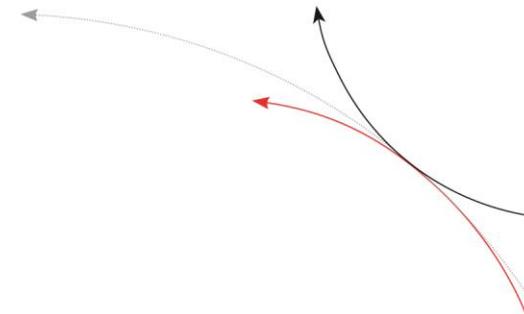


Operating Instructions for the ISO Long Range Decoder

ARE i5 – MTX – RS 232

Instruction Manual



Scope

| | | |
|----------|--|-----------|
| 1 | INTRODUCTION | 4 |
| 2 | INSTALLATION OF THE READER | 4 |
| 2.1 | Using Serval Readers within a Close Operating Area | 4 |
| 2.2 | Reading Performace | 4 |
| 3 | ELECTRICAL AND MEACHNICAL POPERTIES | 5 |
| 3.1 | DataPort and Power Supply Cable | 5 |
| 3.2 | Antenna Cable and Fine Tuning | 5 |
| 3.3 | Housing | 6 |
| 3.4 | Electrical Properties | 6 |
| 4 | HARDWARE | 7 |
| 4.1 | Power Supply | 7 |
| 4.2 | Data Port – RS 232 | 8 |
| 4.3 | Antenna Receiving Coil | 9 |
| 4.4 | Signals | 9 |
| 4.4.1 | Visual Signal | 9 |
| 4.4.2 | Sound Signal | 9 |
| 4.5 | Hardware Reset | 9 |
| 5 | OPERATION MODES | 10 |
| 5.1 | Command Mode – MD 2 | 10 |
| 5.2 | Continuous reading mode – MD 0 | 11 |
| 6 | PROTOKOLLFORMAT | 12 |
| 6.1 | Echo | 12 |
| 6.2 | Answer to an Parameter Request | 12 |
| 6.3 | Empty Input Line | 12 |
| 6.4 | Wrong Command – Error code | 12 |

| | | |
|-----------|--|-----------|
| 6.5 | BootMessage | 12 |
| 6.6 | Case Sensitivity | 13 |
| 6.7 | Line Feed | 13 |
| 6.8 | Data Format of the Transponder Code | 13 |
| 6.9 | NoRead Information Format | 13 |
| 7 | SET OF COMMANDS | 14 |
| 7.1 | Start Reading – GT | 14 |
| 7.2 | Code Presentation – CD (ISO Transponder Only) | 14 |
| 7.3 | Maximum Reading Time – TOR | 15 |
| 7.4 | Operation Mode – MD | 15 |
| 7.5 | Suppression of No Reads- CN | 16 |
| 7.6 | Firmware Edition – VER | 16 |
| 7.7 | Measurement of the Signal Strength of the Transponder or Measurement of the Environmental Noise Level – CM | 16 |
| 7.8 | Failure Protection – NID | 17 |
| 7.9 | Suppression of ID Codes – CID | 17 |
| 7.10 | Buzzer – BUZ | 18 |
| 7.11 | Algorithm – ALGO | 18 |
| 8 | INSTALLATION OF THE READER | 19 |
| 8.1 | First Steps | 19 |
| 8.2 | Failure Management | 19 |
| 9 | WARNINGS | 19 |
| 10 | CONTACTS | 20 |
| 11 | REVISIONS, CHANGES | 20 |

1 Introduction

This document describes technical features and directions for installation of the Long Range Reader with external antennas due to read the following types of transponders, some defined in ISO 11784 /11785:

- FDX-B
- HDX
- Destron
- Datamars
- Trovan
- PSK with an side band carrier of $f_c/2$ and 16 field cycles per bit
- furthermore Read-Only transponder using ASK 64bit Manchester encoding with an data transfer rate of 2 kBaud(e.g. EM 4102)

By means of the external antenna the reader generates an alternating magnetic field, which powers the transponder. Coded signals sent back from the transponder are received and decoded by the reader. The result is fed via the RS 232 interface to the next level of the evaluating system

The comands to control the operation of reader uses parts of the ASB 1.0.

