

MACE MM (QR)^{*}

installation guide

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1 INTRODUCTION

1.1 MACE

MACE is an acronym for Mobile Access Control Entities. MACE is a platform consisting of readers, apps and a cloud based server that enables the use of smartphones to identify people.

MACE supports Bluetooth, NFC and QR-codes to identify people using virtual credentials are stored in a MACE app that is available for iPhone and Android.

MACE can be used in combination with any access control system or any other system that requires the swift identification of people, like parking management systems or registration systems.

Please remember to fill out the 'How to Order Guide' to prepare your MACE installation and order virtual MACE credentials that will be read by the MACE Readers you plan to install.

1.2 NOTES

- MACE is introduced in 2016 and the platform is expected to be subject to continuous development and improvement. You can expect further customization options and advanced 3rd party interfacing options to be available throughout 2016 and 2017.
- If you need assistance or require any option other than found in this guide, please consult with your Nedap representative.
- There is a lot of variation in performance and characteristics of Bluetooth and NFC communication across the wide range of phones that are available today. Please take this into account when planning the commissioning and configuration of your application.
- The cloud based MACE server distributes the virtual credentials to the phones of people. And to do that we need something to uniquely identify the user. Amongst others an e-mail address is used for that.

2 INSTALLATION

2.1 SAFETY INSTRUCTION

The following safety precautions should be observed during normal use, service and repair.

- The MACE may only be installed and serviced by qualified service personnel.
- Disconnect the power supply before (dis)connecting any wires, MACE is NOT hot-swappable, so when making or changing connections, power must be switched OFF.
- The cable shield shall be connected with safety ground and the metal case of the external device(s).
- To be sure of safety, do not modify or add anything to the MACE other than mentioned in this installation guide or indicated by NEDAP N.V.

2.2 MOUNTING INSTRUCTIONS

The MACE can be mounted to any surface, including directly to metal. See the picture below for details about the dimensions.

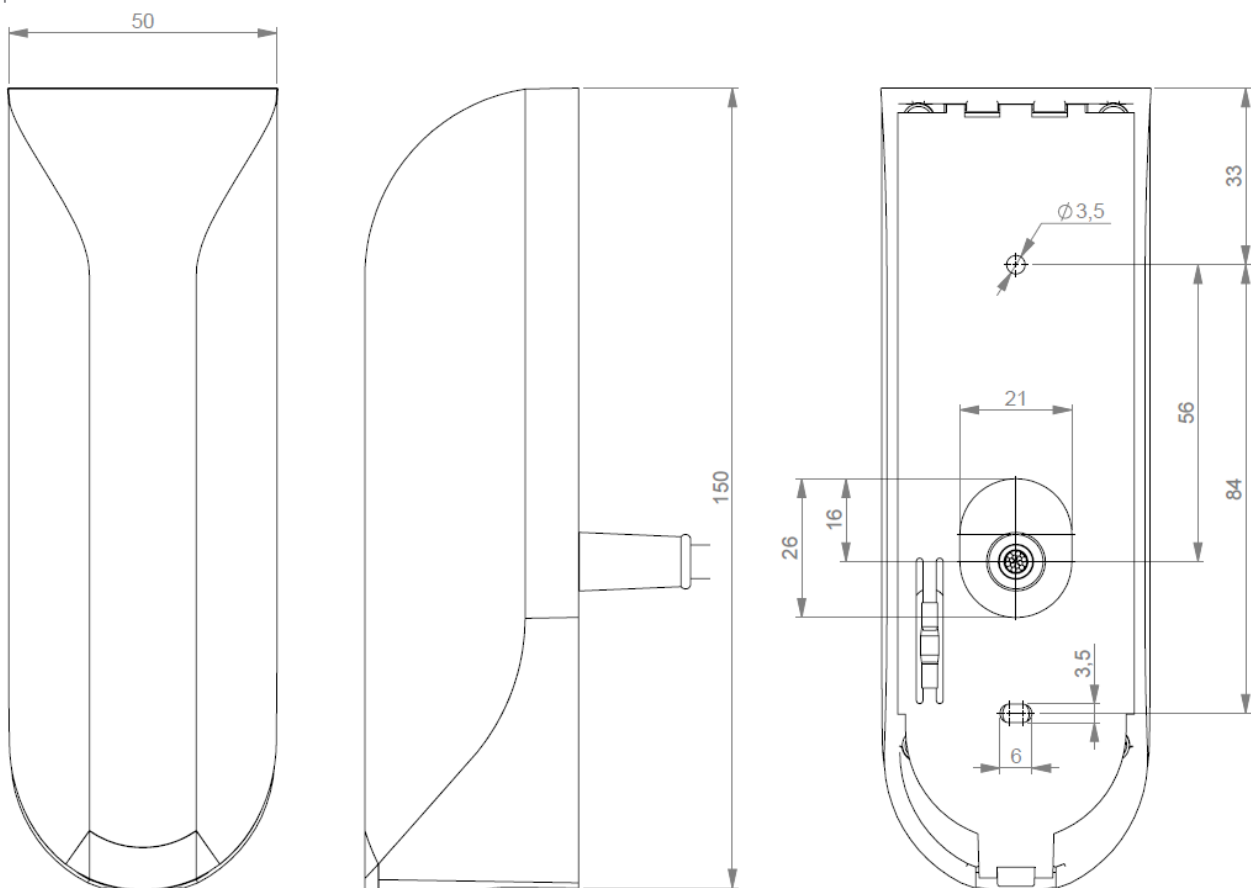


Figure 1: MACE dimensions (mm)

MACE | INSTALLATION GUIDE

Installation

Mount the base-plate on the required location.

