ISO9001

Read/Write Devices
MTT-S1, MTT-F52-S1
MTT-S2, MTT6000-F51-S1
IDENT-M System T

Handbook
Edition ’98

PEPPERL+FUCHS

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1 General Information

1.1 Explanation of used symbols

Warning

This symbol warns the user of possible danger. Failure to heed this warning can lead to personal injury or death and/or damage to equipment.

Attention

This symbol warns the user of a possible failure. Failure to heed this warning can lead to total failure of the equipment or any other connected equipment.

Note

This symbol gives the user important hints.

This symbol warns wearers of pacemakers, hearing aids and other medicinal electronic implants and devices of interference resulting from electromagnetic radiation in the microwave range.

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1.2 Type-examination certificate

BUNDESAMT FÜR POST UND TELEKOMMUNIKATION
Federal Office For Posts And Telecommunications

BAUMUSTERPRÜFBESCHEINIGUNG
TYPE–EXAMINATION CERTIFICATE

Registriernummer (Registration no.): : A131866J — Anzahl der Anlagen (Number of annexes): 2

Benannte Stelle (Notified body): : Bundesamt für Post und Telekommunikation

Bescheinigungsinhaber (Certificate holder): Pepperl + Fuchs GmbH
Königsberger Allee 85-87
D-68307 Mannheim

Produktbezeichnung (Designation of product): : MTT-S1, MTT-S2, MTO-C1, MTM-C1, MTO-C2, MTM-C2

Produktbeschreibung (Product description): : Funkanlagen für Identifizierungszwecke

Produkthersteller (Product manufacturer): : Tag Master AB
Electrum 410
S-16440 KISTA

Vorschriften (Spezifications): : BAPT 211 ZV 037/2050, Ausgabe April 1997 nach der angewandten technischen Vorschrift FINAL DRAFT prETS 300 440, Ausgabe Dezember 1995

Prüfergebnis (Statement): : Das geprüfte Baumuster erfüllt die Anforderungen der oben genannten Vorschriften.
The examinded type meets the requirements of the above mentioned spezifications.

Hinweis (Note): Dieses Zertifikat gilt nur in Verbindung mit den beigefügten Anlagen.
This certificate is only applicable in conjunction with the above mentioned annex(es).

Diese Bescheinigung ist erteilt in Übereinstimmung mit der TKZulV 1995.
This certificate is issued in accordance with the TKZulV 1995.

Saarbrücken, den 23.07.1997
Ort, Ausstellungsdatum (Place, Issue Date):

gezeichnet (Signed): Bernd Jung
(Verantwortlicher der benannten Stelle) (Manager of notified body)

Bundesamt für Post und Telekommunikation

Bundesamt für Post und Telekommunikation, Talstraße 34–42, D–66119 Saarbrücken, Tel.: +49 6 81 5 98–0, Fax: +49 6 81 5 98–18 00

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2 Safety

2.1 Intended use

The read/write devices MTT-S1, MTT-F52-S1, MTT6000-F51-S1, MTT-S2 are part of the Microwave Identification System Ident-M System T from Pepperl+Fuchs and are used for reading and writing to/from code and data carriers offered through Systems T.

Warning

The safety of the operating personnel and the system are not guaranteed when the microwave read/write device is not used in accordance with its intended use.

The devices MTT-S1, MTT-F52-S1, MTT6000-F51-S1, MTT-S2 must only be operated by trained personnel in accordance with these operating instructions.

The microwave radiation generated by the device is less than 50 mW (EIRP - Equivalent Isotropic Radio Power) and is thereby below the permissible values specified by BAPT 211 ZV 037/2050, issued April 1997.

Please observe, however, that the device emits electromagnetic radiation while in operation and, therefore, must not be used in certain surroundings. Wearers of hearing aids and pace makers are, in particular, requested to consult with a doctor prior to commissioning.

2.2 General safety information

Warning

Safety and correct functioning of the device cannot be guaranteed if any operation other than that described in this operating manual is performed.

The connection of the equipment and any maintenance work to be carried out with voltage applied to the equipment must only be performed by appropriately qualified electro-technical personnel.

In the case that a failure cannot be repaired, the device must be taken out of operation and protected against inadvertently being put back into operation.

Repair work may only be carried out by the manufacturer. Additions or modifications to the equipment are not allowed and void the warranty.

The responsibility for the observance to local safety standards lies with the operator.

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2.3 Functional safety / monitoring

The microwave read/write devices MTT-S1, MTT-F52-S1, MTT6000-F51-S1, MTT-S2 function on a microprocessor basis. They are internally monitored for proper function and component failure.

Function control is possible via the RS232/485 interface.

More detailed information can be found in section 8 'Fault Diagnostics'.

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3 Product Description

3.1 Scope of delivery

The following is included with the delivery of the device:

- 1 operating manual
- 1 read/write device MTT...
- Mounting and installation accessories
- 3.5" diskette with Demo-Software

3.2 Range of application

The Ident-M System T is a functional, highly efficient and safe system for the identification of persons, material and vehicles.

The system is control-system independent and multi-day capable. Equipped with efficient safety functions, data can be safely transmitted with the aid of microwaves between code or data carriers and a read/write device. 100 channels in the 2.45 GHz-range are available for use.

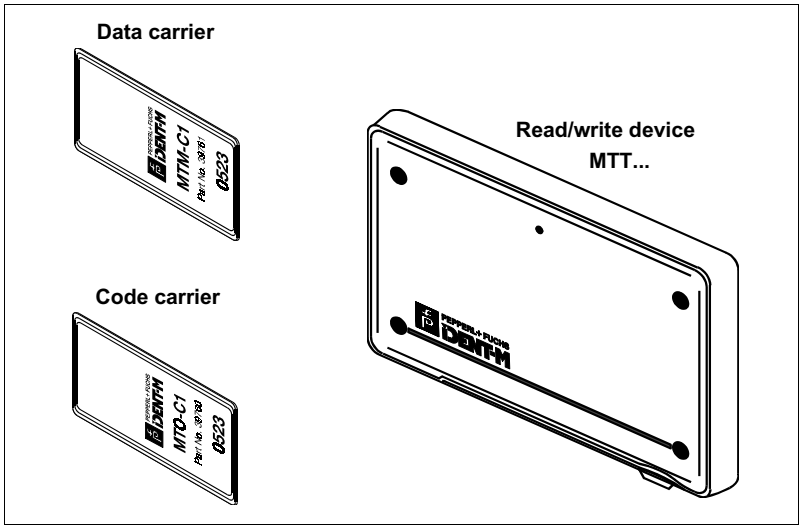

Fig. 3.1: System components Ident-M, System T

As a result, systems can be installed which are made up of several read/write devices, each having the ability to simultaneously communicate with various code or data carriers. In this way the data can be transmitted encrypted and interference-free.

Moreover, the read/write device can also be used to detect various objects, such as humans, animals or vehicles, which move towards or away from the device. In this process the advancing and retreating of objects as well as their speed are registered.

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The basis of the system is the circularly polarised microwave radiation emitted by the read/write device. In the normal case, the radiation spreads in a uniform beam. Microwaves are damped differently by different materials as they spread and are reflected by materials which are metal or which have a metallic surface.

The output of the microwave emitter is measured in such a way that the code and data carriers of the system can read at distances of up to 4 m; data carriers can safely be written to a distances of up to 0.5 m . Motion recognition is ensured at distances of up to 5 m.

Typical areas of application are:

- Area monitoring and access control
- Automotive industry:
  Vehicle identification and production-data memory in the manufacturing process
- Automatic identification of fast-moving object with variable orientation and undefined motion paths.

3.3 System Description

The read/write device establishes the connection between the code and/or data carriers of the Ident-M System and a higher-order computer (industrial-PC, PLC, etc.).

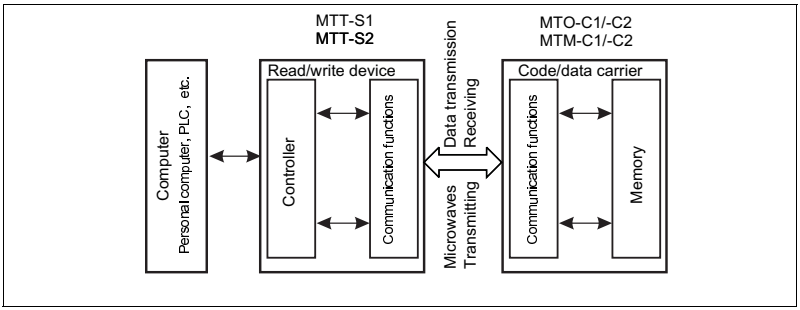

Fig. 3.2: Function of the read/write device within the entire system

For this task, the device is provided with a database function. The memory of the database is realized through a 128 Kbyte Flash-EEPROM. The user and basis software can be stored in two additional 128 Kbyte Flash-EEPROMs. Variables and protocols can be stored in a 128 kByte SRAM. The user software and the database can be actualized by means of one of the serial inputs.

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Two serial interfaces are provided in the devices, an RS232 and an interface which can function as either an RS232 or as an RS485. Additional connections are possible by means of 3 optical coupling inputs, 2 optical coupling outputs and 1 relay output as well as a DTMF-port (tone dial). The DTMF-port is intended for the input of data via a keyboard or a telephone line.

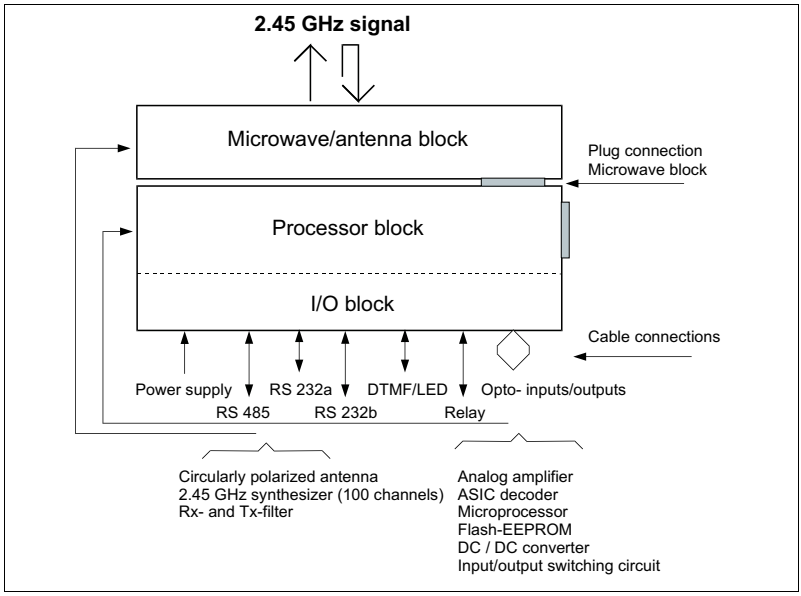

Fig. 3.3: Architecture of the read/write device

An LED which can illuminate in three different colors as well as a buzzer integrated in the device, all of which are controlled via the user program, indicate the operation status.

After removing the front cover, the control panel of the read/write device is accessible. With the exception of the previously mentioned 3-color LED, two 7-segment displays, two pushbuttons and a RESET button are located in the device. By means of these, device settings and tests are possible. One field with three jumpers for the internal battery as well as for the definition of the one serial interface and a monitoring contact for the cover complete the control panel.

Behind the circularly polarized patch antenna is the processor block with its various function groups: analog amplifier, decoder ASIC, 16-bit Hitachi microprocessor, memory, DC/DC converter and I/O switches. The information, e.g. the database, remain in memory even when the DC supply is interrupted for an extended period. The processor block is equipped with a real-time clock (RTC) and a "Watchdog" for automatic restart in the event of malfunction. The battery for the SRAM memory and the clock is automatically charged as soon as the device is connected to a voltage source. In this way, the battery retains its voltage for up to two weeks after power disconnection.

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3.4 Device variants

The microwave read/write devices are available in four versions, where the device variants MTT-S1, MTT-F52-S1 and MTT6000-F51-S1 are hardware and software compatible.