2 Installation of the Reader

2.1 Using Serval Readers within a Close Operating Area

A synchronisation of the readers is not available.

Therefore the operation of serveral readers within an close area may reduce the reading performance of the readers significantly. The reduction of the reading performance must be tested.

2.2 Reading Performace

The reading range and the reading area depends on size of the applied antenna. The decoder will only work with a Passive Two Coil Antenna AAN PT for example

Typ: AAN PT8 flex. 2m

3 Electrical and Mechanical properties

The reader is connected to an master and the power supply by an standard cable. The used power supply must be set to $U = 12\text{ V}$ (Id 1000496, 1005442) **or** 24 V (Id 1004083, 1005451) /DC I = min. 1A.

Check the identification plate.

3.1 DataPort and Power Supply Cable

The length of the cable is set to 10 m.

3.2 Antenna Cable and Fine Tuning

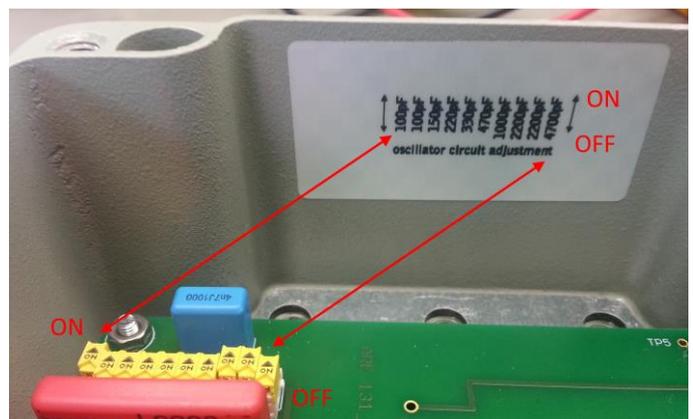
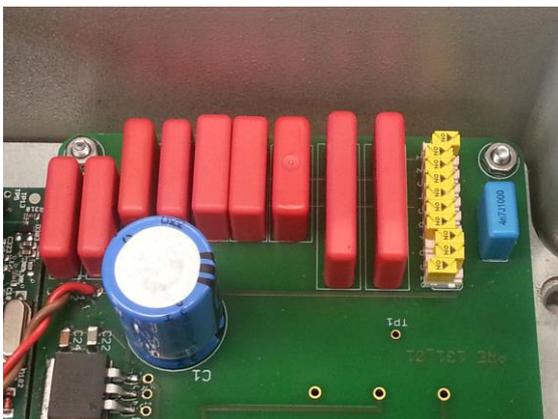
The antennas delivered with the reader, are well tuned by the manufacturer. If there is a change of the length of the antenna cable necessary, or the interaction between antenna and the mounting parts are too high, or another antenna is used, a loss in the reading distance is possible. Then a retuning of the resonant circuit of the antenna must be done by the customer himself. To optimise the sending circuit, capacitors must be added. The fine tuning procedure must be done very carefully and in small steps.

Fine Tuning Area. Starting from the right side:
4,7nF / 2,2nF / 2,2nF / 1,0nF / 470pF / 330pF / 220pF / 150pF / 100pF / 100pF

At delivering state a small quantity of capacitors are added to the decoder.

To get the best reading results, the power consumption of the reader should be around **5.4-6.6W**. The easiest way is to measure the current in continuous reading mode (MD 0) without a transponder in the antenna field. Current should be **450-650mA** with **12V**-readers and up to **225-275mA** with **24V**-readers. There is no risk of damage if power consumption is higher but reading distance decreases again. The best way is to search maximum current consumption with the capacitor jumpers and remove or add a small capacitor afterwards.

