

OEM-DES-MR-M500
13.56 MHz Mid-Range OEM RFID Module
Hardware Description

iDTRONIC GmbH
Ludwig-Reichling-Straße 4
67059 Ludwigshafen
Germany/Deutschland

Phone: +49 621 6690094-0
Fax: +49 621 6690094-9
E-Mail: info@idtronic.de
Web: idtronic.de

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Contents

1	Introduction	4
1.1	Reference Documents	4
1.2	Firmware Update.....	4
1.3	Device Identification · Version with RS232.....	4
1.4	Device Identification · Version with TTL	4
1.5	Function Description	5
1.5.1	Operation Modes	5
1.5.2	Standard Function	5
1.6	Function of the Button	5
1.6.1	Start/Stop Auto-List Cards Operation.....	5
1.6.2	Configure the RF Power	5
1.6.3	Start/Stop the Device	5
1.7	Status Signals.....	5
1.7.1	LEDs	5
1.7.2	Buzzer	6
1.8	Notes on Operation with Software	6
1.8.1	Sending Commands from Your Custom-Specific Software.....	6
1.8.2	Using the Test/Demo software.....	6
2	Mechanical Installation	7
2.1	Dimensions	7
2.2	Position of Ports	7
2.3	Cooling.....	8
3	Electrical Installation	8
3.1	Pinout of D Type connector (male)	8
3.2	Pinout of Power Supply Round Connector	8
4	Additional Commands.....	9
4.1	Output Telegram in Auto-List Mode.....	9
4.2	Set Antenna TX Power	9
4.3	Auto-List Cards Fast Version.....	9
4.4	Power Off command	10
5	Technical Data	11
	Table of Figures.....	12

1 Introduction

1.1 Reference Documents

Command Protocol and API Description: OEM-DES devices Communication Protocol_x.yy_EN.pdf

Manual of Test/Demo Software: OEM-DES devices Test Software Manual_x.y_EN.pdf

Important Note

This device supports only commands for ISO15693 RFID data tags.

1.2 Firmware Update

This reader supports the bootloader to update the firmware as all newer RFID devices from the DESFire series.