MTT-S1

Standard device with following characteristics:

- Maximum read distance: 4 m
- Standard housing with protection class IP 43
- Rated operating voltage 24 V DC, switchable to 12 V DC
- Stand-alone operation by means of internal application software possible
- 384 kByte Flash-EEPROM for program and database memory
- Internal control unit with push button switches, 7-segment displays and buzzer
- Host interfaces: Port A: RS 232,
  Port B: RS 232 / RS 485 2-wire/ RS485 4-wire switchable
- Real time clock

MTT-F52-S1

Same as stand-alone device, however:

- Special housing with protection class IP 65
- Without housing cover monitoring

MTT6000-F51-S1

Same as stand-alone device, however:

- Maximum read distance: 6 m
- Larger housing with protection class IP 56

MTT-S2

Low-cost version with following characteristics:

- Maximum read distance: 4 m
- Standard housing with protection class IP 43
- Rated operating voltage only 12 V DC
  (no DC/DC converter, only voltage regulator without galvanic isolation)
- Stand-alone operation not possible
- 128 kByte Flash-EEPROM for program memory (no database function)
- Internal control unit with pushbutton switches, but without 7-segment displays and buzzer
- Host interfaces: Port A: RS 232,
  Port B: RS 232 / RS 485 2-wire switchable
- No real-time clock

Note

Detailed information can be found in the Sensor Systems 1 Catalog (identification systems) and in the following sections of this manual.

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3.5 Write and read ranges

For plane parallel alignment of code/data carriers and read/write devices, the read range is dependent on the following settings:

- Transmission power (low/high) of the read/write device
- Reception sensitivity (low/high) of the read/write device
- Set read rate of the code/data carrier

The combination of the transmission power and reception sensitivity can be used to set the read range to four levels. The following read-range settings are possible:

read range	sensitivity	transmission power	range factor
1	HIGH	HIGH	100 %
2	HIGH	LOW	50 %
3	LOW	HIGH	25 %
4	LOW	LOW	12 %

Table 3.1: Read range as a function of sensitivity and transmission power

Data are always written to a data carrier with an elevated transmission power at 4 kBit/s. Write operations to a data carrier are independent of reception sensitivity and read speed.

The maximum read distance is 0.5 m for all devices.

The following two illustrations show the read ranges of the read/write devices:

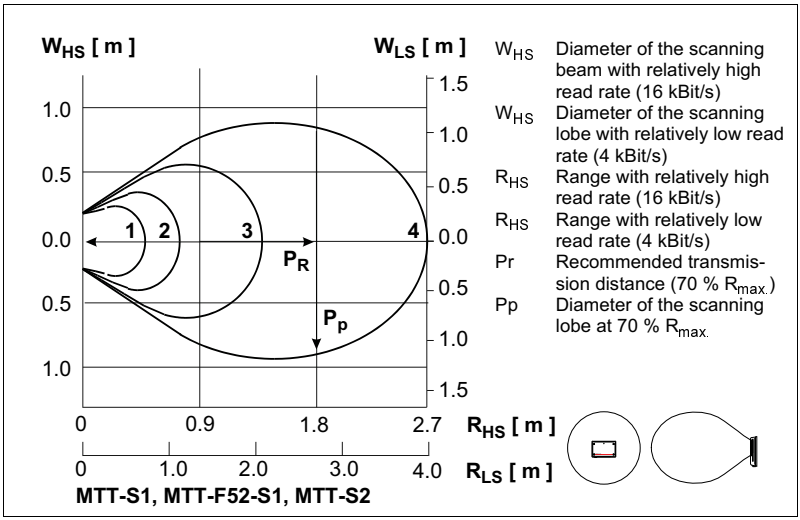

Fig. 3.4: Read ranges of the MTT-S1, MTT-F52-S1 and MTT-S2

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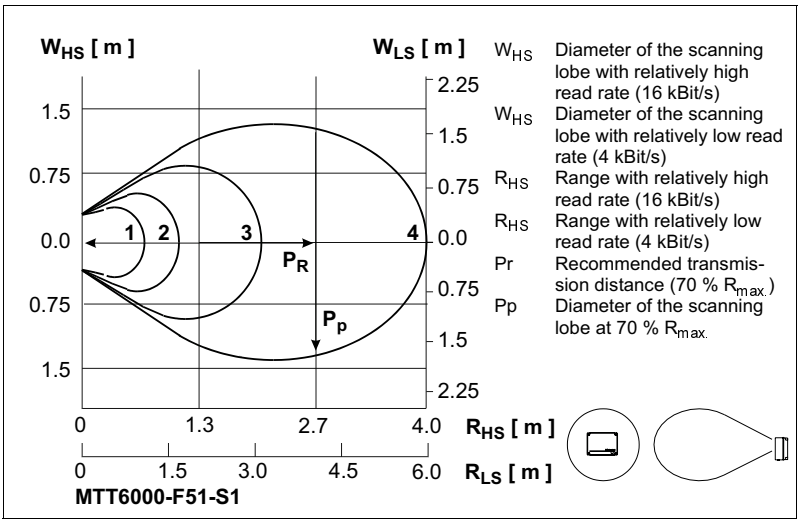

Fig. 3.5: Read ranges of the MTT6000-F51-S1

3.6 Accessories

Code carrier MTO-C1 / MTO-C2

The code carrier can still be safety read at a distance of 4 m, even when multiple code carriers are located in the read zone.

Each code carrier is delivered ex works with an 8-digit decimal number and a 32-bit checksum for unique identification. As a result, it is impossible to confuse the carriers. An environmentally friendly lithium cell ensures a long operating life, independent from the number of read procedures. When the capacity is depleted, a bit is set in the status register of the code carrier. This bit can be analyzed at the next data transmission from the read/write device.

The code carrier MTO-C1 can be mounted with a clip, a card carrier, magnetically, or with adhesive strips. It is still prepared with holes for mounting with M3 screws. The code carrier MTO-C2 is mounted with 2 M4 screws.

The code carrier is vibration-proof, waterproof, corrosion resistant, UV-stable and resists chemicals.

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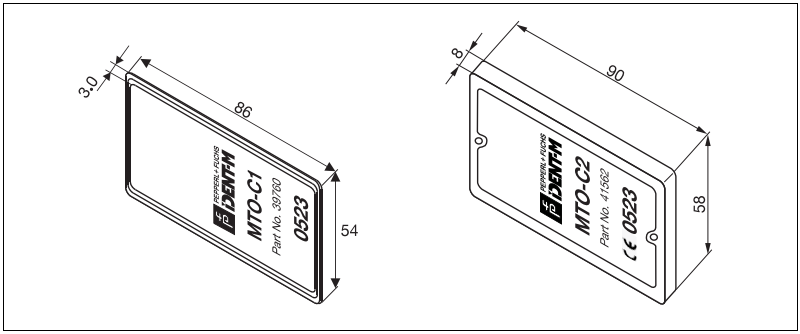

Fig. 3.6: Code carrier MTO-C1 and MTO-C2

Data carrier MTM-C1 / MTM-C2

The data carrier is a read/write data carrier and can be read at a distance of 4 m and, depending on various settings, safety written at a distance of 0.5 m.

Up to 606 Bits (i.e.. 82 7-bit-ASCII characters and one checksum) can be stored in the data carrier. In addition, an 8-digit decimal number with checksum stored in memory by the manufacturer ensures that the individual data carriers are not confused with one another.

Formatting and setting of the various possible operating modes is carried out by means of microwaves. The same conditions as for the writing of data apply. The distance of the read/write device must not exceed 0.5 m here.

The life expectancy of the internal lithium cell is dependent on the mode in which the data carrier is operated. When the voltage drops at the end of the cell's lifetime, a bit is set in the status register which is transmitted to the read/write device with each read process.

The data carrier is vibration-proof, waterproof, corrosion resistant, UV-stable and resists chemicals.

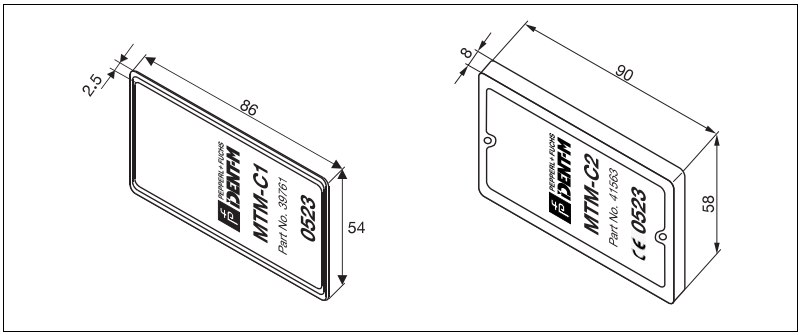

Fig. 3.7: Data carrier MTM-C1 and MTM-C2

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Data carrier MTM-99-T4

The data carrier is a read/write data carrier and can be read at a distance of 4 m and, depending on various settings, safety written at a distance of 0.2 m.

Up to 606 Bits (i.e. 82 7-bit-ASCII characters and one checksum) can be stored in the data carrier. In addition, an 8-digit decimal number with checksum stored in memory by the manufacturer ensures that the individual data carriers are not confused with one another.

Formatting and setting of the various possible operating modes is carried out by means of microwaves. The same conditions as for the writing of data apply. The distance of the read/write device must not exceed 0.2 m here.

The life expectancy of the internal lithium cell is dependent on the mode in which the data carrier is operated. When the voltage drops at the end of the cell's lifetime, a bit is set in the status register, which is transmitted to the read/write device with each read process.

The MTM-99-T4 is designed for temperatures of up to 200 °C as may occur in paint shops in automobile manufacturing.

The data carrier is vibration-proof, waterproof, corrosion resistant, UV-stable and resists chemicals.

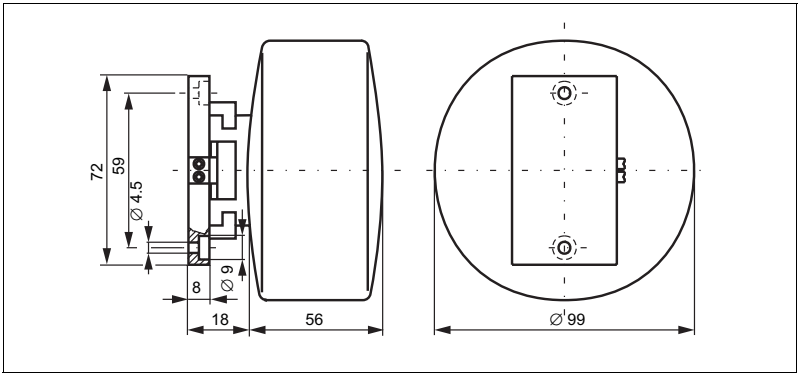

Fig. 3.8: Data carrier MTM-99-T4

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Card holder MTA-C1V1 / MTA-C1V2

The card holder MTA-C1V1 is recommended for mounting the code and data carriers of the IDENT-M System to most objects. The primary application area is the identification of persons. Horizontal or vertical fasteners with a clip are available; the holder can also be mounted with the aid of a twine.

The code or data carrier is inserted into and removed from the card holder without the use of tools. A specially shaped edge ensures that, even when shaken, the code or data carrier remains in the card holder and prevents mechanical damage.

Without a clip or string, numerous provided holes allow the code or data carriers to be mounted with screws or rivets.

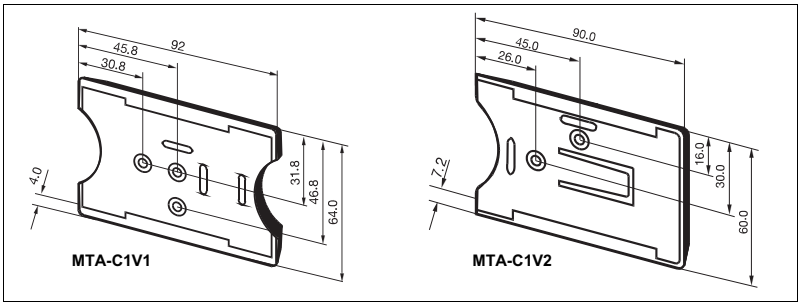

Fig. 3.9: Card holder MTA-C1V1 and MTA-C1V2

Card holder MTA-C1V2 is specially designed for mounting a code carrier to the inside of a car window. Another possibility is in the area of person identification where the code carrier can be fastened to clothing by means of a plastic elastic tongue. As this card carrier is transparent, the detection of the inserted code carrier can also be made optically.

Space is also provided in card holder MTA-C1V2 for an additional card, e.g. a passport photo or magnetic card. The microwave penetrates this card without problem.

Software

Note

Upon request, Pepperl+Fuchs also develops customer-specific application software. Special software drivers are also available upon request from Pepperl+Fuchs.

Additional information on the components of the Microwave Identification System IDENT-M System T can be found in the Sensor Systems 1 catalog and in the respective data sheets.

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4 Installation

4.1 Storage and transport

The read/write device must be packed for storage and transport so that it is shock-resistant and protected against humidity. The original packaging offers optimal protection.

The necessary environmental conditions also must be satisfied (see Technical Data).

4.2 Unpacking

Check that the contents are not damaged. In case of damage, notify the postal service or the forwarding agent and inform the deliverer.