The used capacitors must withstand antenna voltage up to 1000 V_{AC}



3.3 Housing

The housing of reader is made of aluminium and meets the protection class of IP 65.

| | |
|----------------------------|----------------------------------|
| The size of the housing is | 220 x 120 x 80 mm. |
| The wight is about | 1.5 kg. |
| Operating Temperature | 0° C bis +70°C |
| Storage Temperatur | -20°C bis +70°C |
| Humidity | 95% R.H. bei +50°C (no condens.) |

3.4 Electrical Properties

| | |
|-----------------|--------------------------------|
| Power Supply | 12V ± 0.3V |
| | 24V ± 0.3V |
| | Check the identification plate |
| max. Current | ca. 1 A |
| Current StandBy | ca. 0.15 A |
| Data Port | 2-Wire RS 232 |

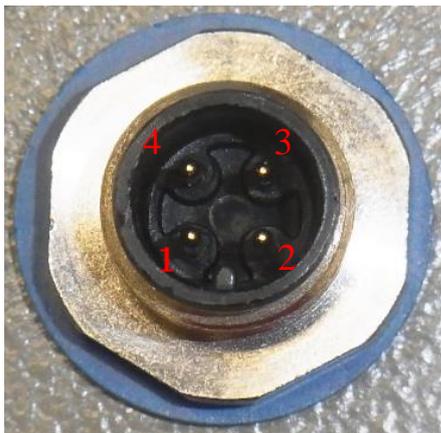
4 Hardware



Connector of the Decoder

4.1 Power Supply

Connector 1: (blue)



Pin 1: +12 V or 24 V (depends on the device type)

Pin 3: GND

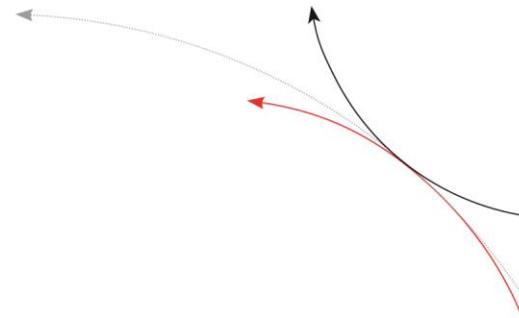
Typ with 12 Volt: Id.No.: 1000496 or 1005442

Typ with 24 Volt: Id.No.: 1004083 or 1005451

Using the power supply cable

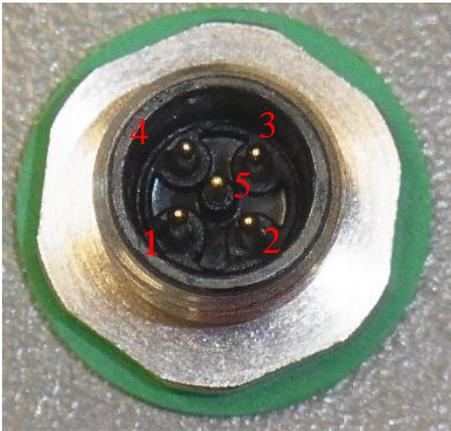
Typ: ID 1001227

brown = +12 V or 24 V (depends on the device type ARE i5)
white = GND



4.2 Data Port – RS 232

Connector 2: (green)