1.3 Device Identification · Version with RS232

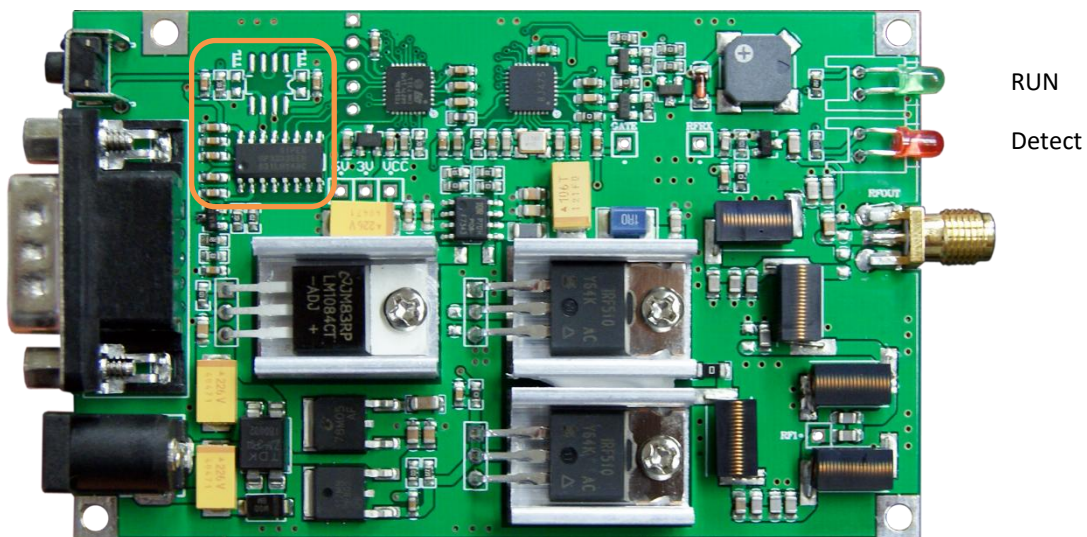


Figure 1 Top view onto OEM-HF-MR-M500-232

1.4 Device Identification · Version with TTL

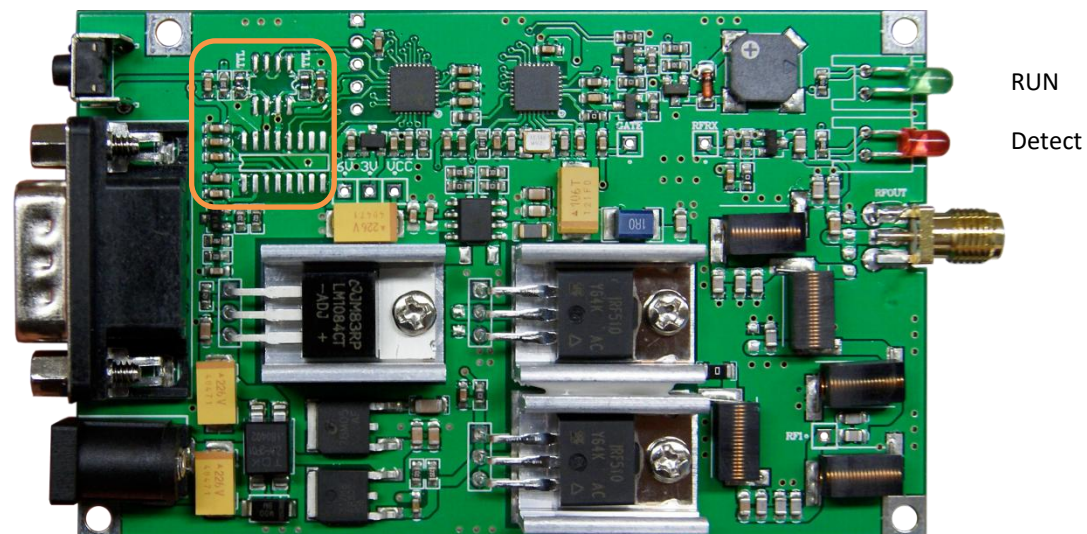


Figure 2 Top view onto OEM-HF-MR-M500-TTL

1.5 Function Description

1.5.1 Operation Modes

Auto-list cards: the device automatically scans for ISO 15693 type RFID tags and reports them on the serial interface.
Idle: the auto-list cards mode is shut off using the auto-list cards command with shut off parameters.
Halted: the device is halted using the halt command.

Note

Auto-list cards is the default mode after power-up.

1.5.2 Standard Function

After power-up, the device automatically scans for ISO 15693 type RFID tags. If it detects an RFID tag, it automatically reports it on the serial interface. Further commands for ISO 15693 type RFID tags can be sent to the device using the DESFire communication protocol.

1.6 Function of the Button

1.6.1 Start/Stop Auto-List Cards Operation

Press the button 1 time briefly. The setting is confirmed by an acoustic signal:

- One beep indicates auto-list cards operation stopped → idle mode
- Two beeps indicate re-start of auto-list cards operation

Note

This setting is non-volatile.

1.6.2 Configure the RF Power

Press the button 2 times briefly. The setting is confirmed by an acoustic signal:

- One beep indicates 12 V output (more range)
- Two beeps indicate 9 V output (less range)

Note

This setting is non-volatile.

1.6.3 Start/Stop the Device

Press the button for 2 seconds, then release it. This toggles between operation and halt mode.

Note

This setting is non-volatile.

1.7 Status Signals

1.7.1 LEDs

RUN, Green LED blinks fast: Auto-list cards mode ON.
 OFF: Device halted.

Detect, Red LED Blinks when an RFID tag is detected.

The red LED is ON after power-up. After the first card is detected, it is switched OFF, only blinking when an RFID tag is detected. Hence, a red LED is a sign, that the device has done a cold-boot or there was a power-failure.

1.7.2 Buzzer

- 1 Beep after start-up
- 2 Beeps after re-enacted from halted mode

1.8 Notes on Operation with Software

1.8.1 Sending Commands from Your Custom-Specific Software

Before sending commands to the device do these 2 things:

- Stop auto-list cards operation mode by either using the button (pls. see chapter “1.6.1 Start/Stop Auto-List Cards Operation”) or sending 50 00 05 23 FF 00 01 01 00 89 (hexadecimal values) to the device.
- Reset the antenna by sending 50 00 01 21 05 75 (hexadecimal values) to the device.

1.8.2 Using the Test/Demo software

When using the Test/Demo Software only the commands in the tab labelled” ISO15693” are available.

Please stop auto-list cards operation by either using the reset button (pls. see chapter “1.6.1 Start/Stop Auto-List Cards Operation”) or sending 50 00 05 23 FF 00 01 01 00 89 (hexadecimal values) to the device.