Check the contents of delivery with respect to your order and the delivery papers for:

- quantity delivered
- device type and version according to the name plate
- accessories
- handbook(s)

Keep the original packaging in case the device must be repacked and stored or re-shipped.

For any further questions please contact Pepperl+Fuchs GmbH.

4.3 Installation

4.3.1 Selecting the installation site

When selecting the installation site, observe the following:

- Install the read/write device on a flat surface. Use an adjustable mounting plate if the alignment of the device must be optimised or changed. In particular, if metal surfaces are located in the direct vicinity of the code/data carriers within the read/write zone, several attempts may, under some circumstances, be necessary to achieve optimal alignment of the device.
- Optimal read/write behavior is achieved when the surfaces of the code/data carriers are, under operating conditions, aligned plane parallel to the emission surface of the read/write device.
- If your application permits, avoid using the maximum read and write distances, particularly if the code/data carriers move through the detection zone at high speed.
- The read/write devices should, for reasons of optimal sealing and accessibility, be installed such that the cable connections point downward.
- When installed outdoors, device version MTT-F52-S1 must be installed with protection class IP 65. To eliminate functional disturbances due to atmospheric effects, e.g. icing, a weather protection cover should also be installed where necessary.

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Example:

For the identification of vehicles, code carriers installed behind the windshield are to be read by the read/write device.

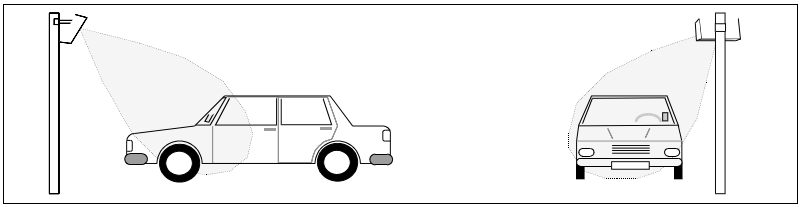

Fig. 4.1: Application example: vehicle identification

Optimal read results are achieved for this application when the MTT... is installed angling downwards at a height of approx. 2 m.

4.3.2 Installing the read/write device

Remove the housing cover of the read/write device by loosening the 4 or 6 screws on the front side. The device is secured with 4 M4 screws. The locations of the mounting holes are shown for the various device variants in the following illustrations.

Device variants MTT-S1, MTT-S2

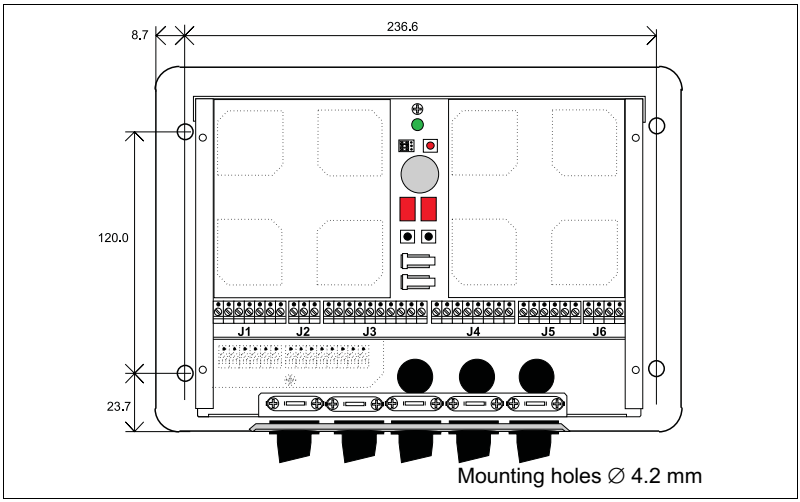

Fig. 4.2: Mounting hole locations: MTT-S1, MTT-S2

For certain safety-technical applications in which housing cover removal is monitored by a microswitch and the connection cables cannot be accessible from the exterior, it is possible, for devices MTT-S1 and MTT-S2, to guide the cable through the rear housing wall of the device.

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Attention

In this case, note that protection class IP43 is no longer guaranteed for the device.

Device variant MTT-F52-S1

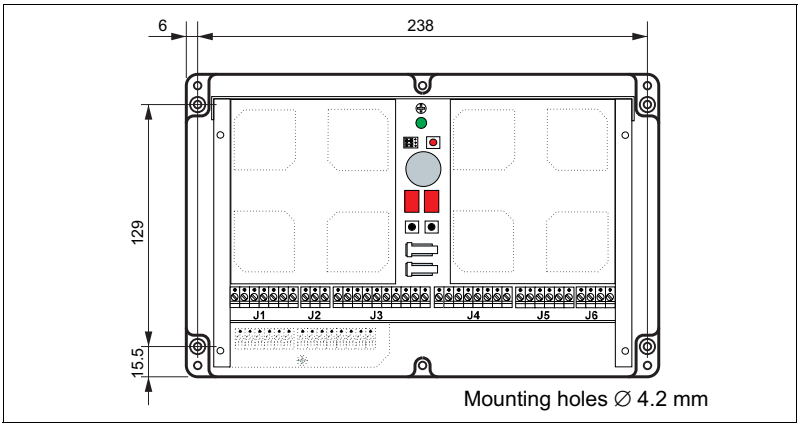

Fig. 4.3: Mounting hole locations: MTT-F52-S1

Device variant MTT6000-F51-S1

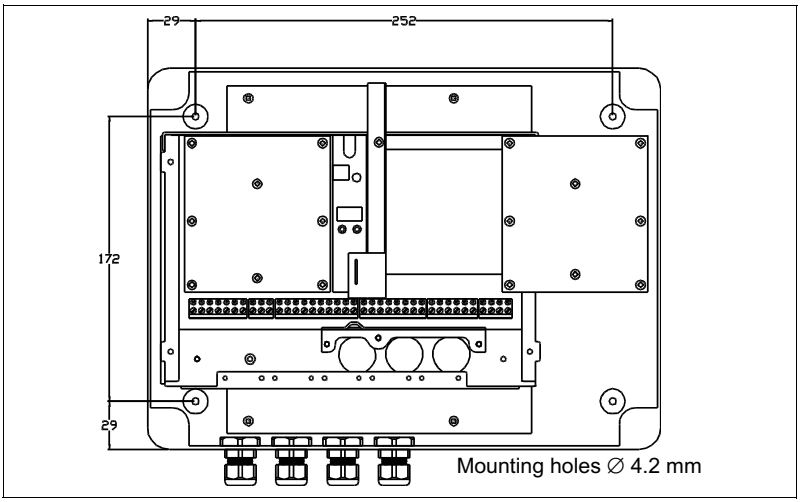

Fig. 4.4: Mounting hole locations: MTT6000-F51-S1

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4.4 Electrical connection

Warning

Only qualified personnel are permitted to carry out work under voltage and make electrical connection to the mains.

Ensure that the correct voltage is applied according to the name plate of the device.

A mains isolating device must be installed close to the read/write device and labeled as such for the MTT...

Before making electrical connections and carrying out service work, the device must be disconnected from all voltage sources.

Wait at least 1 minute after disconnecting before removing a circuit board. The device electronics may otherwise be damaged.

4.4.1 Device connection

After removing the housing cover, all components required for device connection are accessible.

The position of the connection terminals is given in the following illustration:

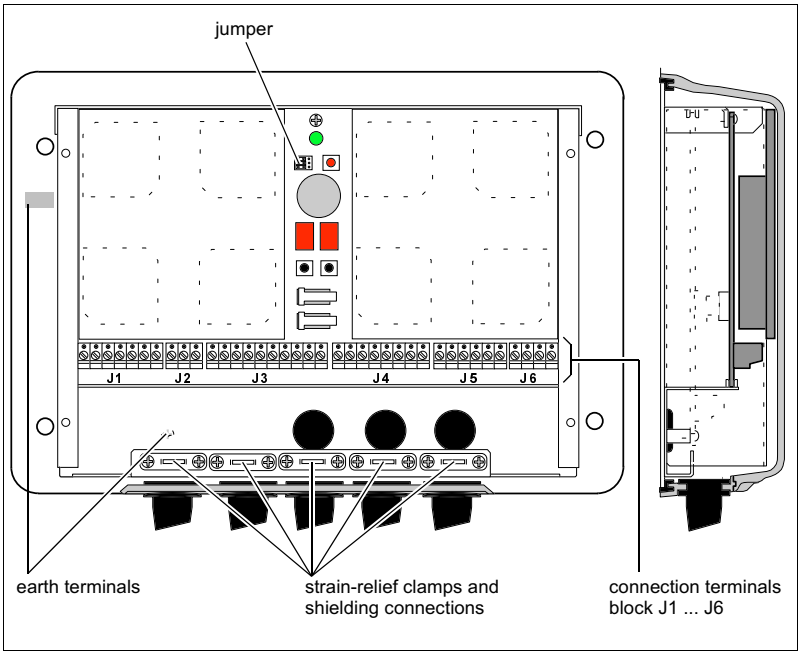

Fig. 4.5: Connection terminal locations MTT-S1, MTT-S2

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Use only shielded cable for all device connections. Connect the cable shielding to the housing ground of the read/write device. By connecting the shielding mesh and/or shielding foil together with the cable under the strain-relief clamps, the device is effectively connected to ground.

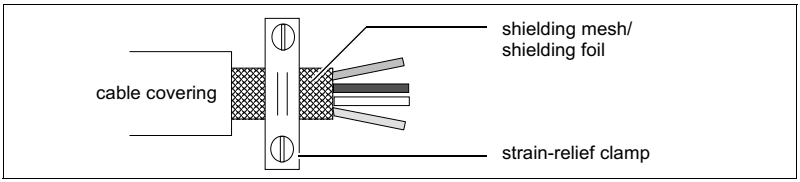


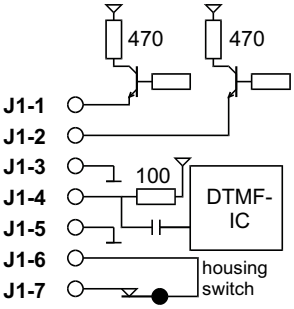
Fig. 4.6: Connection of shielding to the strain-relief clamps

The electrical connection of the read/write device is made by means of the self-opening screw terminals located in the detachable terminal blocks J1 through J6.

4.4.2 Terminal assignment list

Terminal block J1:

Terminals	Signal	Meaning
J1-1	LED 1	LED output 1
J1-2	LED 2	LED output 2
J1-3	GndLED	ground LED output
J1-4	SDTMF	DTMF interface
J1-5	RtnDTMF	
J1-6	Tamp a	Housing switch
J1-7	Tamp b	



Terminal block J2:

Terminals	Signal	Meaning
J2-1	Tx 232a	RS 232 interface A
J2-2	Rx 232a	
J2-3	Gnd 232a	

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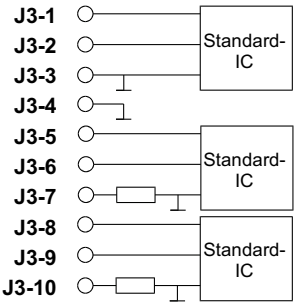
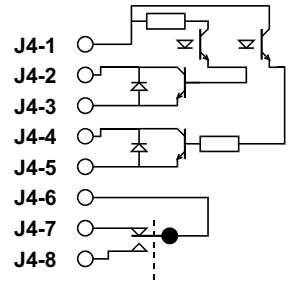
Terminal block J3:

Terminals	Signal	Meaning
J3-1	Tx 232b	RS 232 interface B
J3-2	Rx 232b	
J3-3	Gnd 232b	
J3-4	CGnd	Common ground
J3-5	Tx–/Rx– 485	RS 485 interface
J3-6	Tx+/Rx+ 485	
J3-7	Gnd485t	
J3-8	Rx 485–	
J3-9	Rx 485+	
J3-10	Gnd 485r	



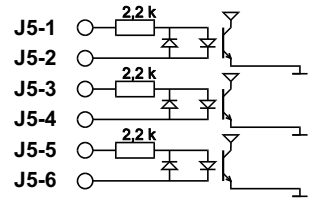
Terminal block J4:

Terminals	Signal	Meaning
J4-1	Outspl1	Voltage outputs
J4-2	Out 1c	Output 1, collector
J4-3	Out 1e	Output 1, emitter
J4-4	Out 2c	Output 2, collector
J4-5	Out 2e	Output 2, emitter
J4-6	R1c	Relay output
J4-7	R1b	
J4-8	R1m	



Terminal block J5:

