



Product User Manual Document

of RFID Reader

Prodrive Technologies BV

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1. Introduction

This specification document describes the hardware-level specification for the RFID Reader.

1.1. Background and context

5 The RFID Reader is designed to operate in industrial vehicles. The objective of the RFID Reader is to support operator identification and access control.

The RFID Reader shall be mounted in an accessible area in a vehicle. After powering up, it accepts RFID cards. Once it detects the RFID, the data read from the card or device will be sent to the master controller over RS232 port.

10 1.2. Definitions and Abbreviations

1.2.1. Definitions

Not applicable

1.2.2. Abbreviations

HBM	Human Body Model
HW	Hardware
ITA	International Type Approval
NA	Not Applicable
NC	Not Connected
NFCIP	Near Field Communication Interface and Protocol
PCB	Printed Circuit Board
PSD	Power Spectral Density
PSK	Pre-Shared Key
RED	Radio Equipment Directive
RFID	Radio Frequency Identification
SMT	Surface Mount
SPD	Specification Document
S&V	Shock and Vibration
SW	Software
TBD	To Be Defined

2. Features

The following list shows the features of the RFID Reader.

- Interfaces
 - 1x RS232
- RFID 13.56MHz reader
- RFID 125kHz reader
- Mechanics
 - IP69K enclosure
- Supply Voltage Input
 - 6..36VDC
- Environmental
 - Operating temperature -30 to 75°C

3. Functional description

This section contains the functional description of the RFID Reader. The interfaces can be found in Section 4, mechanical specifications in Section 5 and environmental specifications in Section 6.

3.1. RS232

- 5 The RFID Reader contains one serial RS232 interface, included in CN_RS232 (§4.1) for communication.

- The RS232 interface is non-isolated.
- The RS232 pins are ESD protected: +/-15kV HBM
- Serial interface characteristics are listed in Table 3-1.

10 *Table 3-1: RS232 performance*

Mnemonic	Description	Min.	Typ.	Max.	Unit	Remarks
fDR_RS232	RS232 interface speed			115.2	kbps	

3.2. RFID

The RFID Reader supports contactless communication of RFID tags based on the 13.56 MHz and the 125 kHz system.

3.2.1. RFID 13.56MHz

- 15 The 13.56MHz RFID system supports:
- ISO14443 A/MIFARE
 - ISO14443 B
 - ISO15693
 - NFCIP-1
- 20
- Write mode is not supported
 - Maximum transmit power: 200mW / +23dBm

3.2.2. RFID 125 kHz

The RFID reader includes a 125 kHz front-end with following features:

- 25
- Antenna driver with carrier frequency of 125 kHz
 - Write mode is not supported
 - Maximum peak transmit power: 1W

3.3. Power supply and consumption

The RFID Reader has to be supplied through CN_RS232 connector. Table 3-2 lists the power supply requirements.

30 *Table 3-2: Power supply operating conditions*

Mnemonic	Description	Min.	Typ.	Max.	Unit	Remark
V _{IN}	Nominal input voltage range	6		36.0	V	

4. External interfaces

This section describes the external interface properties.

4.1. CN_RS232

Function: This connection contains power and RS232 connection.

Type: Dual Row 4 Circuits receptacle connector

Properties:

- Sealed male connector
- Cable mount
- Circuits: 4 (2px2)
- Nickel receptacle pins

Durability: tLIFE_CN_RS232 = 25 cycles

Reference: For power input details refer to section 3.3
For details on the RS232 interface refer to section 3.1

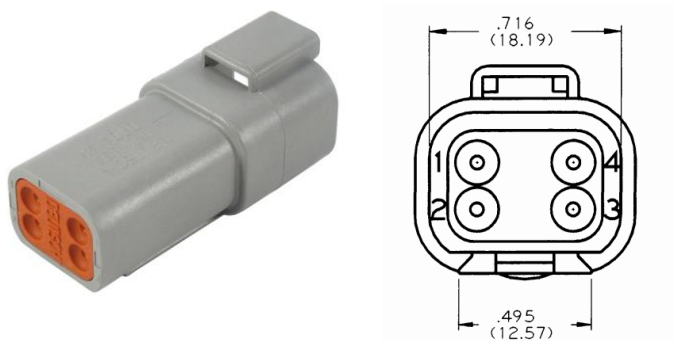


Figure 4-1: CN_RS232 (left: overview, right: rear view pinning)

5 Table 4-1: CN_RS232 connector – pins

Pin	Mnemonic	Dir	Type
1	PWR	-	PWR
2	GND	-	GND
3	RS232_TX	O	DATA
4	RS232_RX	I	DATA

4.2. CABLE

Function: Connects CN_RS232 connector to the baseboard of the RFID Reader

Properties:

1. Length: 510mm±15mm
2. Wires: 0.5mm²

5. Mechanical

The specified mechanical properties of the RFID Reader can be found in this chapter.

