP according to Car Keys specification is implemented to communicate also with Apple NFC devices.
In LPCD mode the door handle electronics checks the magnetic field for amplitude or phase change. This LPCD polling takes place in adjustable interval lengths.

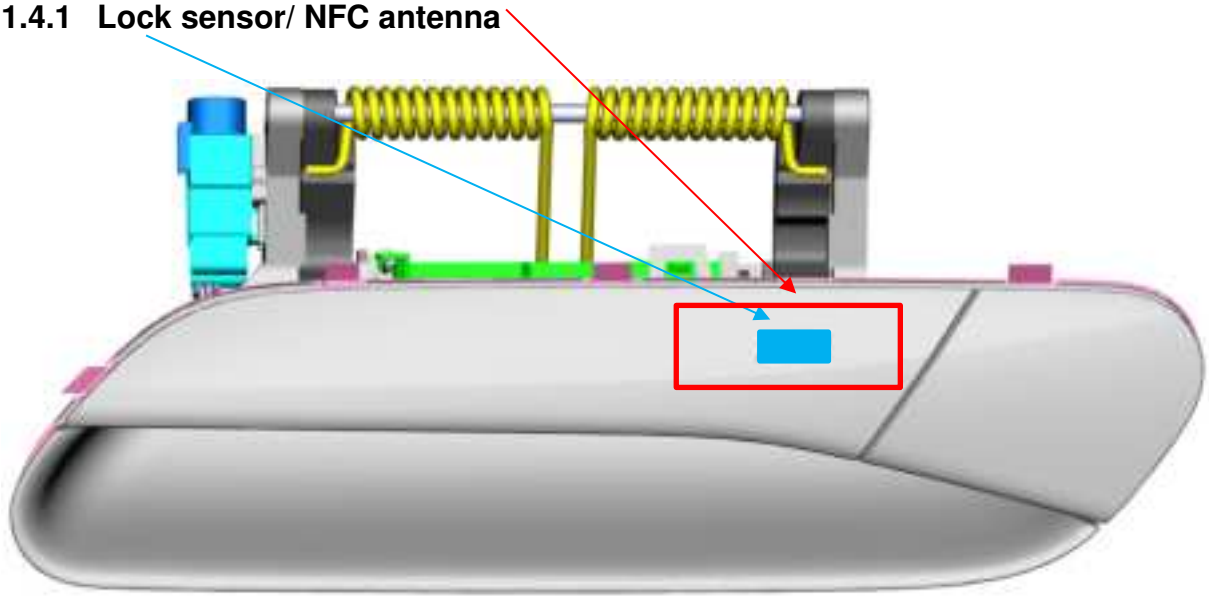
1.3 Electronic design

Figure 1: PCBA Kessy + NFC (Placement top)

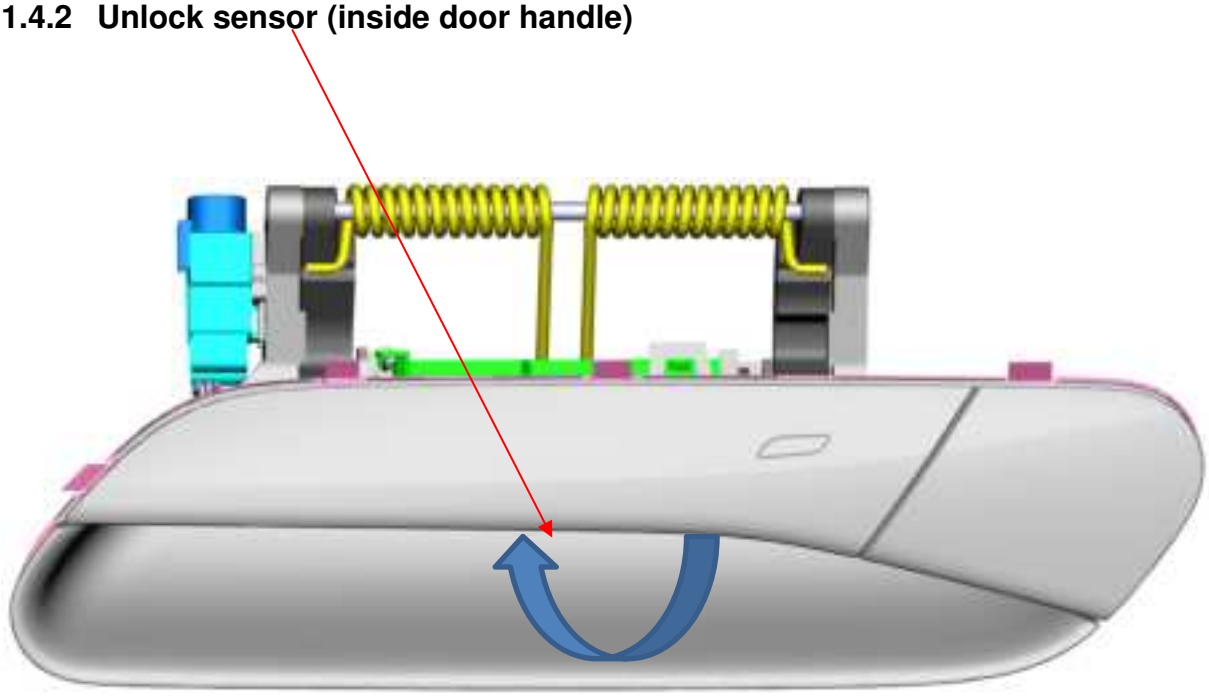
Figure 2: PCBA Kessy + NFC (Placement bottom)