Terminals	Signal	Meaning
J5-1	In 1a	Optical coupling input 1
J5-2	In 1c	
J5-3	In 2a	Optical coupling input 2
J5-4	In 2c	
J5-5	In 3a	Optical coupling input 3
J5-6	In 3c	



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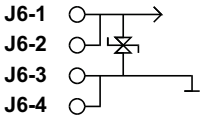
Terminal block J6:

Terminals	Signal	Meaning
J6-1	Spl 1	Supply voltage +
J6-2	Spl 2	
J6-3	Rtnspl 1	Supply voltage –
J6-4	Rtnspl 2	



4.4.3 Connection diagrams

RS 232 interface A/B

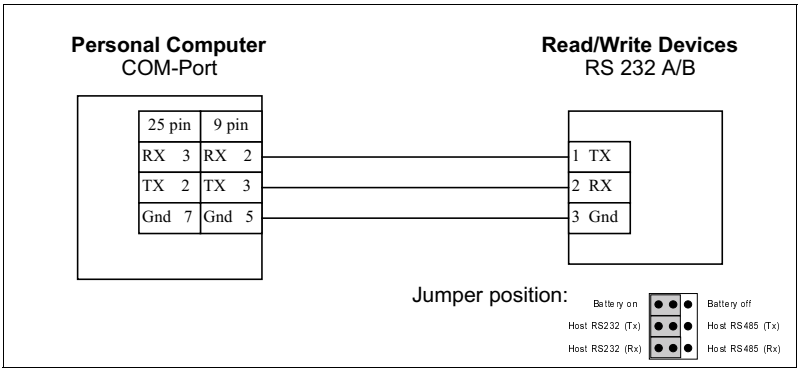


Fig. 4.7: Connection to PC / Host via one of the RS 232 interfaces

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RS 485 interface

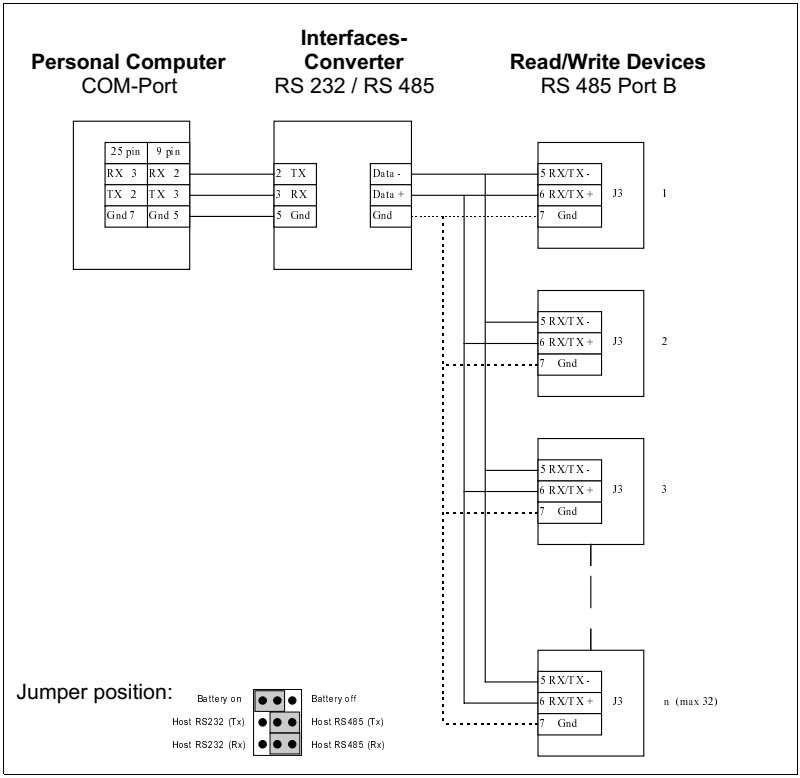

Fig. 4.8: Multipoint connection to PC / host via the RS 485 interface

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MTT6000-F51-S1Inputs/outputs

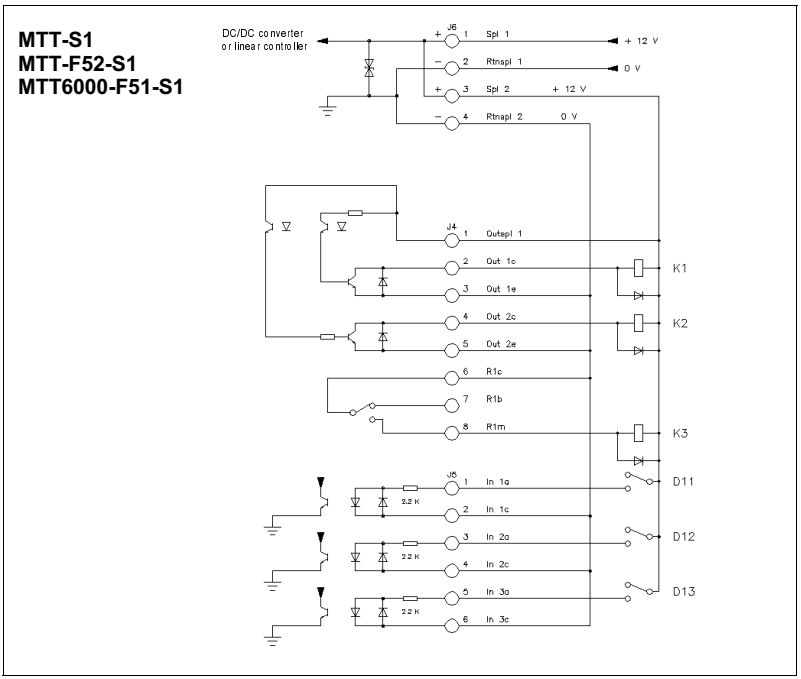

Fig. 4.9: Wiring of the inputs and outputs

Supply voltage

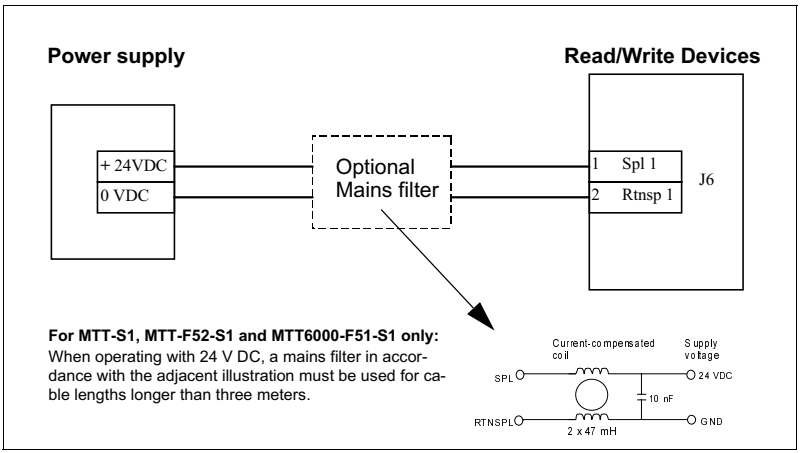

Fig. 4.10: Connection of the supply voltage

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4.4.4 Connection cables to be used

When connecting the read/write device, use only cables meeting the following specifications:

power supply	AWG 0.5 mm^2, 2-wire mains voltage 300 V max. temperature + 80 °C recommended outside diameter > 5 mm max. cable length 100 m
inputs/outputs, DTMF-interface	AWG 0.5 mm^2 mains voltage 300 V max. temperature + 80 °C recommended outside diameter > 5 mm max. cable length 100 m
RS 232	cable in accordance with RS 232 specification EIA RS232C, e.g. Belden 9184 or Belden 9502
RS 485	cable in accordance with RS 485 specification EIA RS485, e.g. Belden 9841

4.4.5 Hardware settings

Jumper:

There are 3 jumpers located on the main circuit board (see figure 4.5) for the following settings:

- Buffer battery for internal RAM: on/of
- Switchover host-interface port B Tx: RS 232/RS 485
- Switchover host-interface port B Rx: RS 232/RS 485

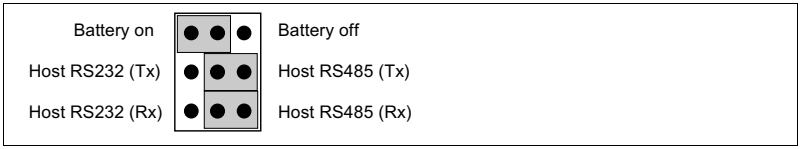

Fig. 4.11: Jumper settings

Changing the rated operating voltage to 10 ... 14 V DC (does not apply to MTT-S2)

The rated operating voltage must only be adjusted by properly trained technical personnel.

Below the right-hand side of each of the microwave antennas are additional jumpers which can be used to adjust the rated operating voltage from 24 V DC (factory setting) to 12 V DC. The jumpers are marked on the circuit board correspondingly.

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4.4.6 EMC, shielding, earthing

The shielding of the cables serves to protect against electromagnetic interference. One side of the shielding is connected to a low-impedance connection to ground, whereas the other side is capacitively coupled. The microwave-read/write devices MTT-S1, MTT-F52-S1, MTT6000-F51-S1, MTT-S2 are provided with two earth terminals (see figure 4.5).

When installing, connect these two terminals to ground. This is best carried out using large metallic objects with a galvanic ground connection, e.g. switching cabinets, high-bay storage posts, etc.

If a cable with double shielding is used, e.g. metallic wire mesh and metallic foil, a low-impedance connection must be made between the two shieldings at the cable ends when preparing the cable.

Many noise impulses come from the supply cables, e.g. switch-on current of a motor. For this reason, running the supply cables in parallel with the data/signal cables, especially in the same cable duct, should be avoided.

4.5 Disassembly, packing and disposal

Repacking

The device must be protected against humidity and shock when packing for later use. The original packaging offers optimal protection.

Disposal

Note

Electronic waste can be hazardous. Pay attention to local regulations when disposing of the device.
The microwave-read/write devices MTT-S1, MTT-F52-S1, MTT6000-F51-S1, MTT-S2 contain an internal, rechargeable backup battery (Panasonic UL 1220 or other.) which must be removed and separately disposed of prior to device disposal.

The backup battery is located on the control panel circuit board between the two push-buttons and the housing switches below the shielding plates.

The battery can be removed for disposal by bending the battery's contact/retaining latch upwards with, for example, a screw driver, and levering the battery out.

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5 Commissioning

Warning

Prior to commissioning, ensure that the system in which the read/write device is integrated cannot be placed in danger, e.g. through unmonitored controlled processes.

Attention

Recheck all connections and hardware settings before proceeding with the commissioning.

Before commissioning, become familiar with the configuration of the read/write device (sections 6 and 7 of this manual).

Note

If you would like to use independently developed application software, Pepperl+Fuchs recommends first installing the identification system in a laboratory for the purpose of testing the system.

5.1 Checking device arrangement

Before starting device commissioning, please check the following points:

- Make certain that all electrical connections and jumper settings are correct.
- Make certain that no metallic objects are located in the communication range between the code/data carrier and the read/write device.
- Ensure that the code/data carrier(s) and the read/write device are aligned as plane-parallel to one another as possible. Only in this way is the largest possible read/write distance and communication range obtained.
- To avoid communication errors, avoid using the maximum permissible read/write distances where possible.
- Make certain that at the installation site the function of the read/write device cannot be influenced by elevated temperatures and electromagnetic fields.

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5.2 Operating Modes

5.2.1 Operating modes for MTT-S1, MTT-F52-S1 and MTT6000-F51-S1

The read/write devices of types MTT-S1, MTT-F52-S1 and MTT6000-F51-S1 are provided with 4 operating modes plus a special mode (see section 7.2) with which simple commands can be sent to the device via the terminal program.

Communication with the host is possible in all operating modes via one of the serial interfaces. For purposes of speed, however, larger quantities of data should be transmitted in the operating mode 'Off'.

Operating mode 'On'

The internal application software of the read/write device is active in this operating mode and facilitates simple stand-alone operation, i.e. access control with activation of a door opener contact. The device configuration can, in this case, be carried out with the aid of only the internal control panel (see section 6).

Operating mode 'Off'

The internal application software of the read/write device is not active in this operating mode, i.e. stand-alone operation is not possible. The read/write device waits for commands which are sent via the serial interface. These commands are transmitted from the host via the device's own ConfiTalk protocol (see section 7.1).

Operating mode 'read-beep'

This operating mode is used for simple commissioning, testing, and alignment of the system for read applications. As soon as a code/data carrier is successfully read, the buzzer sounds. No code/data carrier logging is performed. In this operating mode, you can relatively easily determine the read range for your application.