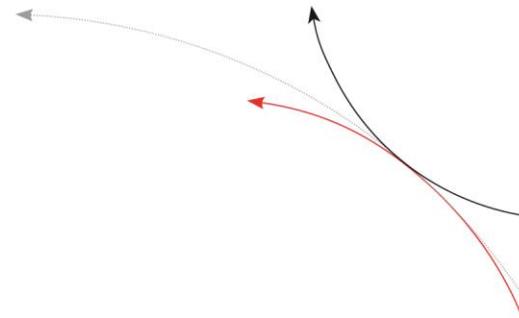


RX Pin 1

TX Pin 2

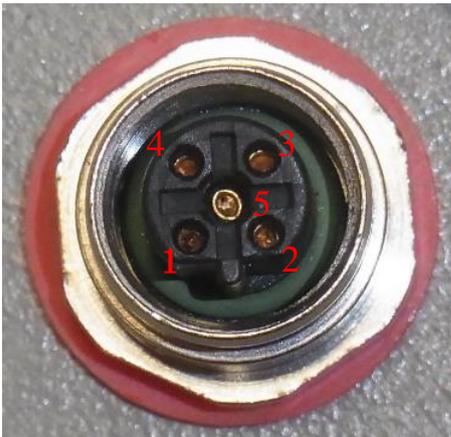
GND Pin 3

The konfiguration of the data port is fixed to 19200 baud und 8N1. There is no handshake procedure needed. Maximum length 10m.



4.3 Antenna Receiving Coil

Connector 3: (red)



Receiving Coil: Pin 1, 2

Sending Coil: Pin 3, 4

4.4 Signals

4.4.1 Visual Signal

On the top, the orange Power LED

4.4.2 Sound Signal

Signal at successful reading

Caution!!!

After switching on the power, no LED is active. It starts working, after getting a reading command.

4.5 Hardware Reset

After an hardware reset the reader starts with the TOR and CD parameter which is stored in the readers flash memory.

5 Operation modes

Two operation modes are defined:

- Operation mode 2 – Command mode
- Operation mode 0 – Continuous reading mode

In the following chapters their functionality is described.

5.1 Command Mode – MD 2

The communication partner is sending the command „Get tag“ („GT<CR>“) to start a reading attempt. The result, the transponder code or a no read message, is sent back.

In operation mode 2 the exciter is normally switched off. Triggered by the GT command input the exciter is activated. When the reading cycle is finished, it is switched off again.

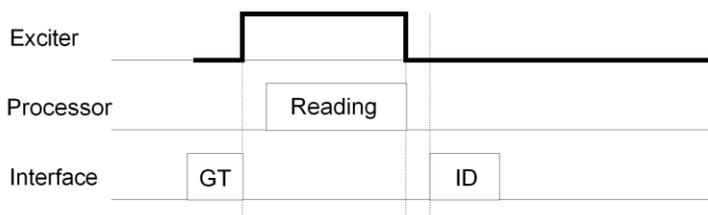


Figure 1: Software triggered reading mode

If the first reading attempt is not successful there are more reading attempts until the TOR time is expired or one reading attempt was successful (reader received the ID code by the transponder). During the whole reading cycle the exciter stays on. If all reading attempts stay unsuccessful a no read message is sent to the communication partner. If reading was successful the ID code is sent.

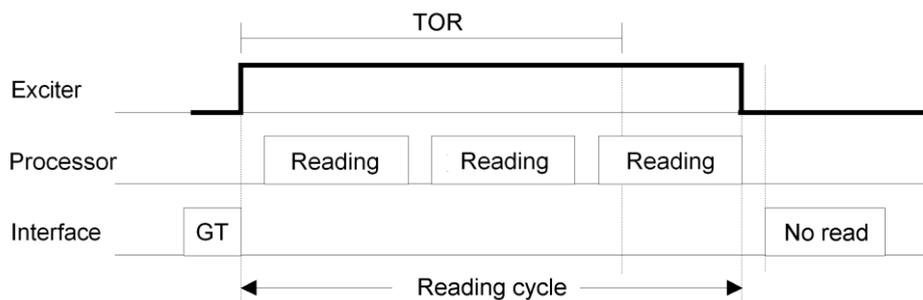


Figure 2: Software triggered reading mode with $TOR > 0$

Attention: During a reading cycle, during the TOR time, there is no no read output in operation mode 2!

This operation mode is factory setting. For further configuration and adaption to the application, use the following commands:

MD 2 Command mode

CN 0 No suppression of no read messages

TOR XYZ Maximal time the exciter is on. Maximal reading time x 0,1s. It takes this time until a no read message is sent.
TOR 5 – factory setting

5.2 Continuous reading mode – MD 0

The reader tries continuously to power up a transponder and to read it's code. External triggering is not necessary.