Ensure that it is placed correctly covering the cable entry hole. Properly fix the base-plate into its position using the 2 screws. When mounting on a stone or concrete wall drill 5mm holes for the plugs. When mounting on wood, drill with 2.5mm.

Install the MACE reader onto the base-plate.

- 1 Feed the cable through the cable entry hole. Important note: minimum bending radius 30mm.
- 2 Attach the top of the MACE onto the base-plate.
- 3 Fix the assembly using the screw on the bottom.

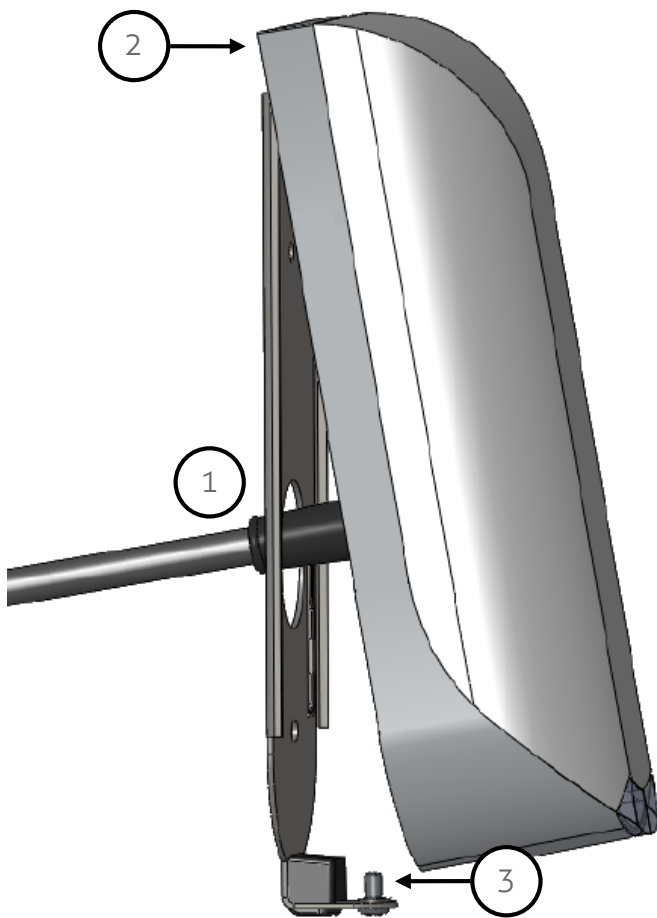


Figure 2: MACE installation

3 CONNECTIONS

The MACE is supplied with a 5 meter (15 feet) shielded cable pigtail with 12 colored wires.

RED	Power supply 12 - 24VDC.
BLACK	Power supply 0VDC, DC-Ground.
BROWN	RS485 A (-)
GREEN	RS485 B (+)
GRAY	Data-0 / Clock
PINK	Data-1 / Data
YELLOW	Tamper switch (normally closed)
GRY/PNK	Tamper switch (common)
RED/BLU	Led_UL_IN*
WHITE	Led_NA_IN*
PURPLE	Nedap antenna interface. Connect to ANT.
BLUE	Beeper_IN*
SHIELD	Shield

3.1 POWER SUPPLY

The MACE requires DC power supply in the range from 12 – 24V. Maximum current consumption is 0.4A @ 12VDC, 0.2A @ 24VDC.

Connections:

RED	Power supply 12 - 24VDC.
BLACK	Power supply 0V / DC-ground.
SHIELD	Shield connected to DC-ground.

3.2 COMMUNICATION

3.2.1 RS485

The MACE reader has a RS485 interface for communication with a host system or to configure the reader settings. RS485 is a 2-wire half-duplex serial communication interface using balanced lines.

Connections:

BROWN	RS485 A (-)	Balanced RX/TX
GREEN	RS485 B (+)	Balanced RX/TR
SHIELD	Shield connected to DC-ground.	

For details about reader configuration see chapter 4.

Default RS485 communication baud rate is 115200. See chapter 4.2.4.

The RS485 output message format is described in chapter 4.5.1

Note

Cable shield shall be connected to the metal case of the external device(s). Cable extensions shall only be made by means of shielded cable(s). All shields of the shielded cable extensions shall be connected together and to the metal case of the external device(s). Led_UL_IN, Led_NA_IN and Beeper_IN are inputs that are active LOW.

Note:

Extending this connection beyond the 5 meter pig tail length shall ONLY be allowed using shielded cable.

The minimum voltage at the end of the fixed shielded pigtail cable shall be greater than 12VDC -10% The shield shall be connected to the metal case of the external device.