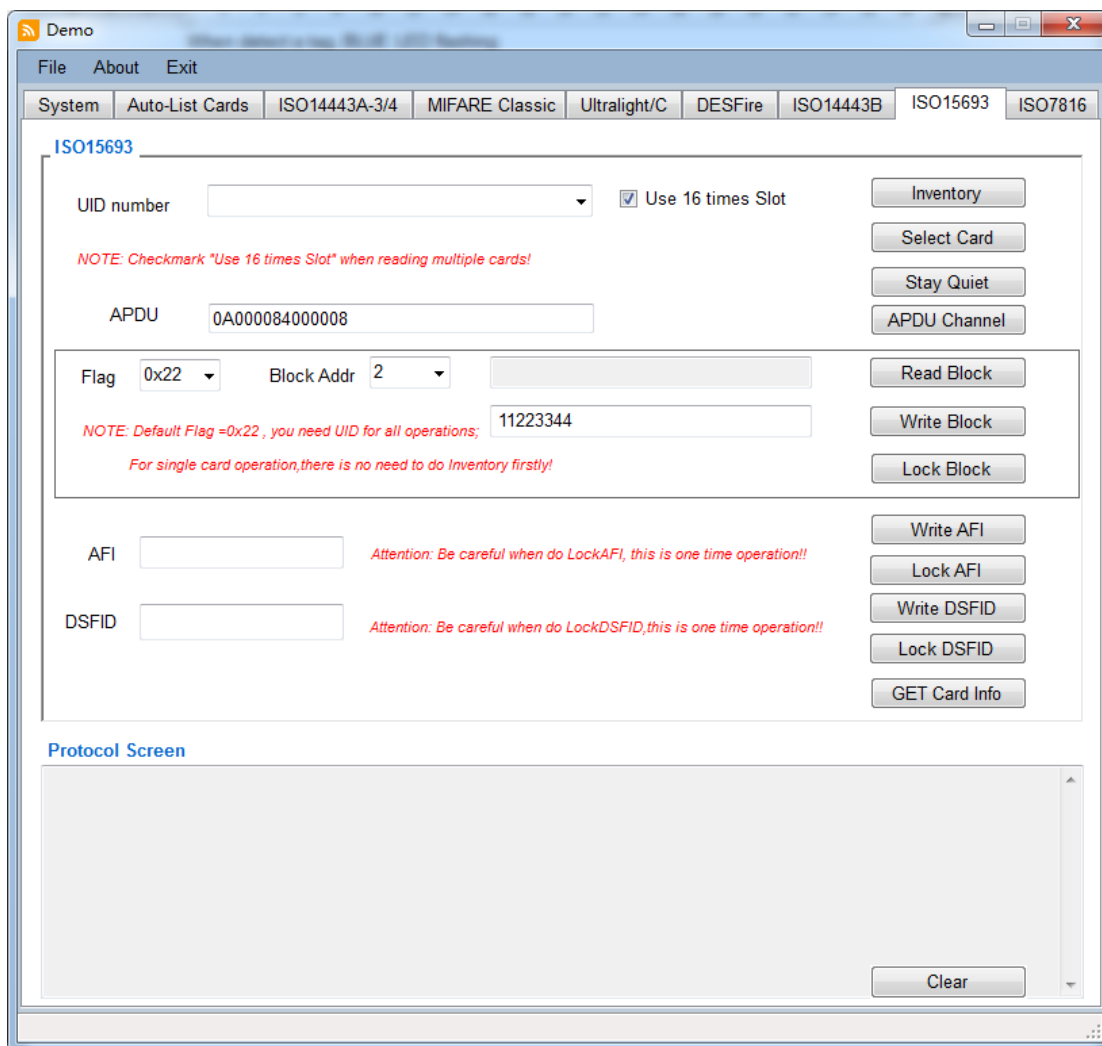


Figure 3 Tab in test/demo software with workable commands

2 Mechanical Installation

2.1 Dimensions

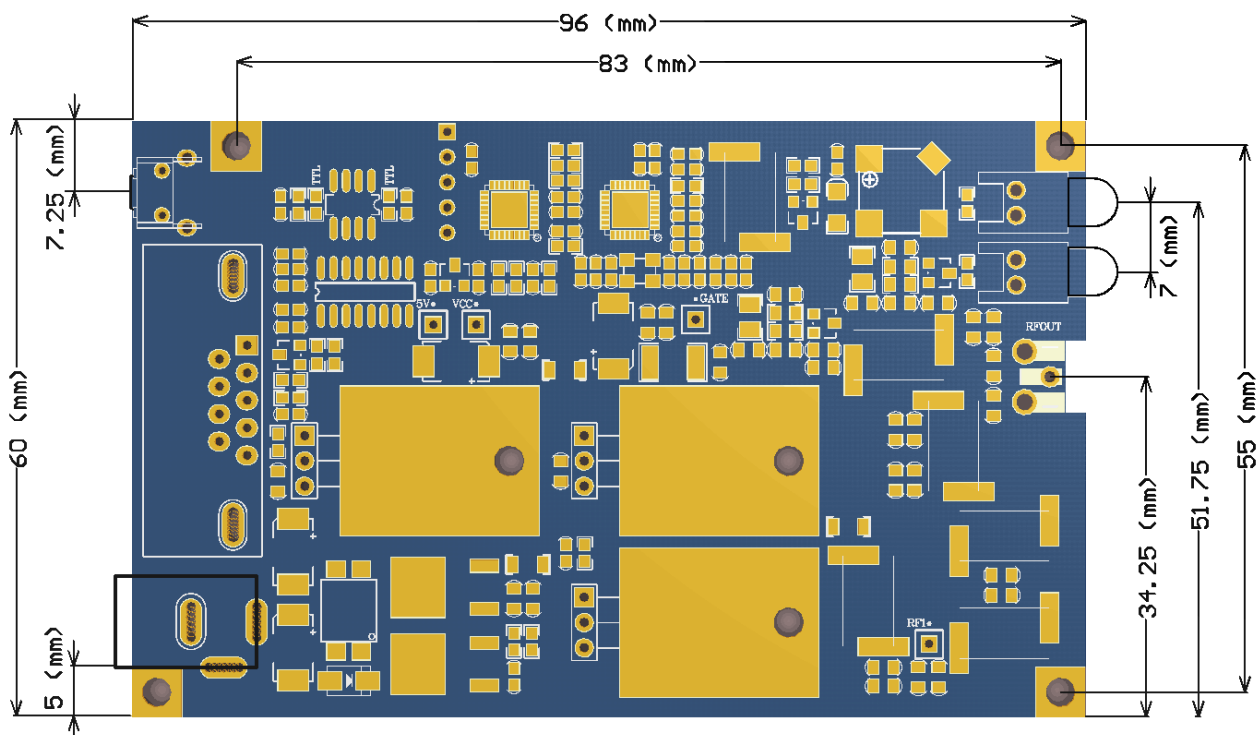