Operating mode 'program-beep'

This operating mode is used for simple commissioning, testing, and alignment of the system for write applications. As soon as a code/data carrier is successfully read, the buzzer sounds. No code/data carrier logging is performed. In this operating mode, you can relatively easily determine the write range for your application.

5.2.2 Operating modes for MTT-S2

The MTT-S2 device variant is provided with only one operating mode. In most respects this mode corresponds to the operating mode 'Off' for MTT-S1.

The read/write device waits for commands which are sent via the serial interface. These commands are transmitted from the host via the device's own ConfiTalk protocol (see section 7.1).

The 'Mail Message' functionality is limited. The special 'Check SW' mode is supported as with MTT-S1 (see section 7.2).

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5.3 Installation of the enclosed demo-software

The easiest method of checking the device for proper function is by installing the supplied demo-software on a notebook/PC and connecting the read/write device via the RS 232 interface (Port A) to the COM-Port on the notebook/PC (see figure 4.7).

Note

The demo-software is delivered with a corresponding software manual. This manual covers program installation, operation, and communication with the read/write device in detail.

5.4 Checking communication

PC communication

First check that the communication between the PC and read/write device via the RS 232 interface is functioning correctly as described in the demo-software manual.

Microwave communication

If communication between the notebook/PC and the read/write device is in proper working order, you should next test the microwave communication between the code/data carriers and the read/write device with the aid of the demo software.

To do this, first hold a code and/or data carrier plane parallel in front of the emission surface of the MTT and perform read and/or write operations with the demo-software.

In the second step, you should test communication under real operating conditions, particularly if the code/data carriers move through the write or read zone with relatively high speed or with irregular paths.

The tests are carried out ideally in the operating mode 'read-beep'. In this mode each successful read operation is signaled by a brief sounding of the built-in buzzer. You can then concentrate entirely on your application test without the need to constantly watch the PC monitor.

Note

Information on the correction of communication problems can be found in section 8, Fault Diagnostics.

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5.5 Operation under demanding conditions

Microwave communication may be impaired under certain conditions:

- Problems may arise when metal surfaces are located in the area of the emission beam between code/data carriers and the read/write device.
- As a result of reflection of the emitted microwave radiation, the maximum read distance may be extended or the emission lobe may be narrowed.
- If the code/data carriers are to be read at a very close distance to the MTT, the maximum read distance or the reception sensitivity can be reduced to prevent unintentional reading of more distant code/data carriers.

In these cases, alignment and the optimal mounting site of the MTT, as well as position, speed and motion recognition of the code/data carriers, must be determined through a series of trials.

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6 Configuration via the Internal Control Panel

6.1 Operation and display elements

The device can be configured via the internal control panel even when no PC/Host is connected to the read/write device.

A parameter can be selected and displayed in the two-digit 7 segment display by pushing the left pushbutton above the two housing switches several times. The values/options of the displayed parameter can be changed by pushing the right pushbutton several times. The new setting is accepted and activated by pushing the left button once.

After opening the read/write device, the control and display elements are accessible. They are located between the two microwave antennae.

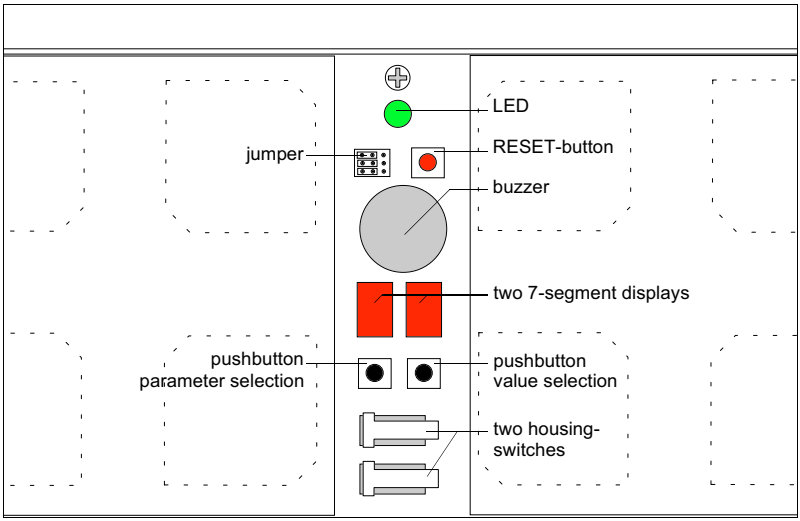

Fig. 6.1: Location of the control and display elements

Note

Device settings made via the control panel remain stored in nonvolatile memory in the device even after the operating voltage has been disconnected for longer periods of time.

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Restoring default values

Upon restoring the device configuration to the default values, all previously made settings are lost and the database deleted.

You have two options to restore the device configuration to the default values:

RESET during operation

Proceed as follows:

1. Push and hold down both black pushbuttons ’parameter selection’ and ’value selection’ simultaneously.
2. Also push the red RESET button until the LED flashes yellow.
3. Release the two buttons.
4. Push the red RESET button again and wait until the LED flashes green.

The default values are now loaded. The database has been deleted.

RESET when applying the operating voltage

Proceed as follows:

1. Switch off the operating voltage.
2. Push and hold down both black pushbuttons ’parameter selection’ and ’value selection’ simultaneously.
3. Switch the operating voltage back on.
4. Wait until the LED flashes green.
5. Release the two buttons.

The default values are now loaded. The database has been deleted.

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6.2 Configuration

In the following sections, all parameters which can be set via the control panel as well as their respective values/options are listed in tabular form.

Note

Each parameter's default value is indicated in the table by an asterisk (*).

6.2.1 Operating mode and microwave communication configuration

Parameter		Values / options	
Display	**Meaning**	**Display**	**Meaning**
OP	Operating mode	OF	The internal device application software is deactivated and the read/write device reacts only to ConfiTalk commands or mail messages from the host.
		On *	The internal device application software is active
		rb	'read-beep' mode
		Pb	'program-beep' mode
ch	Frequency channel	1 ... 99	Channel 1 to 99
		50 *	Default settings: Channel 50
rr	Read range	1	Low power, low sensitivity
		2	High power, low sensitivity
		3	Low power, high sensitivity
		4 *	High power, high sensitivity
dS	Data speed	HI *	High transfer speed
		Lo	Low transfer speed
rc	RC code carrier	OF *	Code carrier with quartz oscillator
		On	Code carrier with RC oscillator

Table 6.1: Microwave communication configuration

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6.2.2 PC-interface (Port A) and Host-interface (Port B) configuration

Parameter		Values / options	
Display	**Meaning**	**Display**	**Meaning**
SP	Serial host-interface, Port B :	23	RS 232
		42 *	RS 485 2-wire
		44	RS 485 4-wire
Ad	ConfiTalk address, Port B	1 ... 99	Addresses 1 to 99
		1 *	Default settings: address 1
br	Baud rate	12	Transfer rate 1200 kBit/s
		24	Transfer rate 2400 kBit/s
		48	Transfer rate 4800 kBit/s
		96 *	Transfer rate 9600 kBit/s
		19	Transfer rate 19200 kBit/s
		38	Transfer rate 38400 kBit/s
Sb	Stop-Bits	1 *	1 Stop-Bit
		2	2 Stop-Bits
PA	Parity	n *	No parity
		o	Odd parity
		E	Even parity

Table 6.2: PC-interface (Port A) and Host-interface (Port B) configuration

6.2.3 Other configuration settings

Parameter		Values / options	
Display	**Meaning**	**Display**	**Meaning**
db	Search database	OF	No search in database
		On *	Search to determine whether the read code/data carrier is included in the data-base
dr	Motion-recognition (Doppler radar)	OF *	Motion recognition not active
		1 ... 5	Motion recognition active, sensitivity: 1 = low, 5 = high

Table 6.3: Other configuration settings

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Parameter		Values / options	
Display	**Meaning**	**Display**	**Meaning**
Lo	Event protocol (Log)	OF	No logging
		Fo *	Logging of all code/data carriers found in the database
		AL	Logging of all read code/data carriers
		do	Logging of all detected motion
		Fd	Logging of all code/data carriers found in the database and all detected motion
		Ad	Logging of all read code/data carriers and all detected motion
rE	Relay output	OF	Relay output not active
		Fo *	Activation of the relay output when code/ data carrier found in database
		AL	Activation of the relay output when code/ data carrier read
		do	Activation of the relay output for all detected motion
		Fd	Activation of the relay output when code/ data carrier found in database and for all detected motion
		Ad	Activation of the relay output when code/ data carrier read and for all detected motion
bu	Buzzer	OF	Buzzer not active
		Fo *	Activation of the buzzer when code/data carrier found in database
		AL	Activation of the buzzer when code/data carrier read
		do	Activation of the buzzer for all detected motion
		Fd	Activation of the buzzer when code/data carrier found in database and for all detected motion
		Ad	Activation of the buzzer when code/data carrier read and for all detected motion

Table 6.3: Other configuration settings

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Parameter		Values / options	
Display	**Meaning**	**Display**	**Meaning**
LE	LED activation	OF	LED always off
		Fo *	LED green when code/data carrier found in database, otherwise LED red
		AL	LED green when code/data carrier read
		do	LED yellow for all detection motion
		Fd	LED green when code/data carrier found in database, otherwise LED red, LED yellow for all detected motion
		Ad	LED green when code/data carrier read, LED yellow for all detected motion
tI	Tripping time (relay, buzzer, LED)	=5 ··· 10	Duration in seconds for which the relay the buzzer and/or LED are activated, e.g. activation of a door-opening contact at an access control
		5 *	Default settings: S5
tS	Log housing switch	OF *	No logging
		On	Logging when the housing switch is switched upon removal of the housing cover

Table 6.3: Other configuration settings

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7 Communication with a Host/PC

7.1 ConfiTalk communication protocol

ConfiTalk is modelled on the BSC-protocol (ISO-1745 Basic Mode) developed by IBM. All communication processes are initiated by commands from the host. The MTT responds to commands sent by the host with identically constructed responses.

Commands and responses consist of a start-of-text character STX (02h), address (1...127) of the read/write device, command or message, checksum and an end-of text character ETX (03h).

STX	ADR	Command/ message	Checksum CS	ETX

All characters are transmitted with the least significant bit first (LSBF - Least Significant Bit First).

For synchronization, i.e. for reliable assignment of commands and responses, the most significant bit of the address field is toggled. The bit is not set on the first command. On the response to this command, the bit is also not set. On the next command and in the response to this command, the bit is set. On the following command, the bit is again not set, etc. Using this process, it can be ensured that responses and commands are correctly assigned. In the event of a fault, a SYN message is transmitted to reestablish synchronization.

A response to a command should follow within 0.5 s. If either no response is received or the response which is received is false, the command should be transmitted with toggled synchronization bit. If no valid response is received after transmitting a command 5 times, a SYN message should be transmitted.

The checksum consists of an XOR-link of all bytes which precede the checksum. The XOR-link of all bytes from STX to including the checksum is, therefore, 0.

If one of the control characters STX, ETX, ACK, DLE, NAK or SYN are present in the address, the message, or checksum, a DLE character (Data Link Escape) is inserted before this character. The DLE characters inserted in front of an address or message are included in the checksum calculation. DLE characters inserted in front the checksum are not included in the checksum calculation.

Character	hexadecimal	decimal
STX	02	2
ETX	03	3
ACK	06	6
DLE	10	16
NAK	15	21
SYN	16	22

The devices are delivered with internal device application software. This program also accesses the device functions via ConfiTalk. To avoid overlapping, it is important to switch off the device application software (operating mode 'OF', see section 6.2.1).

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Synchronization:

A SYN message is treated as a command, i.e. the most significant bit of the address byte corresponds to the inverted most significant bit of the address byte of the previous command. The read/write device does not send a response to a SYN command.

Synchronization should always be carried out as the first command :

1. transmitted command: $\mathbf{02_{hex}\ 01_{hex}\ 16_{hex}\ 10_{hex}\ 15_{hex}\ 03_{hex}}$ (Toggle-Bit = 0)

Response: none

For subsequent SYN commands, the toggle bit corresponds to the inverted toggle bit of the previous command:

subsequently transmitted SYN command: $\mathbf{02_{hex}\ 01_{hex}\ 16_{hex}\ 10_{hex}\ 15_{hex}\ 03_{hex}}$ (Toggle-Bit = 0)

or $\mathbf{02_{hex}\ 81_{hex}\ 16_{hex}\ 95_{hex}\ 03_{hex}}$ (Toggle-Bit = 1)

Response: none

7.2 'Check SW' mode

In this mode, a part of command transmitted via ConfiTalk can bypass the ConfiTalk protocol and be directly transmitted to the read/write device in the form of one or two ASCII characters (see section 7). All that is required is a terminal or a PC with terminal program.