Note:

The RS485 interface is disabled while the USB interface is in use! Extending this connection beyond the 5 meter pig tail length shall ONLY be allowed using shielded twisted pair cable(2 x 2 x 0.25 mm2) as long as the total length is shorter than 1200 meters, 6000 feet, cable capacity < 100 pF/meter. The second twisted pair shall be used for the DC power supply. The shield shall be connected to the metal case of the external device.

3.2.2 USB

The MACE reader features an USB interface for service, installation and firmware upgrade purposes. The Mini-USB connector is located on the bottom of the device and can only be reached when the bottom screw is opened and the MACE is lifted away from the base-plate. This ensures that unauthorized modifications to the reader settings can be detected using the tamper switch.

The USB interface can be used to configure the reader using the MACE config tool software. See chapter 4.

USB Driver installation

Make sure your computer is connected to the internet. The driver should install automatically via Windows update when the MACE reader is connected to your PC via the USB cable. Follow the driver installation wizard. If you do not see the Windows update pop-up, you can manually install the driver. To manually install, you need to go to FTDI's website at www.ftdichip.com/Drivers/VCP.htm and download the VCP (Virtual Com Port) drivers for your operating system. Drivers for MacOS and Linux are available as well.

Note

While the shielded USB cable is connected, the RS485 interface is disabled! The maximum shielded cable length shall be < 2 meter.

3.2.3 WIEGAND

The Wiegand and Magstripe ISO7811/2 (clock & data) interface share the same connections. This means that only Wiegand or Magstripe can be used and not both simultaneously.

Wiegand connections:

GRAY	D0
PINK	D1
BLACK	Ground (0V)
SHIELD	Shield connected to DC-ground.

Message format:

The Wiegand output format is determined by the programming format of the credential. MACE Wiegand credentials will automatically generate a Wiegand message. If the credential is not programmed in Wiegand format, you may configure the message output format as described in chapter 4.5.2.

Make sure to order the correct credential programming format if you want to use the Wiegand or Magstripe interface. See also the MACE how to order guide (HTOG) for more information.

Wiegand Timing

In the figure below the Wiegand protocol timing is specified.

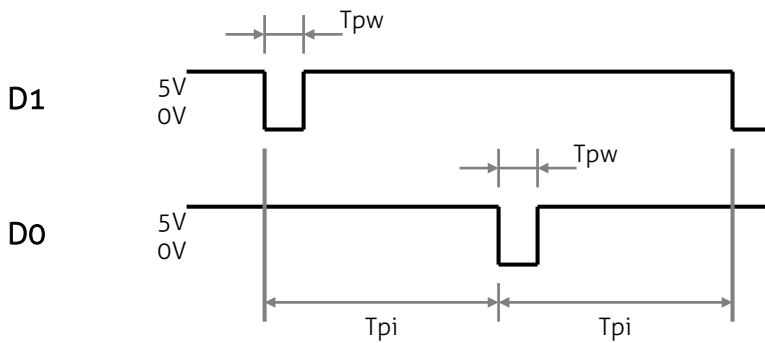


Figure 3: Wiegand protocol timing

Timing constants:

T_{pi}	Pulse interval time	1msec
T_{pw}	Pulse width time	50 μ sec

Note

Extending these connections beyond the 5 meter pig tail length shall ONLY be allowed using shielded cable (4 x 0.25 mm²) as long as the total length is shorter than 150 meters (500 feet). The shield shall be connected to the metal case of the external device.

3.2.4 MAGSTRIPE ISO7811/2

The Magstripe ISO78122/2 (clock & data) and Wiegand interface share the same connections. This means that only Wiegand or Magstripe can be used and not both simultaneously.

Magstripe connections:

GRAY	CLK
PINK	DAT
BLACK	Ground (0V)
SHIELD	Shield connected to DC-ground.

Message format:

The Magstripe output format is determined by the programming format of the credential. MACE Magstripe credentials will automatically generate a Magstripe message. If the credential is not programmed in Magstripe format, you may configure the message output format as described in chapter 4.5.2.

Make sure to order the correct credential programming format if you want to use the Wiegand or Magstripe interface. See also the MACE how to order guide (HTOG) for more information.

Note

Extending these connections beyond the 5 meter pig tail length shall ONLY be allowed using shielded cable (4 x 0.25 mm²) as long as the total length is shorter than 150 meters (500 feet). The shield shall be connected to the metal case of the external device.

Magstripe Timing

The figure below shows the timing for one magstripe character. Each bit consists out of one period low (220µsec) and two periods high (440µsec). The Data-signal is valid and stable on the falling edge of the Clock-signal.