Figure 4 Dimensional drawing

2.2 Position of Ports

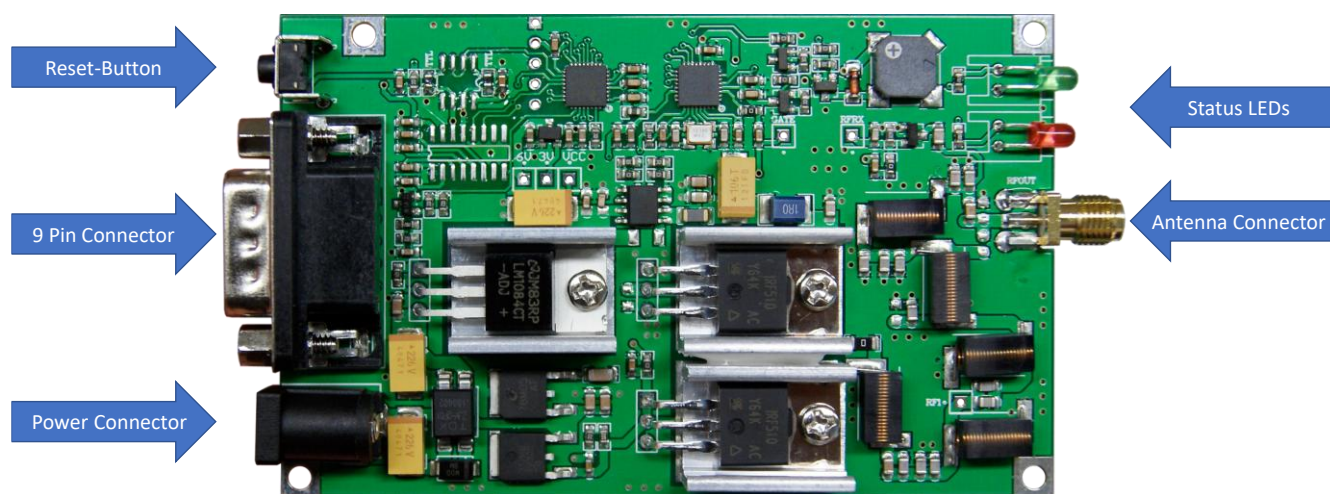


Figure 5 Position of Ports

2.3 Cooling

The device consumes up to 10 Watts peak power.