Activation of 'Check SW'

Proceed as follows:

1. Switch off the operating voltage and remove the housing cover.
2. Push and hold down one of the two black pushbuttons 'parameter selection' and 'value selection'.
3. Switch the operating voltage back on.
4. Wait until the LED flashes yellow.
5. Release the button.

The 'Check SW' mode is now active.

If, instead of pushing down only one of the pushbuttons, you push them both down simultaneously, the default device configuration settings will be loaded and the database deleted!

As a result, all previously made settings are deleted!

Deactivation of 'Check SW'

The 'Check SW' mode remains active until the read/write device receives a ConfiTalk command via a serial interface port. The device then switches to the normal, set operating mode.

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Note

The ConfiTalk command which deactivates the 'Check SW' mode is not interpreted and is lost. If this command needs to be interpreted, it must be transmitted again.

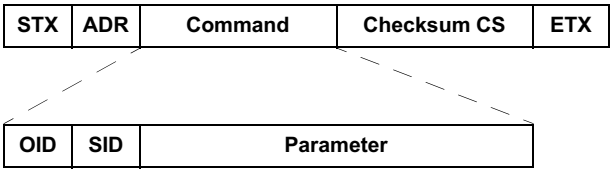
An overview of the commands available in 'Check SW' can be found in the command overview (see section 7.3.2). The description of the 'Check SW' commands has been integrated into the description of the corresponding ConfiTalk commands (see section 7.3).

7.3 Commands

7.3.1 Command structure

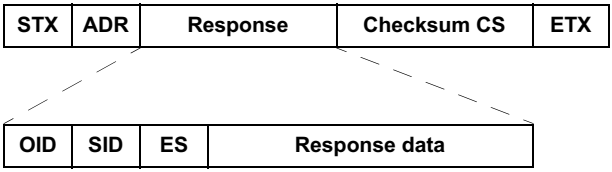
The commands/messages within the ConfiTalk protocol frames have the following structure:

Commands:



OID (Object ID) 1 character (1 byte) to call up the target software module
SID (Service ID) 1 character (1 byte) to call up the target software function
Parameter parameter of the software function (if available), any length

Responses:



OID (Object ID) 1 character (1 byte) for identification of the source software module
SID (Service ID) 1 character (1 byte) for identification of the source software function
ES (Execution Status) Execution status of the function call (2 bytes):
80 00_{hex} = command successfully executed
7F FF_{hex} = faulty command/command execution
Response data Response data of the software function (if available), any length

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7.3.2 Command overview

Command	ConfiTalk	Check SW
Microwave communication		
Set transmission power	CA	P=high, p=low
Query transmission power	CB	no command available
Set reception sensitivity	CC	G=high, g=low
Query reception sensitivity	CD	no command available
Set frequency channel	CE	01..99, 00
Query frequency channel	CF	no command available
Set transfer rate	CG	B=high, b=low
Query transfer rate	CH	no command available
Set code/data carrier timeout	CI	K=7 s, k=0.3 s
Query code/data carrier timeout	CJ	no command available
Start read process	CM	R=beep mode r0=text mode r1=beep&text mode
Stop read process	CN	O
Query status	CO	no command available
Write data carrier	CP	H=write data
Format data carrier	CY	J
Set CRC mode	CV	no command available
Query CRC mode	CU	no command available
Set scan mode	CX	S=RC, s=crystal
Query scan mode	CW	no command available
Set read-beep mode	C\	R=beep mode
Set microwave-carrier mode	C[	no command available
Query microwave-carrier mode	CZ	no command available
Motion recognition		
Activate motion recognition	DA	D = ON ; = reverse direction
Deactivate motion recognition	DB	d
Set recognition threshold	DC	\
Query recognition threshold	DD	no command available
Data storage/database		
Initialize buffer	EA	no command available
Check whether buffer is full	EB	no command available
Check whether buffer is empty	EC	no command available
Make entry in buffer	ED	no command available
Fetch entry from buffer	EE	no command available

Table 7.1: ConfiTalk and Check SW command overview

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Command	ConfiTalk	Check SW
Query buffer size	EF	no command available
Query entry size	EG	no command available
Delete buffer	EH	no command available
Initialize database	FA	F
Add data record to database	FB	F
Delete data record	FC	no command available
Search for data record	FD	f
Fetch first data record	FE	no command available
Fetch next data record	FF	no command available
Delete database	FG	o
Fetch database info	FH	no command available
LEDs and buzzer		
LED on	GA	(= Ext. LED 1 on < = Ext. LED 2 on
LED off	GB	? = main LED off) = Ext. LED 1 off > = Ext. LED 2 off
LED on, flashing	GC	no command available
Fetch LED status	GD	no command available
Set color of the control LED	GE	% = control LED red : = control LED green & = control LED orange
Fetch color of the control LED	GF	no command available
Buzzer on (permanent)	HA	Z
Buzzer off	HB	z
Buzzer on (intermittent tone)	HC	no command available
Fetch buzzer status	HD	no command available
Control panel		
Write characters in display	IA	Y
Clear display	IB	y
Read out display characters	IC	no command available
Activate pushbutton monitoring	MA	no command available
Deactivate pushbutton monitoring	MB	no command available
Inputs/outputs		
Initialize outputs	JA	no command available
Set status of outputs	JB	Outp1 Outp2 Relay On: + * A Off: - / a
Fetch status of outputs	JC	no command available

Table 7.1: ConfiTalk and Check SW command overview

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Command	ConfiTalk	Check SW
Initialize inputs	KA	I
Deactivate inputs	KB	i
Fetch status of inputs	KC	,
Start DTMF-port monitoring	LA	M
Stop DTMF-port monitoring	LB	m
Timer / Real Time Clock (RTC)		
Set RTC	NA	C
Fetch time and date from RTC	NB	c
Query RTC status	NC	no command available
Start RTC	ND	no command available
Stop RTC	NE	no command available
Initialize timer	OA	no command available
Set timer	OB	no command available
Clear timer	OC	no command available
Event handling		
Fetch event	PA	no command available
Serial communication		
Initialize serial port	RA	! = select RS232 Port A " = select RS232 Port B = = select RS485 2-wire $ = select RS485 4-wire ‘ = Port setup V = set address
Fetch serial port settings	RB	v = fetch address
Fetch serial port status	RC	no command available
Read from serial port reception buffer	RD	no command available
Write to serial port transmission buffer	RE	no command available
Set timeout of the RS 485 (2-wire)	RG	no command available
Fetch timeout of the RS 485 (2-wire)	RH	no command available
System administration		
Fetch version	QA	no command available
Write data to EEPROM	QD	no command available
Read data from EEPROM	QE	no command available
Restore default values	QF	. = default settings!
Mail communication		
Transmit mail	$EOT	no command available
Receive mail	$ENQ	no command available

Table 7.1: ConfiTalk and Check SW command overview

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7.3.3 Data types of the command parameters

There are 5 different data types for the command parameters:

Data type	Length	Range	Description
byte	1 byte	0 ... 255	8-bit character, unsigned
integer	2 bytes	-32768 ... +32767	whole numbers, signed
unsigned integer	2 bytes	0 ... +65535	whole numbers, unsigned
long	4 bytes	0 ... +2147483647	whole numbers, unsigned
Long	4 bytes	0 ... +4294967295	whole numbers, unsigned

7.3.4 Command group: microwave communication

Set transmission power

Command / *Parameter*	**CA** (43 41_{hex}) / ***Pwr***
Description	This command sets the microwave transmission power of the read/write device. The setting 'low' reduces the transmission power by 12 dB relative to the setting 'high'. The setting affects the write and read ranges of the device (see section 3.5).
Parameter	***Pwr***; 01_{hex} = high, 00_{hex} = low, (default: 00_{hex})
Data type parameter	*Byte*
Response/parameter	**CA ES**
Check SW command	P (50_{hex}) = high transmission power, p (70_{hex})= low transmission power

Query transmission power

Command / *Parameter*	**CB** (43 42_{hex})
Description	This command queries the microwave transmission power of the read/write device (see command **CA**).
Parameter	–
Response/parameter	**CB ES *Pwr***, 01_{hex} = high, 00_{hex} = low
Data type parameter	*Byte*
Check SW command	–

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Set sensitivity

Command / *Parameter*	**CC** (43 43_{hex}) / ***Sen***
Description	This command sets the reception sensitivity of the read/write device. The setting 'low' reduces the sensitivity by 24 dB relative to the setting 'high'. The setting affects the write and read range of the device (see section 3.5).
Parameter	***Sen***; 01_{hex} = high, 00_{hex} = low, (default: 00_{hex})
Data type parameter	*Byte*
Response/parameter	**CC ES**
Check SW command	G (47_{hex}) = high sensitivity, g (67_{hex}) = low sensitivity

Query sensitivity

Command / *Parameter*	**CD** (43 44_{hex})
Description	This command queries the reception sensitivity of the read/write device (see command **CC**).
Parameter	–
Response/parameter	**CD ES *Sen***, 01_{hex} = high, 00_{hex} = low
Data type parameter	*Byte*
Check SW command	–

Set frequency channel

Command / *Parameter*	**CE** (43 43_{hex}) / ***80_{hex}*** / ***Frq***
Description	This command sets the frequency channel of the read/write device via microwave communication. 100 channels are available. Select different channels when two or more read/write devices could mutually interfere with one another.
Parameter	***80_{hex} Frq***; Range Frq: 1 ... 100, (default: channel 50)
Data type parameter	*Byte*
Response/parameter	**CE ES**
Check SW command	00 ... 99 (00_{hex} ... 63_{hex})

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Query frequency channel

Command / *Parameter*	**CF** (43 46_{hex})
Description	This command queries the set frequency channel of the read/write device (see command **CE**).
Parameter	–
Response/parameter	**CF ES *80_{hex} Frq***; Range Frq: 1 ... 100
Data type parameter	*Byte*
Check SW command	–

Set transfer rate

Command / *Parameter*	**CG** (43 47_{hex}) / ***Btr***
Description	This command sets the transfer rate of the microwave communication when reading from code/data carriers. In the setting 'low' the transfer rate is 4 kBit/s, in the setting 'high' 16 kBit/s (see section 3.5).
Parameter	***Btr***; 01_{hex} = high, 00_{hex} = low, (default: 01_{hex})
Data type parameter	*Byte*
Response/parameter	**CG ES**
Check SW command	B (42_{hex}) = high transfer rate, b (62_{hex}) = low transfer rate

Query transfer rate

Command / *Parameter*	**CH** (43 48_{hex})
Description	This command queries the transfer rate of the microwave communication when reading code/data carriers (see command **CG**).
Parameter	–
Response/parameter	**CH ES *Btr***, 01_{hex} = high, 00_{hex} = low
Data type parameter	*Byte*
Check SW command	–

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Set code/data carrier timeout

Command / *Parameter*	**CI** (43 49_{hex}) / ***Tto***
Description	This command sets the code/data carrier timeout time in milliseconds. This time specifies after what amount of time following reading/writing a code/data carrier, reading/writing is again possible.
Parameter	***Tto***; Range Tto: +10 ... +2147483647, (Default: 1000 ms)
Data type parameter	*long*
Response/parameter	**CI ES**
Check SW command	K ($4B_{hex}$) = 7000 ms, k ($6B_{hex}$) = 300 ms

Query code/data carrier timeout

Command / *Parameter*	**CJ** (43 $4A_{hex}$)
Description	This command queries the code/data carrier timeout time in milliseconds (see command **CI**).
Parameter	–
Response/parameter	**CJ ES *Tto***; Range Tto: +10 ... +2147483647
Data type parameter	*long*
Check SW command	–

Start read process

Command / *Parameter*	**CM** (43 $4D_{hex}$)
Description	This command activates continuous reading of code/ data carriers. The code/data carrier timeout time begins upon reading a code/data carrier. After this time, a new code/data carrier can be read.
Parameter	–
Data type parameter	–
Response/parameter	**CM ES**
Check SW command	R (52_{hex}) = beep mode, r0 (72 30_{hex}) = text mode, r1 (72 31_{hex}) = beep&text mode

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Stop read process

Command / ***Parameter***	**CN** (43 $4E_{hex}$)
Description	This command deactivates continuous reading of code/data carriers (see command **CM**).
Parameter	–
Response/parameter	**CN ES**
Check SW command	O ($4F_{hex}$)