5.1. Dimensions and Orientation

An illustration of the RFID Reader and its relevant outer dimensions can be found in Figure 5-1 and Table 5-1.

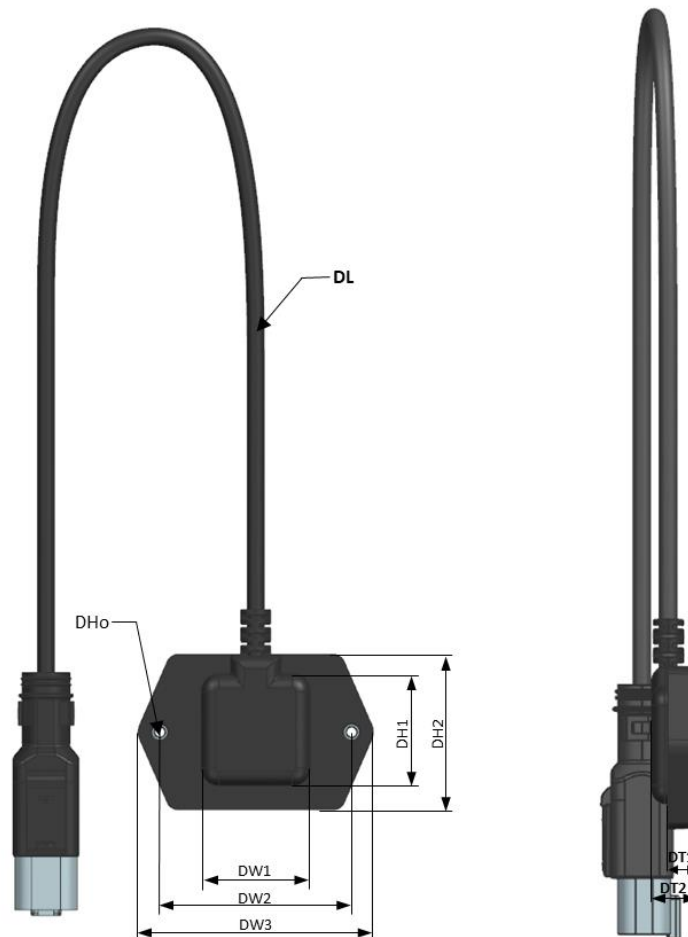


Figure 5-1: RFID Reader illustration (for reference only) and outer dimensions overview

Table 5-1: RFID Reader dimensions

Parameter	Description	Min	Typ	Max	Unit	Remarks
DL	Length cable	495	510	525	[mm]	
DH1	Base height	37	37.35	37.7	[mm]	
DH2	Total height	51.5	52	52.5	[mm]	
DW1	Width base housing	36	36.35	36.7	[mm]	
DW2	Width mounting holes	63.7	64	64.3	[mm]	
DW3	Width mounting plate	78	78.5	79	[mm]	
DT1	Thickness mounting plate	8.5	8.7	8.9	[mm]	
DT2	Total Thickness	13.5	14.1	14.6	[mm]	
DHo	Hole diameter	-	M4	-	[mm]	M4x0.7 tapped hole

5.2. Identification & Labelling



Figure 5-2: Label example

5.3. Installation and Mounting

- 5 The RFID Reader can be mounted from the bottom side with M4 bolts (See Figure 5-3) or from the top side with M3 bolts (see Figure 5-4). The maximum mounting torque of the RFID reader for both options can be found in table 5-6.

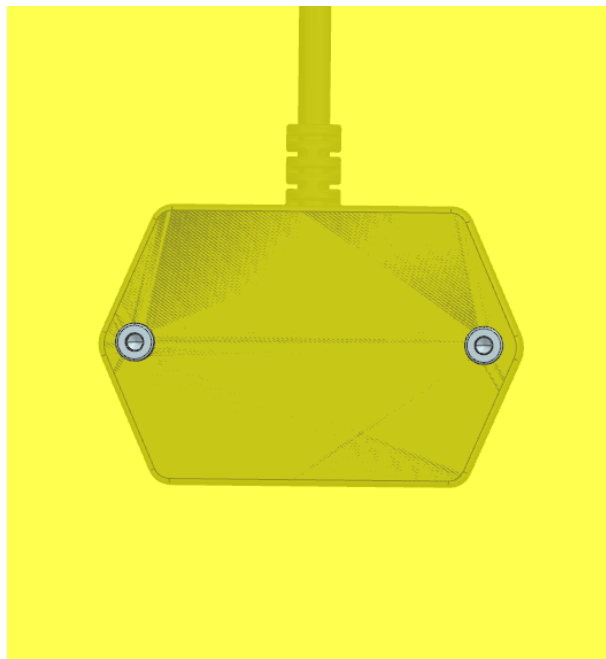


Figure 5-3: RFID Reader bottom-side mounting illustration



Figure 5-4: RFID Reader top-side mounting illustration

Table 5-2: RFID Reader mounting torque

Parameter	Description	Min	Typ	Max	Unit	Remarks
T M4	Mounting torque M4	-	1.6	2	[Nm]	As shown in Figure 5-3
T M3	Mounting torque M4	-	1.6	2	[Nm]	As shown in Figure 5-4