Figure 3: Continuous reading process

This operation mode can be configured with the following commands:

MD 0 – Continuous reading

CN X - Setting of the no read message output
 CN 0 No suppression of no read messages
 CN 1 Suppression of no read messages

6 Protokollformat

6.1 Echo

There is no echo sended back

6.2 Answer to an Parameter Request

The value of the settings of the TOR parameter can be read out by the command of `TOR` + <CR> .. example:

Command: `TOR` <CR>

Answer: `5` <CR>

6.3 Empty Input Line

Is there only an <CR> send to the reader the reader will answer with an <CR> only. Example:

Command: <CR>

Answer: <CR>

6.4 Wrong Command – Error code

If there is sent a wrong Command the Reader will answer with following error codes:

Wrong command: <NAK> `#00` <CR>

Wrong value: <NAK> `#02` <CR>

6.5 BootMessage

There is no Bootsmesssage send. The edition Number can be determined by send the ver – command

6.6 Case Sensitivity

The reader is not case sensitive.

6.7 Line Feed

There is no Line Feed Character send.

6.8 Data Format of the Transponder Code

The location of the transponder bits in the ASCII characters is shown in the following tables:

| | | | | |
|-------------|-------------|-------------|------------|-----------|
| D39 ... D32 | D31 ... D24 | D23 ... D16 | D15 ... D8 | D7 ... D0 |
| ASC9 ASC8 | ASC7 ASC6 | ASC5 ASC4 | ASC3 ASC2 | ASC1 ASC0 |

Table 1-: Data Format of the Transponder Code

| | | | | |
|---------------|-----------------|-----------------|-----------------|-----------------|
| 0 0 0 0 0 0 0 | 0 0 0 1 1 1 1 1 | 0 0 1 1 0 1 1 1 | 1 0 1 1 1 1 0 1 | 1 0 0 1 0 0 1 0 |
| 00H | 1FH | 37H | BDH | 92H |
| 30H 30H | 31H 46H | 33H 37H | 42H 44H | 39H 32H |

Table 2-: Data Format of the Transponder Code

The code of the transponder 001F37BD92 is brought to the data port in such a way

30H, 30H, 31H, 46H, 33H, 37H, 42H, 44H, 39H, 32H and <CR>.

To show the data stream, the code of R0 64 Bit transponder is taken.

6.9 NoRead Information Format

An unsuccessful reading cycle is represented by the NoRead character sequence (see command CN in chapter). The NoRead is coded by the number XXXXXXXXXXX, which can never appear as transponder code.

7 Set of Commands

7.1 Start Reading – GT

The reading command code is GT. For details to this function see chapter.

Input format: GT <CR>

Output (example): Dependent of the parameter settings and the actual antenna input signal, three different responses are possible in operating mode 2:

- Transponder number, e.g. 001F37BD92 <CR>
- XXXXXXXXXXXX <CR>
- <CR> as command acknowledge, if a filter function is active, which cut the transponder code or the NoRead result.

Note: The command is always effective in operating mode 2. According to the hardware implementation it is not definitely ensured that this command is executed as well in other operating modes.

7.2 Code Presentation – CD (ISO Transponder Only)

The code presentation of an ISO Transponder can be changed only, by changing the value of the value of the CD-Parameter:

Input format: CD <SP> parameter <CR>

Parameter:

| | Function |
|---|------------------|
| 0 | Hex-Presentation |
| 1 | ISO Animal |
| 2 | ISO Industry |
| 3 | ISO BDE |

Output (example): 2 <CR>

7.3 Maximum Reading Time – TOR

Timeout for the reader. TOR is used in operation mode 2 as maximum gating time for a reading process. The length of the maximum gating time results from the equation $\text{gating_time} = \text{TOR} * \text{TB}$. The time constant TB (Time Base) has always the default value 100ms.