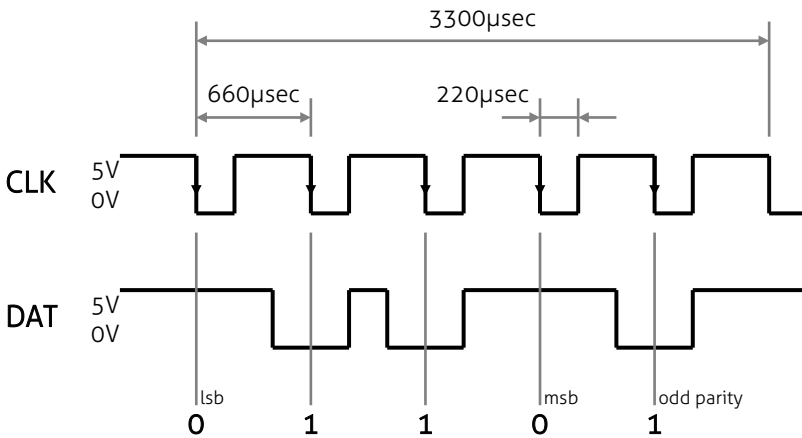


Figure 4: Magstripe protocol timing one character

Timing constants:

- Clock period 660µsec
- Clock high 440µsec
- Clock low 220µsec
- Data pre-amble 16 clock periods
- Data post-amble 16 clock periods

3.3 LED CONTROL

The built-in high intensity LED provides visual feedback that the tag has been read or authorized. The LED and buzzer can be controlled by the access control system.

Automatic mode:

Default the MACE will automatically control the LED.

During stand-by the LED will be BLUE and upon identification it will be GREEN.

These colors can be changed!

Remote control:

The LED can be controlled remotely by a connected access control system. Digital inputs will determine the color indicated on the LED. Use MACE config tool to enable the Remote LED control mode.

RED/BLU	Led_UL_IN*
WHITE	Led_NA_IN*
BLUE	Beeper_IN*
BLACK	Ground
SHIELD	Shield connected to DC-ground.

Note

Extending these connections beyond the 5 meter pig tail length shall ONLY be allowed using shielded cable (4 x 0.25 mm²) as long as the total length is shorter than 150 meters (500 feet). The shield shall be connected to the metal case of the external device.

3.4 TAMPER SWITCH

An internal magnet provides tamper indication when the reader is dismantled. This contact may be connected to an external alarm system. The contacts are normally closed when the reader is in place.

Tamper switches of multiple readers can be connected in series.

Connections:

YELLOW	Tamper switch (normally closed)
GRY/PNK	Tamper switch (common)
SHIELD	Shield connected to DC-ground.

Contact ratings:

Max. current 50 mA (0.5 Volt voltage drop)

Max. switching voltage +24 VDC

3.5 NEDAP ANTENNA INTERFACE

The Nedap antenna interface is used to connect the MACE to NEDAP AEOS access control hardware such as the AP1001. Instead of proximity antenna the MACE can be connected.

Connections:

PURPLE	Nedap antenna interface. Connect to ANT.
BLACK	Nedap antenna interface. Ground, shield. Connect to ANT GND.
SHIELD	Shield connected to DC-ground.

Note

Extending this connection beyond the 5 meter pig tail length shall ONLY be allowed using shielded cable (2 x 0.25 mm²) as long as the total length is shorter than 150 meters (500 feet).

The shield shall be connected to the metal case of the external device.

Note

Extending this connection beyond the 5 meter pig tail length shall ONLY be allowed using coaxial cable, RG58U, as long as the total length is shorter than 100 meters (350 feet).

The shield shall be connected to the metal case of the external device.

4 READER CONFIGURATION

The MACE reader can be configured easily using the MaceConfigTool software. Configuration allows to change:

- General settings.
- Reader settings; what to read and how.
- Communication output settings.

Some settings require expert knowledge. Leave settings unchanged, when their specific meaning is unclear.

It's always a good practice to save the configuration into a file for future reference or when requesting technical assistance from Nedap or its business partners.

4.1 CONFIG SOFTWARE

The MaceConfigTool software allow to configure all settings for the MACE reader. The software can interface with the reader using the USB or RS485 interface.

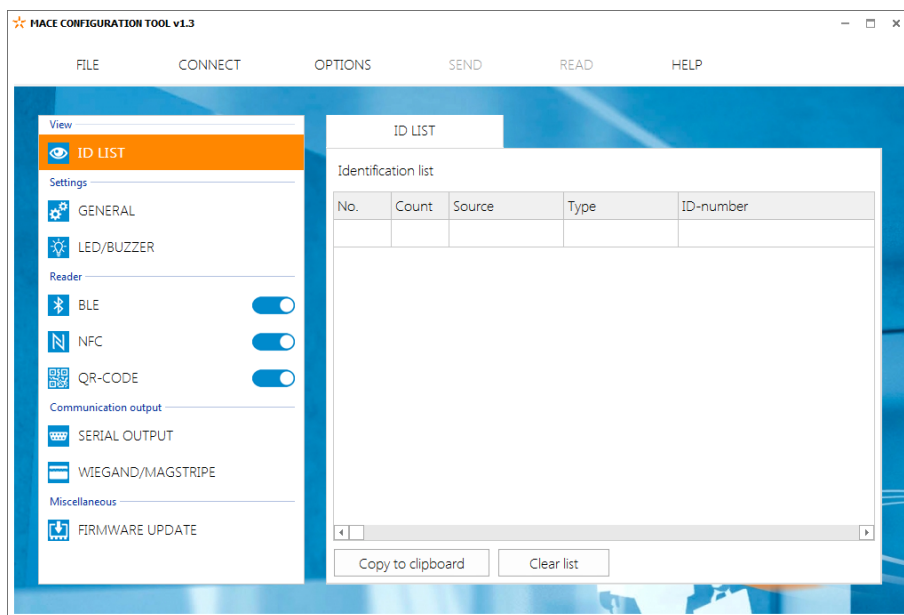


Figure 5: MaceConfigTool software

Start the MaceConfigTool software and click CONNECT. Select the COM-port and the baud rate and click OK. Default baud rate is 115200. When the connection is established, the software checks the MACE firmware version.