6. Environmental

6.1. Climatic

6.1.1. Climatic conditions

Table 6-1: Operational and storage temperature conditions

Description	Min	Typ.	Max.	Unit	Remark
Operational temperature range	-30		75	°C	
Storage temperature range	-40		105	°C	

5 6.2. Ingress Protection

Table 6-2: Ingress protection test

Standard	Description	Parameters	Remarks
ISO 20653	IP rating from all directions Non-operational	IP69K	

6.3. EMC

6.3.1. Emission

Table 6-3: Emission standards

Standard	Description	Remark
EN 12895	Industrial trucks EMC	

10 6.3.2. Immunity

Table 6-4: Immunity standards

Standard	Description	Limits	Remark
ETSI EN 301 489-1 V2.2.3	General requirement	Vehicular use equipment	
ETSI EN 301 489-03 v2.1.2 (Draft)	SRD 9kHz to 246GHz	Vehicular use equipment	
EN 12895	Industrial trucks EMC	Refer to standard	
EN 61000-4-2	Electrostatic discharge	Level 4 8kV contact / 15kV air	Additional test, not mandatory for product certification
EN 61000-4-3	Radiated Immunity	80MHz – 1GHz: 20V/m	Additional test, not mandatory for product certification
EN 61000-4-6	Conducted Immunity	150kHz – 80MHz 17Vrms	Additional test, not mandatory for product certification

6.3.3. Classification

Port classification is according to Table 6-5 for emission and Table 6-6 for immunity.

Table 6-5: Port classification emission

Port classification	Connection	EMC shielded	Remarks
Enclosure port	Enclosure	-	
Mains port	-	-	
Telecommunications port	-	-	
	-	-	

15 Table 6-6: Port classification immunity

Port classification	Connection	Cable length	EMC shielded	Remarks
Enclosure port	Enclosure	-	-	

6.4. Safety

This section mentions the applied safety standards.

6.4.1. Standards

Table 6-7: Safety standards

Standard	Description	Remark
IEC 62368-1	Audio/video, information and communication technology equipment - Part 1: Safety requirements	

6.4.2. Classification

6.4.3. Insulation / grounding concept

- 5 The RFID Reader does not contain hazardous voltages. Therefore safety isolation is not required. Furthermore functional isolation is not required by the customer. As a result the RFID Reader is constructed with a single ground plane.

6.5. Radio

The applicable radio standards for the RFID receivers are listed by Table 6-8.

10 Table 6-8: RFID - applicable radio standards

Directive/Standard	Region	Description	Remark
ETSI EN 300 330 V2.1.1	Europe	Short Range Devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU	Used for both 125kHz and 13.56MHz reader
EN 62311:2008	Europe	Electromagnetic field	
FCC/ISED 47 CFR Part 15.225	North America	Radio Frequency Devices – Intentional Radiators	RFID 13.56MHz
FCC 47 CFR Part 15.209 ISED RSS-Gen	North America	Radio Frequency Devices – Intentional Radiators	RFID 125kHz
ISED RSS-102	Canada	Electromagnetic field	

6.6. Conditions of Use

This section lists the requirements and conditions to consider during installation of the RFID Reader.

- 15 1. The RFID Reader shall be used with an external fuse or current limiter with a maximum rating of 10A.

6.7. FCC compliance statement

- 20 *This device includes antenna elements that radiate electromagnetic energy. The device must not be collocated or operating in conjunction with any other antenna or transmitter but does not require installation instructions to provide a minimum separation distance.*

- 25 *This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.*

30

!	Caution! Any changes / modifications not approved by the responsible party could void the user's authority to operate the equipment.
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6.8. Industry of Canada statement

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*
- 5 2. *this device must accept any interference, including interference that may cause undesired operation of the device.*

10 *This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment does not require to be installed and operated with minimum distance between the radiator & your body.*

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*
- 15 2. *l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.*

20 *Cet équipement est conforme aux limites d'exposition au rayonnement IC RSS-102 définies pour un environnement non contrôlé. Cet équipement ne doit pas être installé et utilisé à une distance minimale entre le radiateur et votre corps.*