Query status

Command / ***Parameter***	**CO** (43 $4F_{hex}$)
Description	This command queries the current device status and communication status.
Parameter	–
Response/parameter	**CO ES** ***Err Status*** Description ***Err***: Bit 7 (MSB): bit-recognition faulty Bit 6: write error Bit 5: checksum error Bit 4: not used(= 0) Bit 3: synchronization error Bit 2: status error Bit 1: out of memory Bit 0 (LSB): hardware error Description ***Status***: Bit 7 (MSB): reserved for future functions Bit 6: read code/data carriers active Bit 5: writing data carrier Bit 4: reserved for future functions Bit 3...0 (LSB): not used (= 0)
Data type parameter	*Byte*
Check SW command	–

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Write data carrier

Command / *Parameter*	**CP** (43 50_{hex}) / ***AnyTag*** / ***Mark1*** / ***...*** / ***Mark9*** / ***Ctrl1*** / ***Ctrl2*** / ***UDS*** / ***UD1*** / ... / ***UDn***
Description	This command writes data to a data carrier. During command execution, Bit5 in the status byte is set (see command **CO**). Following command execution, Bit5 is reset to zero and Bit6 in the error byte is updated (see command **CO**) (Bit6: 0 = writing successful, 1 = write error). The transfer rate of the data carrier must be known (see parameter ***Ctrl1***, Bit7).
Parameter	***AnyTag***: 00_{hex} = a given data carrier located in the write range is being written 01_{hex} = only the data carrier specified by parameter Mark1 ... Mark9 is being written ***Mark1***...***Mark9***: (optional) nine bytes which contain the permanently stored default Tag-ID. These 9 parameter bytes are declared only when ***AnyTag*** = 00_{hex}. ***Ctrl1*** Control byte for transfer and memory options (for parameter meaning, see data carrier data sheet). Bit7: 0 = transfer rate 4 kBit/s 1 = transfer rate 16 kBit/s Bit6: 0 = interval type: constant 1 = interval type: random Bit5: 0 = uninterrupted transfer 1 = interval length (see Bit1, Bit2) Bit4,3: 11 = reserved 01 = full capacity, 574 bit 10 = quarter capacity, 154 Bit 00 = mini capacity, 14 Bit Bit2,1: 11 = interval length 16 01 = interval length 16 10 = interval length 8 00 = interval length 4 Bit0: 0 = analyze switching input 1 1 = do not analyze switching input 1

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Parameter	***Ctrl2***	Control byte for analysis or activation of the switching inputs/outputs Bit7: 0 = analyze switching input 2 1 = do not analyze switching input 2 Bit6: 0 = activate switching output 1 1 = do not activate switching output 1 Bit5...0: not used (= 0)
	UDS	Size of user data: 00_{hex} 14 Bit, n = 2 bytes (mini capacity) 01_{hex} 154 Bit, n = 20 bytes (quarter capacity) 02_{hex} 574 Bit, n = 72 bytes (full capacity)
	UD1...UDn	n bytes user data (n see parameter ***UDS***), written on the data carrier
Data type parameter	*Byte*	
Response/parameter	**CP ES**	
Check SW command	H (48_{hex})	

Format data carrier

Command / *Parameter*	**CY** (43 50_{hex}) / ***AnyTag*** / ***Mark1*** / ***...*** / ***Mark9*** / ***Ctrl1*** / ***Ctrl2*** / ***UDS*** / ***UD1*** / ... / ***UDn***
Description	This command has the same function and the same command parameter as the command CP, the difference being that data carriers with unknown transfer rates can also be formatted.
Parameter	See command **CP**
Data type parameter	*Byte*
Response/parameter	**CY ES**
Check SW command	J ($4A_{hex}$)

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Set CRC mode

Command / ***Parameter***	**CV** (43 56_{hex}) / ***CRC***
Description	This command sets the mode of the checksum calculation.
Parameter	***CRC***: 00_{hex} = no checksum calculation, 01_{hex} = checksum calculation only by means of the Tag-ID, 02_{hex} = checksum calculation by means of the complete message (default)
Data type parameter	*Byte*
Response/parameter	**CV ES**
Check SW command	–

Query CRC mode

Command / ***Parameter***	**CU** (43 55_{hex})
Description	This command queries the mode of the checksum calculation (see command **CV**).
Parameter	–
Response/parameter	**CU ES** ***CRC*** Value: 00_{hex} = no checksum calculation, 01_{hex} = checksum calculation only by means of the Tag-ID, 02_{hex} = checksum calculation by means of the complete message (default)
Data type parameter	*Byte*
Check SW command	–

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Set scan mode

Command / ***Parameter***	**CX** (43 58_{hex}) / ***Scn***
Description	This command activates/deactivates the scan mode. The scan mode is necessary for reading code/data carriers with RC oscillators. When reading code/data carriers with quartz oscillators, the scan mode remains deactivated. **Notice: All data carriers currently available from Pepperl+Fuchs have a quartz oscillator.**
Parameter	***Scn***: 01_{hex} = scan mode on, 00_{hex} = scan mode off (default)
Data type parameter	*Byte*
Response/parameter	**CX ES**
Check SW command	S (53_{hex}) = scan mode on, s (73_{hex}) = scan mode off

Query scan mode

Command / ***Parameter***	**CW** (43 57_{hex})
Description	This command queries whether the scan mode is activated or deactivated (see command **CX**).
Parameter	–
Response/parameter	**CW ES *Scn***, 01_{hex} = scan mode on, 00_{hex} = scan mode off
Data type parameter	*Byte*
Check SW command	–

Set read-beep mode

Command / ***Parameter***	**C** (43 $5C_{hex}$) / ***Beep***
Description	This command activates/deactivates the read-beep mode (see section 5.2.1).
Parameter	***Beep***: 01_{hex} = read-beep mode on, 00_{hex} = read-beep mode off (default)
Data type parameter	*Byte*
Response/parameter	**C\ ES**
Check SW command	R (52_{hex}) = read-beep mode

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Set microwave-carrier mode

Command / *Parameter*	**C[** (43 $5B_{hex}$) / ***Carr***
Description	This command sets the mode for activating the microwave carrier.
Parameter	***Carr***: 00_{hex} = microwave carrier always off, 01_{hex} = microwave carrier always on (default), 02_{hex} = microwave carrier is automatically switched on when the execution of a read or write command is started.
Data type parameter	*Byte*
Response/parameter	**C[ES**
Check SW command	–

Query microwave-carrier mode

Command / *Parameter*	**CZ** (43 $5A_{hex}$)
Description	This command queries the mode for activating the microwave carrier (see command **C[**).
Parameter	–
Response/parameter	**CZ ES *Carr*** Value: 00_{hex} = microwave carrier always off, 01_{hex} = microwave carrier always on (default), 02_{hex} = microwave carrier is automatically switched on when the execution of a read or write command is started.
Data type parameter	*Byte*
Check SW command	–

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7.3.5 Command group: Motion recognition

Activation of motion recognition

Command / *Parameter*	**DA** (44 41_{hex})
Description	This command activates motion recognition of objects in the read/write device acquisition range.
Parameter	–
Response/parameter	**DA ES**
Check SW command	D (44_{hex}) = activation of motion recognition, ; ($3B_{hex}$) = direction inversion between advancing and retreating of detected object

Deactivation of motion recognition

Command / *Parameter*	**DB** (44 42_{hex})
Description	This command deactivates motion recognition of objects in the read/write device acquisition range.
Parameter	–
Response/parameter	**DB ES**
Check SW command	d (64_{hex}) = deactivation of motion recognition

Set recognition threshold

Command / *Parameter*	**DC** (44 43_{hex}) / ***th***
Description	This command sets the recognition threshold of the read/write device during motion recognition in decibels. The higher the threshold in dB, the lower the sensitivity. Practical values lie between -30 dB and 0 dB.
Parameter	***th***; range th: -32768 ... 0, (default: -15 dB)
Data type parameter	*integer*
Response/parameter	**DC ES**
Check SW command	\ ($5C_{hex}$) = set recognition threshold

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Query recognition threshold

Command / ***Parameter***	**DD** (44 44_{hex})
Description	This command queries the recognition threshold of the read/write device for motion recognition (see command **DC**).
Parameter	–
Response/parameter	**DD ES** ***th***, range th: -32768 ... 0, (default: -15 dB)
Data type parameter	*integer*
Check SW command	–

7.3.6 Command group: buffer memory

Initialize buffer memory

Command / ***Parameter***	**EA** (45 41_{hex}) / ***Max_Items*** / ***Item_Size*** / ***Buffer_ID***
Description	This command initializes a dynamic FIFO buffer memory. The size of the buffer is determined by the maximum possible number of entries (parameter ***Max_Items***). The size of the entries in bytes is determined by the parameter ***Item_Size***. The parameter ***Buffer_ID***, on the other hand, identifies the buffer memory. Up to 32 buffer memories (30 when the mail functionality is used) can be defined. A total of 2 kBytes are available for buffer memory.
Parameter	***Max_Items***: limited by the available memory ***Item_Size***: limited by the available memory ***Buffer_ID***: range 0 ... 31
Data type parameter	***Max_Items***: *unsigned integer* ***Item_Size***: *unsigned integer* ***Buffer_ID***: *integer*
Response/parameter	**EA ES**
Check SW command	–

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Check whether buffer is full

Command / *Parameter*	**EB** (45 42_{hex}) / ***Buffer_ID***
Description	This command checks whether the specified buffer memory is full.
Parameter	***Buffer_ID***; range0 ... 31
Data type parameter	*integer*
Response/parameter	**EB ES *Full***, 00_{hex} = buffer is not full, 01_{hex} = buffer is full
Data type parameter	***Full***: *byte*
Check SW command	–

Check whether buffer is empty

Command / *Parameter*	**EC** (45 43_{hex}) / ***Buffer_ID***
Description	This command checks whether the specified buffer memory is empty.
Parameter	***Buffer_ID***; range0 ... 31
Data type parameter	*integer*
Response/parameter	**EC ES *Empty***, 00_{hex} = buffer is not empty, 01_{hex} = buffer is empty
Data type parameter	***Empty***: *byte*
Check SW command	–

Make entry in buffer

Command / *Parameter*	**ED** (45 44_{hex}) / ***Buffer_ID*** / ***Item_Size*** / ***Data_1*** / ***...*** / ***Data_n***
Description	This command writes data to the buffer memory specified by ***Buffer_ID***. The size of the data (entries) is determined by ***Item_Size*** (see command **EA**). The data themselves are specified by parameters ***Data_1 ... Data_n***.
Parameter	***Buffer_ID***: range 0 ... 31 ***Item_Size***: n, as defined for the buffer ***Data_1 ... Data_n***: data to be transmitted
Data type parameter	***Buffer_ID***: *integer* ***Item_Size***: *unsigned integer* ***Data_1 ... Data_n***: *byte*
Response/parameter	**ED ES**
Check SW command	–

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Fetch entry from buffer

Command / *Parameter*	**EE** (45 45_{hex}) / ***Buffer_ID***
Description	This command fetches data from the buffer memory specified by ***Buffer_ID***. The size of the data in the response (entries) is specified by ***Item_Size*** (see command **EA**). The data themselves are in the response parameters ***Data_1 ... Data_n***.
Parameter	***Buffer_ID***: range 0 ... 31
Data type parameter	***Buffer_ID***: *integer*
Response/parameter	**EE ES *Item_Size*** / ***Data_1*** / ***...*** / ***Data_n***
Parameter	***Item_Size***: n, as defined for the buffer ***Data_1 ... Data_n***: retrieved data
Data type parameter	***Item_Size***: *unsigned integer* ***Data_1 ... Data_n***: *byte*
Check SW command	–

Query buffer size

Command / *Parameter*	**EF** (45 46_{hex}) / ***Buffer_ID***
Description	This command queries the size of the buffer memory specified by ***Buffer_ID***. The size of the buffer is specified in the response by ***Max_Items*** (see cmd. **EA**).
Parameter	***Buffer_ID***: range 0 ... 31
Data type parameter	***Buffer_ID***: *integer*
Response/parameter	**EF ES *Max_Items***, see command **EA**
Data type parameter	***Max_Items***: *unsigned integer*
Check SW command	–

Query size of the entries of a buffer

Command / *Parameter*	**EG** (45 46_{hex}) / ***Buffer_ID***
Description	This command queries the size of the entries of the buffer memory specified by ***Buffer_ID***. The size of the entries in the response is specified by ***Item_Size*** (see command **EA**).
Parameter	***Buffer_ID***: range 0 ... 31
Data type parameter	***Buffer_ID***: *integer*
Response/parameter	**EG ES *Item_Size***, see command **EA**
Data type parameter	***Item_Size***: *unsigned integer*
Check SW command	–

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Delete buffer

Command / *Parameter*	**EH** (45 48_{hex}) / ***Buffer_ID***
Description	This command deletes the buffer memory specified by ***Buffer_ID***. All entries in the buffer are deleted. The memory previously occupied by the buffer is released.
Parameter	***Buffer_ID***: range 0 ... 31
Data type parameter	*integer*
Response/parameter	**EH ES**
Check SW command	–

7.3.7 Command group: database

The database commands described in this section are not available for read/write device MTT-S2 .