Check the ID List to see what is identified. Check the Console to see the communication details. For details about the communication protocol refer to the firmware manual.

4.2 OPTIONS

The options menu gives access to various Mace reader configuration options.

4.2.1 USER MODE

Select user mode simple or advanced to adjust the user interface.

4.2.2 SEND CONFIG

Send configuration to reader.

This option will send all configuration settings to the reader and save them into non-volatile memory of the reader. A message indicates that the configuration was sent successfully.

4.2.3 READ CONFIG

Read configuration from reader.

This option will read all* configuration settings from the reader. A message indicates that the configuration was read successfully.

* Security keys and passwords cannot be read from the reader.

4.2.4 SETUP BAUDRATE

Select the serial communication baud rate.

Possible selections are:

- 1200
- 2400
- 9600
- 19200
- 38400
- 57600
- 115200 (default)

Click OK after changing the baud rate. Upon success the software will show a message and the baud rate in the software and reader have been changed. The new baud rate setting in the reader is saved to non-volatile memory.

Note that when using a separate interface converter, it may be required to update the baud rate setting in there as well.

4.2.5 RESET CONFIG

Reset configuration to factory defaults.

All settings will be reset to factory defaults. The reader will restart automatically afterwards.

4.3 SETTINGS

4.3.1 GENERAL

Nedap customer codes

The MACE reader is programmed with a customer code. Nedap tags or credentials may also have a customer code. Enable 'Read only if customer code is correct' to make the reader ignore tags that have an invalid customer code.

Identifiers without customer code

Other tags or credentials may not have a customer code. For example Desfire cards or the MACE UID64. Enable or disable 'Allow reading ID numbers without customer code'.

Configuration password

Enter a configuration password to lock the configuration settings in the reader. Without the password you cannot change any configuration settings. Please remember this password very carefully. By default the MACE reader has no configuration password.

Hold time / repeat time

Set tag hold time. Default 1 sec. Max. 25 sec.

Enable 'repeat using hold-time interval' to repeat the communication output while the tag remains within read range.

*** Advanced user mode settings;

Antenna modulation

This setting is only used for the Nedap antenna interface. See chapter 3.5. The setting defines how often the id number is sent on the antenna interface. Default settings is 30 cycles, which corresponds to ± 1 sec.

Heater

The MACE reader has a heater unit to prevent condensation on the QR-code scanner at low temperatures. By default the heater unit is off.

4.3.2 LED/BUZZER

LED and buzzer mode

Automatic:

MACE reader will automatically set the LED color and optionally beep upon identification. The LED color upon identification and during idle can be configured.

Remote (follow digital inputs)

The connected access control panel may control the LED and buzzer using the digital inputs. The corresponding LED colors can be configured. See chapter 3.3.

Direct (using serial commands)

The connected access control panel may control the LED and buzzer using commands on the serial interface. Details are described in the firmware manual.

LED brightness

Set LED brightness in range from 0 to 100%. Default 50%.

4.4 READER SETTINGS

4.4.1 BLE

The Mace Bluetooth low energy (BLE) reader is a single mode Bluetooth Smart reader that complies with the Bluetooth Core specification 4.1. The Bluetooth reader implements the peripheral role.

Enable

Enable the MACE BLE module. This automatically starts the Bluetooth advertising.

Ranging profile

Select ranging profile:

- P Proximity range (max ± 50 centimeter)
- S Short range (max ± 2 meter)
- M Medium range (max. ± 5 meter)
- L Long range (max ± 15 meter)

Reader function

Select the reader function:

- M Mace general purpose
- D Door
- I Vehicle entrance
- U Vehicle exit
- X Vehicle entrance/exit

Note:

Please be aware that, after changing the ranging profile or reader function, it may take some time before the MACE-app recognises the update. It may occur one or two times after the ranging profile or reader function have been changed that the MACE app is still responding based on the prior settings.

*** Advanced user mode settings;

Custom bluetooth device name

Setup a custom bluetooth device name. This is not recommended, because the MACE app uses the bluetooth device name for ranging purpose.

Advertising interval

Default advertising interval is 100 msec.

TX power

Set TX power in dBm (default 8 dBm). Not each TX power setting is possible. The value will be rounded to the nearest possible TX power setting.

The TX correction (default 0 dBm) can be used for readers that are mounted on a location that affect the gain of the Bluetooth antenna. Set the TX correction to a positive value when the received signal is higher than expected.

Note that smartphone specific corrections will be done by the MACE app.

The TX power and TX correction added together are sent within the advertisement data. They are used by the MACE app to implement ranging.

