

User Manual
NFO-1G

Version 0.1



CE UKCA FC ISED

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1. FUNCTION DESCRIPTION

NFO-1G is a radar-based sensor for close range obstacle detection to prevent collisions of an autonomous vehicle door with objects. The sensor monitors the door swing area and provides the maximum possible opening angle. It can be integrated invisibly behind plastic parts of the door or the body of the vehicle and detects static as well as moving obstacles.

2. MAINTENANCE AND SERVICE

This device is not intended to be serviced or maintained by end users.

In case of malfunction or failure, the device must only be repaired or replaced by authorized personnel. Unauthorized servicing or modification may void regulatory approvals and warranties.

3. DETECTABLE OBJECTS

Objects	poles, walls, fences, curbs, cars, bicycles, people, animals, plants etc.
Materials	metal, wood, plastic, stone, concrete, body tissue etc.

4. RADAR PARAMETERS

Frequency Range	76 - 80 GHz (Worldwide: 77-80 GHz / China: 76-79 GHz)
Bandwidth	3 GHz
Rated maximum antenna gain (all TX)	10.79 dBi
Rated maximum antenna gain (single TX)	4.77 dBi
Modulation type	FMCW (Frequency Modulated Continuous Wave)
Maximum rated output power (CE)	21 dBm (Average)
Maximum rated output power (FCC)	11 dBm EIRP (Average)
Homologation feasibility	EU, USA, Japan, China, ...

5. MECHANICAL DESIGN

Dimensions (L x W x H)	88 mm x 41 mm x 16 mm
Weight	33 g
Connector	NMQS 12 Pin
Integration	Behind radar transparent cover (plastic, painting).

6. COMMUNICATION INTERFACE

Interface	CAN-FD
Inputs	vehicle bus communication
Outputs	Maximum door opening angle

7. OPERATING PARAMETERS

Temperature	-40 °C ... 85 °C	
Supply voltage	9 V ... 16 V Nominal: 14 V	
Supply current	active: ~180 mA (@ 14 V)	low power: ~130 mA (@ 14 V)
Max. power	active: 2.5 W	low power: 1.8 W

8. DYNAMICAL BEHAVIOR

Update rate	50 ms
Detection time	< 200 ms
Start-up time	< 500 ms

9. RADAR SYSTEM PERFORMANCE

Min. range (radial)	~ 0.1 m ¹
Max. range ²	7.33 m (3 GHz)
Range resolution	5.725 cm (3 GHz)
Max. unambiguous velocity	±16 m/s
Velocity resolution	0.27 m/s
Angular field of view	azimuth: ±75° elevation: ±70°
Angular accuracy	2°
Angular resolution	azimuth: ± 28° elevation: ± 10°

10. CYBER SECURITY

Authentication	symmetric keys (256 bit); Asymmetric keys (up to RSA-4K or ECC-512)
Hardware accelerated crypto algorithms	Personal key Acc. (PKA) with ECC; AES (up to 256 bit); SHA (up to 512 bits); Random Numbers TRNG/DRBG
Device security	Programmable embedded hardware security Module (HSM)

1 Accuracy may be reduced in very close ranges depending on object properties.

2 SW-limited to 3m; Actual detection range depends on object RCS and direction.

11. FUNCTIONAL SAFETY

System functional safety level	QM, no ASIL classification
Hardware capability	ASIL-B

12. INTENDED USE

The radar sensor is used for monitoring the door swing area and is used to detect objects and people around the vehicle doors to prevent accidents or collisions when opening the doors. This system increases safety for vehicle occupants and other road users, especially in urban environments with densely parked vehicles and many objects surrounding the vehicle. The system is designed for use in the door area of the vehicle and operates at close range (0-3 meters).

13. INSTALLATION INSTRUCTIONS

The sensor is installed at its predefined mounting points in the vehicle door panel. It is connected to a power supply and the communication bus (CAN) via the wiring harness. Through initial coding, it is possible to select a specific vehicle type for correct geometric integration. An initial diagnostics check ensures correct installation.

14. OPERATIONAL DESCRIPTION

For operating the sensor, it needs to be connected to its vehicle bus. The current possible door opening angle is streamed out continuously every 50ms to the control unit.

15. INFORMATION TO THE USER

The minimum distance from sensor to user is 5 centimeters.

16. FCC & ISSED COMPLIANCE

FCC (ID: UXS-NFO-1G)

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.

Changes or modifications not expressly approved by the party responsible for compliance voids the user's authority to operate this equipment.

ISED (ID: 6902A-NF01G)

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

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

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique 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;
- (2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This equipment complies with FCC and IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 5 cm between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un Environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 5 cm de distance entre la source de rayonnement et votre corps.

Ce transmetteur ne doit pas être placé au même endroit ou utilisé simultanément avec un autre transmetteur ou antenne.



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