Input format: TOR <SP> parameter <CR>

Parameter:

| | Function |
|-----|---|
| 2 | limits the reading process duration to maximum 2 times TB |
| 3 | limits the reading process duration to maximum 3 times TB |
| 4 | limits the reading process duration to maximum 4 times TB |
| ... | |
| 999 | limits the reading process duration to maximum 999 times TB |

Output (example): 2 <CR>

Note: Depending on different hardware implementations it cannot be guaranteed that parameter values greater than 9 can be processed.

7.4 Operation Mode – MD

The operation mode of the reader is changed with the command MD.

Input format: MD <SP> <Parameter> <CR>

Parameter:

| Parameter | Function |
|-----------|-------------------------|
| 0 | Continuous reading mode |
| <u>2</u> | <u>Command mode</u> |

Output (e.g.): 2 <CR>

Note: In software version MTR15 MD parameter is not saved. The reader is starting in command mode. If it is changed to continuous reading mode the reader does not respond to commands any longer. It is exclusively sending transponder codes or no read messages. To switch it back to command mode it has to be restarted.

7.5 Suppression of No Reads- CN

Through the setting CN=1 all NoRead results are suppressed on the serial interface..

Input format: CN <SP> parameter <CR>

Parameter:

| <u>Value</u> | <u>Function</u> |
|--------------|--|
| 0 | issue NoReads on serial interface; (default value) |
| 1 | suppress NoReads on interface |

Output (example): 0 <CR>

Please note: The CN parameter is only active, if the GT-Command is applied or the reader is in the Continuous Reading Mode. In the MD 2 any way a <CR> is sent to the master.

7.6 Firmware Edition – VER

The command VER shows the software version of the reader. The software version is permanently stored in the program memory together with the firmware.

Input: 'VER' <CR>

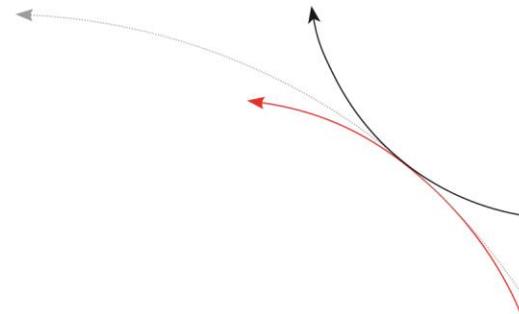
Output (Example): 'I5_MTR12' <CR>

7.7 Measurement of the Signal Strength of the Transponder or Measurement of the Environmental Noise Level – CM

At the end of the analogue stage, a rms-value is calculated from the signal coming from transponder or from the environmental noise.

Input format: CM <CR>

Output (example): Four Hex Characters <CR>



7.8 Failure Protection – NID

NID specifies the number of identical transponder numbers, which have to appear for the result “successful reading” within a reading cycle. In the setting NID = 1, two successive readings have to show the same transponder number.

Input format: NID <SP> parameter <CR>

Parameter:

| <u>Value</u> | <u>Function</u> |
|--------------|--------------------------------|
| 0 | one out of one (no effect) |
| <u>1</u> | two out of two (default value) |

Output (example): 1 <CR>

| Sequence of readings | Length of the reading cycle | Result of the reading cycle |
|------------------------|-----------------------------|-----------------------------|
| NoRead | 1 reading | NoRead |
| 0000125ED1, 0000125ED1 | 2 readings | 0000125ED1 |
| 0000125ED1, 0000126ED1 | 2 readings | NoRead |

Schedule 7-: example for a reading cycle with NID=1

7.9 Suppression of ID Codes – CID

With CID=1 **only the first** of in succession identical transponder numbers is output on the serial interface. The possibly following identical transponder numbers are suppressed, as long as no new valid transponder number is received, processed and output.

Input format: CID <SP> parameter <CR>

Parameter:

| <u>Value</u> | <u>Function</u> |
|--------------|------------------------------------|
| <u>0</u> | no filter function (default value) |
| 1 | suppression of repeatedly read IDs |

7.10 Buzzer – BUZ

A result telegram after a reading process can be accompanied by a sound signal. It is enabled or disabled with the command BUZ.