Authentication

Bluetooth authentication should normally be enabled. Leave the AES-128 key empty to keep it unchanged. The key will be diversified to ensure a unique security key per identifier.

4.4.2 NFC

Near Field Communication (NFC) is a wireless communication technique operating on 13 MHz. Read range is only few centimeters. NFC is currently not supported on Apple iOS. On Android at least version 4.4 (KitKat) is required.

Enable

Enable the MACE NFC reading.

*** Advanced user mode settings;

Application ID, file number, data length and offset

For MACE the following settings are required:

Application ID: A0000007151001

File number: 0

Data length: 0

Data offset: 0

Authentication

NFC authentication should normally be enabled. Leave the AES-128 key empty to keep it unchanged. The key will be diversified to ensure a unique security key per identifier.

4.4.3 QR-CODE

The barcode scanner can be used to read MACE QR-codes or any other barcode. The MACE QR-codes are mainly used when BLE or NFC is not possible, but besides that it is a user friendly and comfortable method of identification.

Custom barcodes should contain an id-number in hex notation. Leading or trailing text characters can be automatically trimmed. See check prefix/suffix setting below.

Enable

Enable the barcode scanner.

Aiming beam

Enable the optical aiming beam. This may be useful when reading paper barcodes.

Illuminator

Enable the illuminator. Useful when reading paper barcodes during darkness.

*** Advanced user mode settings;

Check prefix/suffix

The prefix and/or suffix may be used to only read tag that contain specific leading or trailing text characters. These characters will be trimmed.

The MACE prefix "MACE: " is automatically stripped, but not required, unless specifically enabled.

The prefix/suffix do not have to be at the start or end of the barcode.

Example customer barcode "<name=Hans><id=123><country=NL>".

Set the prefix to "<id=" and the suffix to ">".

This will result in the barcode id-number 123.

Check authentication code

Enable the option 'check authentication code' to prevent copying the QR-code and to prevent uncontrolled generation of fake QR-codes. The MACE App will show a QR-code containing the MACE ID-number. Besides that the QR-code also contains the current date and time and an authentication code calculated using a secure encryption algorithm (AES-CMAC).

Note: this option is not yet implemented in the MACE App!!!

4.4.4 DESFIRE

The MACE Reader features also a universal smartcard reader. It also supports reading Desfire (EV1) cards. This can be used to read existing physical Desfire cards.

*** Advanced user mode settings;

Enable

Enable to read custom Desfire cards.

Data to read

Select to read the CSN (7-bytes) or Desfire file data.

Byte order

Select byte order normal or reversed.

For example CSN normal is = 04 6C 5E A2 BD 24 80

For example CSN reversed is = 80 24 BD A2 5E 6C 04

Application ID

Application ID. 6-digit hex. For example F12345.

File number

File number within range from 0 to 255.

Communication mode

Select Plain, MACed or Enciphered.

Data length and offset

Select the data length and offset in nibbles. Set data length and offset both to 0 (zero) to read the whole file. Nibbles are half bytes or digits.

For example file data is 0123456789ABCDEF.

Set data length to 3 and offset to 7.

This will result in the id-number 789.

Encryption

Select the authentication/encryption method.

- None (skip authentication)

- Native DES/3DES

- ISO DES/3DES

- 3Key 3DES

- AES

Select the key number in range from 0 to 13.

Enter the read key. The length of the key depends upon the chosen encryption method.

4.4.5 MIFARE

The MACE Reader features also a universal smartcard reader. It also supports reading Mifare Classic, Mifare Ultralight and Mifare Plus cards (SL3) cards. This can be used to read existing physical Mifare cards.

*** Advanced user mode settings;

Enable

Enable to read custom Mifare cards.

Data to read

Select what to read from the Mifare card;

CSN (can be 4-byte or 7-byte)

Mifare Classic sector data

Mifare Ultralight data

Mifare Plus SL3

Byte order

Select byte order normal or reversed.

For example CSN normal is = A2 07 6E 43

For example CSN reversed is = 43 6E 07 A2

Sector number

Select sector using fixed sector number within range from 0 to 39.

MAD (Mifare Application Directory)

When using MAD the AID and MAD Key must be given.

MAD key for Mifare Classic is normally A0A1A2A3A4A5.

MAD key for Mifare Plus is normally A0A1A2A3A4A5A6A7 A0A1A2A3A4A5A6A7.

Block number

Block number to read data from. The block number must be in range from 0 to 3. For sectors 32 to 39 the block number can range from 0 to 15.

Page number

Mifare Ultralight page number to read data from. Must be in range from 0 to 15.

Read key

Select to use KeyA or KeyB for reading. Usually KeyA is used for reading.

Enter the read key. For Mifare Classic the key length is 6 bytes (12 hex digits).

For Mifare Plus SL3 the key length is 16 bytes (32 hex digits).

Data length and offset

Select the data length and offset in nibbles. Nibbles are half bytes or digits.

Each Mifare classic data block contains 16 bytes data = 32 nibbles.

For example sector data contains 12345000000000000000000000000000.

Set data length to 5 and offset to 0.

This will result in the id-number 12345.