The module can be cooled in 2 ways:

- Airflow on the component side of the PCB
- Through the thermal pad on the bottom side of the PCB in contact with a metal housing.

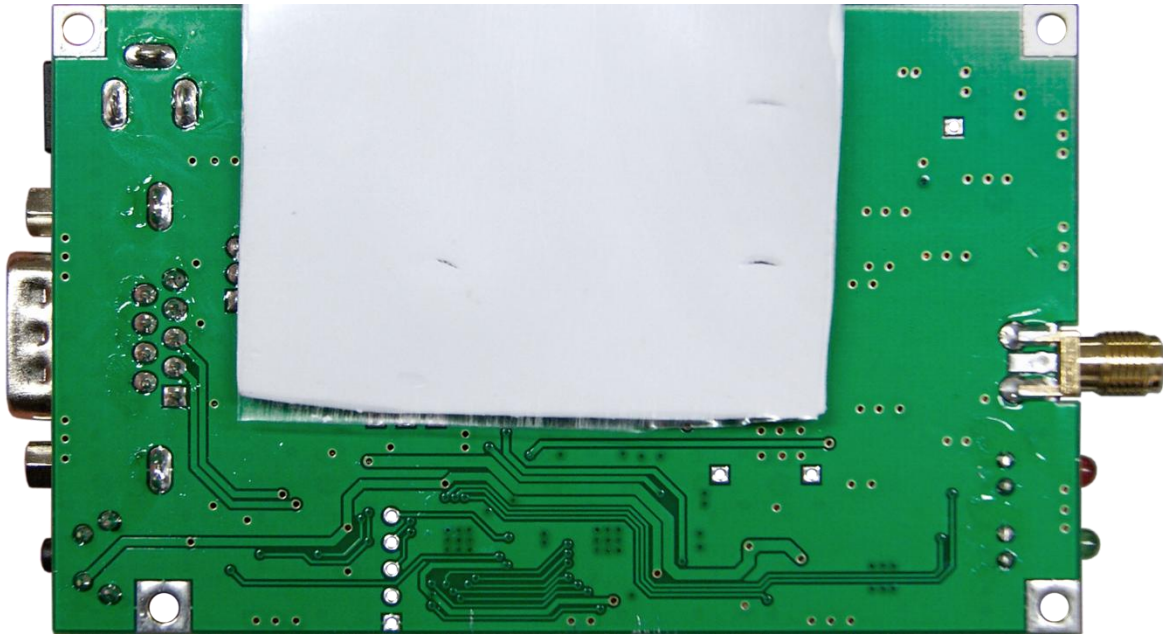


Figure 6 Thermal Pad on Bottom of PCB

3 Electrical Installation

3.1 Pinout of D Type connector (male)

PIN	Name	Description
1	–	
2	TxD	RS232 or TTL Level, connect to Pin 3 of your PC
3	RxD	RS232 or TTL Level, connect to Pin 2 of your PC
4	–	
5	GND	RS232
6	–	
7	–	
8	–	
9	–	

Note: The pinout for TTL is the same, only the levels are different.

3.2 Pinout of Power Supply Round Connector

PIN	Name	Description
Tip	+	
Ring	GND	

4 Additional Commands

These are additional commands to the communication protocol of the DESFire series.

4.1 Output Telegram in Auto-List Mode

Example

50 00 0D 23 04 64 03 04 00 F5 25 26 9F 00 01 04 E0 95

The Bytes in Detail:

50	=	Start of telegram
00 0D	=	13 Bytes payload between command code and checksum
23	=	Command code
04	=	Type of data tag, 0x04 = ISO 15693
64	=	Interval of inventory rounds; 0x64 = 100 ms
03	=	Antenna number; this hardware supports only 1 antenna, so do not change this value
04	=	Event notification, 0x04 = send telegram as long as the tag is in field
00	=	RFU (Reserved for Future Use)
F5 25 26 9F 00 01 04 E0	=	UID of RFID data tag
95	=	Checksum

4.2 Set Antenna TX Power

Command from PC/PLC to RFID device

50 00 01 0F 01 5F (set to 9 V RF amplitude)

50 00 01 0F 00 5E (set to 12 V RF amplitude)

The Bytes in Detail:

50	=	Start of telegram
00 01	=	1 Byte payload between command code and checksum
0F	=	Command code
00	=	Value; 0x00 = 12 V RF amplitude, 0x01 = 9 V RF amplitude
5E	=	Checksum

Reply from RFID device to PC/PLC

50 00 00 0F 5F (return OK)

The Bytes in Detail:

50	=	Start of telegram
00 00	=	No Byte between command code and checksum
0F	=	Command code
5F	=	Checksum

4.3 Auto-List Cards Fast Version

There is a command to use the autolistcard command to set fast list (the reader will always use 1slot first)

Command from PC/PLC to RFID device

50 00 05 23 04 20 00 01 00 53

The Bytes in Detail:

50	=	Start of telegram
00 05	=	5 Bytes of payload between command code and checksum
23	=	Command code
04	=	Type of data tag, 0x04 = ISO 15693
20	=	Interval of inventory rounds; 0x20 = 32 ms
00	=	Antenna number; this hardware supports only 1 antenna, so do not change this value
01	=	Event notification, 0x01 = send telegram the first time this tag is discovered
00	=	RFU
53	=	Checksum

Event notification

- 0x01 = NOTICE when a tag enters the field
- 0x02 = NOTICE when a tag leaves the field
- 0x03 = NOTICE when a tag enters and leaves the field
- 0x04 = NOTICE continuously as long as the tag is in field, the notification period equals the inventory rounds.

Reply from RFID device to PC/PLC

50 00 00 23 73

The Bytes in Detail:

50	=	Start of telegram
00 00	=	No Byte between command code and checksum
23	=	Command code
73	=	Checksum

4.4 Power Off command**Command from PC/PLC to RFID device**

50 00 00 0A 5A (power off, antenna off)

The Bytes in Detail:

50	=	Start of telegram
00 00	=	No Byte between command code and checksum
0A	=	Command code
5A	=	Checksum

Reply from RFID device to PC/PLC

50 00 01 0A 00 5B

The Bytes in Detail:

50	=	Start of telegram
00 01	=	1 Byte of payload between command code and checksum
0A	=	Command code
00	=	Confirmation
5B	=	Checksum

Important Note

The device is activated again by sending any other command or by pressing the button.

5 Technical Data

Other functions and details to be continued and upgraded.

Electrical Specifications	
Power Supply	15 Vdc, capable to deliver up to 700 mA briefly
Power Connector	Round socket, Ø5.5/2.1 mm
Power Consumption	HALT mode: app. 40 mA IDLE mode: app. 50 mA Standard (auto-list mode): up to 300 mA
Interface	RS232 (OEM-HF-MR-500-232) or TTL (OEM-HF-MR-500-TTL, on request)

Operation Specifications	
Operating Frequency	13.56 MHz
Baudrate	9600...115200 bit/s, factory preset at 115200
Antenna	SMA female
Reader IC	CL 663
RF TX Speed	up to 848 kBd

Mechanical Specifications	
Dimensions	109.5 × 60 × 17 mm (overall including connectors) 96 × 60 × 17 mm (PCB only)
Weight	58 g
Material	FR4, green

Environmental Conditions	
Operating Temperature	-20 °C ... +80 °C
Storage Temperature	-40 °C ... +85 °C
Humidity	up to 95 %, non-condensing
MTBF	200'000 h

Supported Standards / Tags	
ISO 15693 and compatible	EM4135, EM4043, EM4x33, EM4x35, I-Code SLI / SLIX, M24LR16/64, TI Tag-it HF-I, SRF55Vxx (my-d vicinity)

Applicable Standards	
EMC	EN 301489-1:2012-04 (v1.9.21) EN 301489-3:2013-12 (V1.6.1)
Radio Regulation	EN 300330-1:2015-08 (V1.8.1) EN 300330-2:2015-08 (V1.6.1)
Safety	EN 60950-1:2014-08 EN 62369-1:2010-03 EN 50364:2010-11
RoHS	EC Guideline 2011/65/EU
Certificates	FCC, CE

SDK Information	
Supported OS	Windows XP, Vista, 7, 8, 8.1, 10
Supported Languages	ASCII command protocol, VS2005 C++
Demo Software	Windows

Table of Figures

Figure 1 Top view onto OEM-HF-MR-M500-232 4

Figure 2 Top view onto OEM-HF-MR-M500-TTL..... 4

Figure 3 Tab in test/demo software with workable commands..... 6

Figure 4 Dimensional drawing 7

Figure 5 Position of Ports..... 7

Figure 6 Thermal Pad on Bottom of PCB 8