Input format: BUZ <SP> parameter <CR>

Parameter:

| <u>Value</u> | <u>Function</u> |
|--------------|--|
| 0 | Buzzer off |
| 1 | Buzzer on, output in Good and Bad Read case |
| 2 | Buzzer on, Good Read indication only (default value) |

Output (example): 1 <CR>

7.11 Algorithm – ALGO

The reader supports 8 algorithms respectively transponder formats. With the parameter ALGO every single algorithm can be activated or deactivated. With the hexadecimal format of the parameter, every possible combination of algorithms can be masked. 00 means no algorithm, FF means all 8 algorithms.

Input format: ALGO <SP> Parameter <CR>

Parameter:

| <u>Parameter</u> | <u>Function</u> |
|------------------|---|
| 01 | Trovan |
| 02 | Marin, ASK 64 Bit |
| 04 | Datamars |
| 08 | Destron |
| 10 | ISO Hdx |
| 20 | ISO Fdx |
| 40 | PSK2 |
| 80 | PSK1 |
| 03 | Trovan + Marin |
| ... | |
| <u>FF</u> | <u>All Algorithms activated (Default value)</u> |

Output (Example): FF <CR>

8 Installation of the Reader

8.1 First Steps

- Connect the reader to a power supply and a master (PC).
- Test the communication status by using a simple terminal software. Read the edition version of the Firmware by sending the VER –Command.
- Test the reader with the „GT“ command.
- The maximum reading time of the reader – TOR-Parameter – must be fixed to the needed value.

8.2 Failure Management

If the reading is not successful, please check following failure modes:

- Baud rates of the Terminal Software und ARE i5 is not the same.
- There is big influence of electromagnetic noise.
- The Antenne is mounted direct to a conductive plate or the interaction between mounting structure and antenna leads to shift of the resonant frequency of the exciter circuit. A retuning is necessary.

9 Warnings

Y The RFID Reading System is a Low Range Radio System. The magnetic field strength is higher than 42dBµA/m (measured in the distance of 10 m). People with pacemakers must take care of this.

Y -Don't open the housing.

Y Warning! Y

The direct mounting to a conductive plate or struktur is prohibited.

A minimum distance of several meters between two operating readers is needed.

10 Contacts

To improve our products, as well as its documentation is our permanent effort.
For any questions, feedback or comments please call:

Sales und Marketing: ++49 (0)731-140088-0
 Fax: ++49 (0)731-140088-9000
 e-mail: sales@aegid.de
 http:\ www.aegid.de

11 Revisions, Changes

The initial English Edition is based on Revision 3 of the German Manual

| Revision | Date | Description of changes | |
|----------|------------|---|----|
| 00 | 20.01.2003 | First revision | |
| 01 | 01.09.2005 | <ul style="list-style-type: none"> not documented command "Measurement of the Signal Strength of the Transponder or Measurement of the Environmental Noise Level – CM" new command "Failure Protection – NID" | |
| 02 | 10.01.2007 | <ul style="list-style-type: none"> "Antenna Cable and Fine Tuning" – new capacitor board new command "Suppression of identical Code – CID" new command "Buzzer – BUZ" | |
| 03 | 06.08.2010 | Format | |
| 04 | 12.03.2011 | TOR parameters | MK |
| 05 | 04.11.2011 | | MM |
| 06 | 04.06.2012 | New parameter ALGO | MK |
| 07 | 20.10.2015 | Operation modes MD | MK |
| 08 | 15.12.2016 | 12 and 24 V reader manual in one, MD parameter is not saved in MTR15 version | MK |
| 09 | 24.03.2017 | New antenna tuning board | MK |
| 10 | 27.03.2017 | Antenna tuning description | MK |
| 11 | 23.11.2017 | Antenna tuning description | MM |
| 12 | 05.04.2018 | Antenna tuning description | MK |
| 13 | 14.12.2018 | Connector 4.1, 4.2 and 4.3 | MM |