1.4 Detection areas

1.4.1 Lock sensor/ NFC antenna



1.4.2 Unlock sensor (inside door handle)



1.5 Pinning

Connector pin	Signal	Color (Banana connector)
1	Kl.30	Red
3	Kl. 31 (GND)	Black

1.6 Technical data

- **Temperature:**
  - Operating temperature range: -40°C to +70°C
  - Storage temperature range: -40°C to +85°C
  - Repainting temperature: 110°C for 1h, 130°C for 0.25h

- **Operating voltage range:**
  - CAN 7V – 18V (± 2%)
  - Function 9V – 16V (±2%)

- **Quiescent current:**
  - Standby-Mode max. 350µA
  - Aktiv-Mode < 250mA

- **Measuring cycle:**
  - NFC — 100ms (adjustable up to 500ms)
  - NFC-LPCD pulse: — 40µs

- **Working frequencies:**
  - NFC carrier frequency — 13.56MHz

- **Baud rates:**
  - CAN — 500kBit/s

- **NFC:**
  - Antenna — Aero B FLUSHNFC included in the PCBA
  - Mode — NFC initiator in Reader-Writer Mode
  - Communication Role — Proximity Coupling Device (PCD)
  - Communication Range — ≤ 3cm
  - Standard — ISO/IEC 14443 Type A + Apple ECP
  - Type of modulation — 100% ASK modified Miller (PCD to PICC)
Load Modulation OOK (PICC to PCD)
  - Bit rate — 13.56MHz/128 ≈ 106kBaud
  - Frequency — 13.56MHz +/- 7kHz
  - Crystal Stability — +/- 30ppm

1.7 Operating modes for Homologation

- OP1 (Application Mode):
  - Door handle in normal application Polling-Mode. Capacitive sensors and NFC-Field will be triggered cyclically, CAN/Kessy interface is not active.

- OP2 (Radiated CW-Mode + Modulation):
  - Door handle in Active-Mode. Capacitive sensors are disabled. NFC-Continuous-Wave-Mode + Random Modulation Type A is activated permanently and Kessy interface line is not active
    - Radiated Continuous Wave (min. 5 minutes)
    - Radiated Continuous Modulation (min. 5 minutes)

- OP3 (Device Monitoring Mode):
  - Door handle in Active-Mode. Capacitive sensors are disabled. NFC-Continuous-Wave-Mode + Request Type A is activated cyclically, Kessy interface line is not active. NFC communication response can be checked via LED.
    - Radiated Continuous Receive (min. 5 minutes, optical response at reception of a wanted telegram)

Only for information:

- Conducted SMA samples:
  - Every connection directly at the antenna will generate a major distortion of the main frequency due to R, C and L values parallel to the NFC antenna. NFC filter will be detuned and resonance maximum will be no longer at round about 13,56MHz. Therefore it is not possible to test with conducted SMA samples. Also known from other projects with NFC door handle.
    - Conducted (with SMA jack) Continuous Wave (min. 5 minutes)
    - Conducted (with SMA jack) Continuous Modulation (min. 5 minutes)

2 Declaration of Conformity, product Label

2.1 Radio equipment authorization to FCC in USA

FCC ID: YGOFLUSHNFC

The transmitter will be supplied as an original equipment device to the car manufacturer.

According to 47 CFR 15.19 (labelling requirements) the car manufacturer will print the following text in the appropriate User's Manual of the car:

> 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.
>
> Usually this is followed by the following FCC caution:
> Any changes or modification not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

2.2 Radio equipment authorization to RSS-210 in Canada

IC ID: 4008C-FLUSHNFC

The transmitter will be supplied as an original equipment device to the car manufacturer.

According to RSS-210 (labelling requirements) the car manufacturer will print the following text in the appropriate User's Manual of the car:

> 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 harmful interference, and
> (2) This device must accept any interference received, including interference that may cause undesired operation.
>
> 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, mêmesi le brouillage est susceptible d'en compromettre le fonctionnement.
>
> Usually this is followed by the following RSS caution:
> Any changes or modification not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

3 Regulatory Information

3.1 USA:

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.

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

3.2 Kanada:

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

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, mêmesi le brouillage est susceptible d'en compromettre le fonctionnement.

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

3.3 Taiwan

「取得審驗證明之低功率射頻器材，非經核准，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。低功率射頻器材之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前述合法通信，指依電信管理法規定作業之無線電通信。低功