4.4.6 OTHER ID TYPES

The MACE Reader also support reading different RFID card types based upon 13 MHz and 120/125 kHz. Enable the individual RFID card types as mentioned below.

*** Advanced user mode settings;

Nedap XS

Enable reading Nedap XS cards (default enabled).

These tags are programmed with a CF, DF or GF customer code. Optionally enable the customer code check. See chapter 4.3.1.

Nedap RW80

Enable reading Nedap RW80 cards.

EM4200 (and compatible)

Enable reading EM4200 (and compatible) RFID cards.

HID iCLASS (CSN only)

Enable reading HID iCLASS CSN.

The HID iCLASS CSN is the read-only 8-byte CSN.

ISO15693 (UID only)

Enable reading ISO15693 UID.

Different RFID cards comply with this standard, form example the LEGIC Advant MP cards. Only reading the UID is supported. The UID for ISO15693 cards is 8 bytes.

4.5 COMMUNICATION OUTPUT

4.5.1 SERIAL

The serial communication output defines the format of the message that is transmitted upon identification.

This serial output message format is used on the USB and RS485 interface. See for interface connection details chapter 3.2.

Message format:

```
<prefix><id-source><id-type><id-number><suffix><cr><lf>
```

If the message format has been changed, the MaceConfigTool may fail to recognize the message and the identification may not be shown in the ID-list anymore. In this case check the Console to check the communication output.

Prefix

Default prefix is '4005'.

Can be any string of characters of min 0 (zero) to max 10 characters.

Add ID source

If enabled, the id-source will be sent as a 2 digit code that identifies how the id-number was read.

- '00' PROX-LF (120/125 kHz)
- '01' BLE
- '02' NFC
- '03' Barcode
- '04' Smartcard (13 MHz)
- '05' Mifare
- '06' Desfire
- '07' ISO15693
- '08' HID iCLASS

Add ID type

If enabled, the id-type will be sent as a 2 digit code that identifies the programming format.

- '00' RAW
- '08' MACE UID64
- '10' MACE UUID128
- '45' EM4200
- '4E' Nedap XS
- '4F' Nedap RW80
- '57' Wiegand

ID number

Select to output the id-number complete, left aligned or right aligned.

When left or right aligned specify the id-length and offset in bits.

Optionally convert the id-number from hex to decimal.

Suffix

Default no prefix is used.

Can be any string of characters of min 0 (zero) to max 10 characters.

Example:

MACE UID64 on BLE: '40050108B03BF925E6F04D34'<CR><LF>

4.5.2 WIEGAND/MAGSTRIPE

The wiegand/magstripe communication output defines the format of the wiegand/magstripe message that is transmitted upon identification.

Note that if the id-number is already programmed in the Wiegand or Magstripe format these settings are not used. For example the id-number programmed in Wiegand 26-bit format will always generate Wiegand 26-bit output regardless of the wiegand/magstripe settings.

The wiegand/magstripe output settings are only used for id-numbers that are not programmed in the Wiegand or Magstripe format.

Unconfigured

Select unconfigured if the id-numbers are already programmed in the Wiegand or Magstripe format or if the wiegand/magstripe interface is not used.

Wiegand

Select Wiegand to manually configure the wiegand message output format.

Wiegand output message format:

```
<P1><prefix><facility-code><id-number><suffix><P2>
```

Parity

Enable add parity bits to add a leading and trailing parity bit to the wiegand message. The leading parity bit (P1) is even calculated on the first half of the data bits. The trailing parity bit (P2) is odd calculated on the second half of the data bits. If the number of data bits used in the parity calculation is odd, then the center bit is used in both parity bit calculations.

Prefix

Constant prefix value. Max 65,535 (16 bits).

Facility-code

Constant facility-code (or site-code) value. Max 65,535 (16 bits).

ID number

Select to output the id-number complete, left aligned or right aligned. When left or right aligned specify the id-length and offset in bits.

Suffix

Constant suffix value. Max 65,535 (16 bits).

MACE | INSTALLATION GUIDE

Reader configuration

Wiegand configuration example:

The configuration shown below will generate a Wiegand 26-bit message with facility-code 10. The id-number uses the 16 least significant bits (right aligned). Mace UID64 B03BF925E6F04D34 → id-number 0x4D34 = 19764.

Protocol

Unconfigured (default)

Wiegand

Magstripe

ID number

Right aligned

Length in bits

16

Offset in bits

0

Add parity bits

Add facility-code (max 16 bits)

Facility-code

10

Length in bits

8

Add prefix (max 16 bits)

Add suffix (max 16 bits)

Figure 6: Example wiegand 26-bit configuration

Magstripe

Select Magstripe to configure the magstripe message output format.

Wiegand output message format:

```
<0xB><prefix><id-number><suffix><0xF><LRC>
```

Add start, stop-sentinel and LRC

According to the Magstripe ISO7811/2 standard the messages should begin with a start-sentinel (0xB) and finish with an stop-sentinel (0xF) and LRC checksum.

Add preamble and postamble clocks

If enabled the Magstripe output will generate 16 preamble clock cycles before the message and and 16 postamble clock cycles afterwards.

Prefix

Constant prefix value transmitted before the id-number. Max. 16 digits.

ID number

Select to output the id-number complete, left aligned or right aligned.

When left or right aligned specify the id-length and offset in bits.

Convert to decimal

Enable to convert the id-number to a decimal value. Default enabled because hexadecimal characters should be avoided within the id-number. Hexadecimal characters are according to the ISO7811/2 standard reserved for message control.

Suffix

Constant suffix value transmitted after the id-number. Max 16 digits.

MACE | INSTALLATION GUIDE

Reader configuration

Magstripe configuration example:

The configuration shown below will generate a Magstripe message. The id-number uses the 6 least significant hex digits (right aligned) and they are converted to 8 decimal digits.

Mace UID64 B03BF925E6F04D34 → id-number 0xF04D34 = 15.748.404.

After adding the start, stop-sentinel and LRC this results in message:

B15748404FB

Protocol

Unconfigured (default)

Wiegand

Magstripe

ID number

Right aligned

Length in digits

6

Offset in digits

0

Convert to decimal

Add start, stop-sentinel and LRC

Add preamble and postamble clocks

Prefix (max 16 digits)



Suffix (max 4 digits)

Figure 7: Example magstripe configuration

A TECHNICAL SPECIFICATIONS

Technical information	Mace reader MM (QR)
Operating frequency	Bluetooth low energy 2.402 – 2.480 GHz NFC & smartcards: 13.56 MHz Proximity cards: 120 kHz
Dimensions	150 x 50 x 40 mm [5.9 x 2 x 1.6 inch]
Weight	0.5 kg [1.1 lbs]
Housing	Aluminum (Zamak5) chassis with polycarbonate cover
Color	RAL9006 cover and RAL7016 chassis
Protection	IP65 [approx.NEMA4x]
Detection range	Bluetooth Low Energy: configurable up to 2m (short), 5m (medium) or 15m (long). NFC, smartcards and proximity cards: up to 5cm.
Operating temperature	-30...+60°C [-22...+140°F]
Power	12 ... 24 VDC
Current consumption	0.4A@12VDC, 0.2@24VDC
Input	2 TTL digital inputs for LED control (RED/GREEN) 1 TTL digital input for beeper control
Tamper indication	Yes, magnetic tamper switch
Cable	Fixed cable length of 5 meters [16.4 ft.] included (pigtail)
Cable length	Wiegand 150 m [500 ft.] 22AWG RS485 1200 m [3950 ft.] when installed properly
Interfaces	RS485 and USB service interface, additional interfacing options exist. Please consult your representative.
Output	Wiegand, magstripe (clock & data)
Compliance	Europe R&TTE Directive 1999/5/EC USA: FCC Title 47 Part 15B and 15C Canada: ISSED ICES-003 and RSS210.
Certifications	Safety: EN60950-1 EMC: EN301489 Telecom: EN330 330 and EN300 328 Human Exposure assessment: ICNIRP Guidelines, EN62369 and EN50364 UL294

B PART NUMBERS

Readers	Part number	Description
	9565523	MACE MM
	9565531	MACE MM QR

C FCC AND ISED DECLARATIONS

FCC ID: CGDMACER1 and IC: 1444A-MACER1

FCC (15.19) and ISED Compliance statement

This device complies with part 15 of the FCC Rules and to RSS210 of Industry Canada. 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.

Warning (15.21)

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

Cet appareil se conforme aux normes RSS 210 exemptés de license du Industry Canada. L'opération est soumis aux deux conditions suivantes:

- (1) cet appareil ne doit causer aucune interférence, et
- (2) cet appareil doit accepter n'importe quelle interférence, y inclus interférence qui peut causer une opération non pas voulu de cet appareil.

Les changements ou modifications n'ayant pas été expressément approuvés par la partie responsable de la conformité peuvent faire perdre à l'utilisateur l'autorisation de faire fonctionner le matériel.

FCC and ISED Radiation Exposure Statement

This equipment complies with FCC (OET Bulletin 65) and Canadian radiation exposure limits set forth in RSS-102 for a uncontrolled environment. This equipment should be installed and operated with a minimum distance of 3 mm 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 a RSS-102 limites énoncées pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec une distance minimale de 3 mm entre le radiateur et votre corps.

ISED EMC Declaration

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de Classe B est conforme à la norme Canadienne ICES-003.

FCC Information to the user (15.106(b))

Note: This equipment has been tested and found to comply with the limits for a class B digital devices, 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 frequent 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 not cause harmful interference to radio or television reception, which can be determine 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.
- Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
- To ensure compliance with FCC regulations, use only the shielded interface cables provided with the product, or additional specified components or accessories that can be used with the installation of the product.

D DISCLAIMER

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E DOCUMENT REVISION

Version	Date	Comment
1.5	2016-08-18	Power supply specifications updated
1.4	2016-08-18	Added FCC and ISED declarations
1.3	2016-08-08	BLE note added when changing ranging profile
1.2	2016-07-15	Added simple and advanced user mode settings
1.1	2016-07-07	Added reader configuration chapter
1.0	2016-06-21	First preliminary release