Initialize database

Before the database can be used, it must first undergo a one-time initialization. Here, the size and location of the database memory area in the Flash-EEPROM must be specified. Moreover, the maximum number of data records as well as the size of the data records must be defined.

The actual size T of the database can be determined using the following formula:

T [byte] = 12 + 4 x (N/20 + 1) + N x (S + 4)

where N = maximum number of data records in the database
S = size of a data record rounded off to an even number of bytes (maximum size of a data record: 500 bytes)

The address area in the flash EEPROM available for database memory extends from 40040_{hex} ... $5FFFF_{hex}$.

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Command / *Parameter*	**FA** (46 41_{hex}) / ***Max_Items*** / ***Record_Size*** / ***Start_Address*** / ***Offset***
Description	This command initializes the database (as previously described).
Parameter	***Max_Items***: maximum number of data records ***Record_Size***: size of a data record in bytes ***Start_Address***: starting address of the database memory area ***Offset***: size of the database memory area in bytes
Data type parameter	***Max_Items***: *Long* ***Record_Size***: *unsigned integer* ***Start_Address***: *Long* ***Offset***: *Long*
Response/parameter	**FA ES**
Check SW command	F (46_{hex})

Note

The execution of this command can last up to 10 seconds.

Add data record to database

Every data record is identified by a database key (data type *Long*, 32-bit integer). The structure of this key is not fixed and can be freely defined by the user.

Database operations are, in general, executed faster when the data records are entered in the data base ordered according to key (e.g. ascending).

Command / *Parameter*	**FB** (46 42_{hex}) / ***Key*** / ***Record_Size*** / ***Data_1*** / ***...*** / ***Data_n***
Description	This command adds a data record with ***Key*** to the database. The size of the data (entries) is determined by ***Record_Size*** (see command **FA**). The data themselves are specified by parameters ***Data_1 ... Data_n***.
Parameter	***Key***: 0 ... +4294967295 ***Record_Size***: n, 0 ... 500 bytes (even numbers only) ***Data_1 ... Data_n***: data to be transmitted
Data type parameter	***Key***: *Long* ***Record_Size***: *unsigned integer* ***Data_1 ... Data_n***: *byte*
Response/parameter	**FB ES**
Check SW command	F (46_{hex})

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Delete data record

Command / *Parameter*	**FC** (46 43_{hex}) / ***Key***
Description	This command deletes the data record with the specified key.
Parameter	see command **FB**
Data type parameter	*long*
Response/parameter	**FC ES**
Check SW command	–

Search for data record

Command / *Parameter*	**FD** (46 44_{hex}) / ***Key***
Description	This command searches the database for the data record with the ***Key*** and, if found, outputs the data record.
Parameter	***Key***: see command**FB**
Data type parameter	***Key***: *long*
Response/parameter	**FD ES** / ***Found*** / ***Record_Size*** / ***Data_1*** / ***...*** / ***Data_n***
Parameter	***Found***: 0 = data record not found 1 = data record found only if ***Found*** = 1: ***Record_Size***: n, 0 ... 500 bytes (even numbers only) ***Data_1 ... Data_n***: data record contents
Data type parameter	***Found***: *byte* ***Record_Size***: *unsigned integer* ***Data_1 ... Data_n***: *byte*
Check SW command	f (66_{hex})

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Fetch first data record

Command / *Parameter*	**FE** (46 45_{hex})
Description	This command fetches the first data record from the database if the database contains at least one entry.
Parameter	**–**
Response/parameter	**FE ES** / ***Found*** / ***Key*** / ***Record_Size*** / ***Data_1*** / ***...*** / ***Data_n***
Parameter	***Found***: 0 = no data records in the database 1 = first data record found only if ***Found*** = 1: ***Key***: see command **FB** ***Record_Size***: n, 0 ... 500 bytes (even numbers only) ***Data_1 ... Data_n***: contents of the first data record
Data type parameter	***Found***: *byte* ***Key***: *Long* ***Record_Size***: *unsigned integer* ***Data_1 ... Data_n***: *byte*
Check SW command	–

Fetch next data record

Command / *Parameter*	**FF** (46 45_{hex})
Description	This command fetches the next data record from the database if available in the database.
Parameter	**–**
Response/parameter	**FF ES** / ***Found*** / ***Key*** / ***Record_Size*** / ***Data_1*** / ***...*** / ***Data_n***
Parameter	***Found***: 0 = no further data records in the database 1 = next data record found only if ***Found*** = 1: ***Key***: see command **FB** ***Record_Size***: n, 0 ... 500 bytes (even numbers only) ***Data_1 ... Data_n***: contents of the next data record
Data type parameter	***Found***: *byte* ***Key***: *Long* ***Record_Size***: *unsigned integer* ***Data_1 ... Data_n***: *byte*
Check SW command	–

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Delete database

Command / *Parameter*	**FG** (46 47_{hex})
Description	This command deletes the entire database. After executing this command, the database must, if necessary, be recreated with the command **FA**.
Parameter	–
Response/parameter	**FG ES**
Check SW command	o ($6F_{hex}$)

Fetch database info

Command / *Parameter*	**FH** (46 45_{hex})
Description	This command queries the following information about the database: status, starting address, data-record size, current number of data records, maximum number of data records
Parameter	**–**
Response/parameter	**FH ES** / ***Status*** / ***Start_Address*** / ***Record_Size*** / ***No_Of_Items*** / ***Max_Items***
Parameter	***Status***: 0 = database deleted 1 = database initialized 2 = data base initialized only if ***Status*** = 1 or 2: ***Start_Address***: see command **FA** ***Record_Size***: n, 0 ... 500 byte (even numbers only) ***No_Of_Items***: Number of data records in the database ***Max_Items***: maximum number of data records
Data type parameter	***Status***: *byte* ***Start_Address***: *Long* ***Record_Size***: *unsigned integer* ***No_Of_Items***: *Long* ***Max_Items***: *Long*
Check SW command	–

Issue date 25.06.98

7.3.8 Command group: LEDs and buzzer

Switch on LED

Command / *Parameter*	**GA** (47 41_{hex}) / ***Led***
Description	This command switches on one of the three possible LEDs.
Parameter	***Led***: 00_{hex} = control LED on 01_{hex} = external LED 1 on 02_{hex} = external LED 2 on
Data type parameter	*Byte*
Response/parameter	**GA ES**
Check SW command	((28_{hex}) external LED 1 on < ($3C_{hex}$) external LED 2 on

Switch off LED

Command / *Parameter*	**GB** (47 42_{hex}) / ***Led***
Description	This command switches off one of the three possible LEDs.
Parameter	***Led***: 00_{hex} = control LED off 01_{hex} = external LED 1 off 02_{hex} = external LED 2 off
Data type parameter	*Byte*
Response/parameter	**GB ES**
Check SW command	? ($3F_{hex}$) control LED off) (29_{hex}) external LED 1 off > ($3E_{hex}$) external LED 2 off

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LED on, flashing

Command / ***Parameter***	**GC** (47 43_{hex}) / ***Led*** / ***Period*** / ***Duty_Cycle***
Description	This command flashes one of the three possible LEDs with the adjustable flash cycle.
Parameter	***Led***: 00_{hex} = control LED on, flashing 01_{hex} = external LED 1 on, flashing 02_{hex} = external LED 2 on, flashing ***Period***: period of the blink cycle (on-off) value range 100 ... 10000 ms. ***Duty_Cycle***:ratio of duty cycle to period in % of the period value range 1 ... 99
Data type parameter	***Led***: *byte* ***Period***: *integer* ***Duty_Cycle***:*integer*
Response/parameter	**GC ES**
Check SW command	–

Fetch LED status

Command / ***Parameter***	**GD** (47 44_{hex}) / ***Led***
Description	This command queries the status of an LED. (see command **EA**).
Parameter	***Led***: 00_{hex} = control LED 01_{hex} = external LED 1 02_{hex} = external LED 2
Data type parameter	***Led***: *byte*
Response/parameter	**GD ES** ***State***: 00_{hex} = LED is on 01_{hex} = LED is off 02_{hex} = LED flashing
Data type parameter	***State***: *byte*
Check SW command	–

Issue date 25.06.98

Set color of the control LED

Command / *Parameter*	**GE** (47 45_{hex}) / ***Colour***
Description	This command sets the color of the control LED.
Parameter	***Colour***:00_{hex} = red 01_{hex} = green 02_{hex} = orange
Data type parameter	*Byte*
Response/parameter	**GE ES**
Check SW command	% (25_{hex}) control LED red : ($3A_{hex}$) control LED green & (26_{hex}) control LED orange

Fetch color of the control LED

Command / *Parameter*	**GF** (47 46_{hex})
Description	This command queries the color of the control LED.
Parameter	**–**
Response/parameter	**GF ES *Colour***; 00_{hex} = red 01_{hex} = green 02_{hex} = orange
Data type parameter	***Colour***: *byte*
Check SW command	–

Switch on buzzer

Command / *Parameter*	**HA** (48 41_{hex})
Description	This command switches on the built-in buzzer.
Parameter	**–**
Response/parameter	**HA ES**
Check SW command	Z ($5A_{hex}$) buzzer on

Switch off buzzer

Command / *Parameter*	**HB** (48 41_{hex})
Description	This command switches off the built-in buzzer.
Parameter	**–**
Response/parameter	**HB ES**
Check SW command	z ($7A_{hex}$) buzzer off

Issue date 25.06.98

Buzzer on (intermittent tone)

Command / *Parameter*	**HC** (48 43_{hex}) / ***Period*** / ***Duty_Cycle***
Description	This command is used to beep the buzzer with an adjustable intermittent tone.
Parameter	***Period***: period of the tone signal (on-off) value range 100 ... 10000 ms. ***Duty_Cycle***:ratio of duty cycle to period in % of the period value range 1 ... 99
Data type parameter	***Period***: *integer* ***Duty_Cycle***:*integer*
Response/parameter	**HC ES**
Check SW command	–

Fetch buzzer status

Command / *Parameter*	**HD** (48 44_{hex})
Description	This command queries the status of the buzzer.
Parameter	**–**
Response/parameter	**HD ES *State***: 00_{hex} = buzzer is on 01_{hex} = buzzer is off 02_{hex} = buzzer beeping
Data type parameter	***State***: *byte*
Check SW command	–

Issue date 25.06.98

7.3.9 Command group: Control panel

Write characters in display

The read/write device is provided with a two-digit 7-segment display with a decimal point to the right of the display position. The following characters can be displayed:

Character	Code (ASCII)	Character	Code (ASCII)	Character	Code (ASCII)	Character	Code (ASCII)
'Space'	32 (20_{hex})	**6**	54 (36_{hex})	**I**	73 (49_{hex})	**B**	98 (62_{hex})
"	34 (22_{hex})	**7**	55 (37_{hex})	**J**	74 ($4A_{hex}$)	**c**	99 (63_{hex})
'	39 (27_{hex})	**8**	56 (38_{hex})	**L**	76 ($4C_{hex}$)	**d**	100 (64_{hex})
-	45 ($2D_{hex}$)	**9**	57 (39_{hex})	**O**	79 ($4F_{hex}$)	**h**	104 (68_{hex})
.	46 ($2E_{hex}$)	**A**	65 (41_{hex})	**P**	80 (50_{hex})	**L**	108 ($6C_{hex}$)
0	48 (30_{hex})	**B**	66 (42_{hex})	**S**	83 (53_{hex})	**N**	110 ($6E_{hex}$)
1	49 (31_{hex})	**C**	67 (43_{hex})	**U**	85 (55_{hex})	**o**	111 ($6F_{hex}$)
2	50 (32_{hex})	**D**	68 (44_{hex})	**[**	91 ($5B_{hex}$)	**R**	114 (72_{hex})
3	51 (33_{hex})	**E**	69 (45_{hex})	**]**	93 ($5D_{hex}$)	**T**	116 (74_{hex})
4	52 (34_{hex})	**F**	70 (46_{hex})	–	95 ($5F_{hex}$)	**u**	117 (75_{hex})
5	53 (35_{hex})	**H**	72 (48_{hex})	‘	96 (60_{hex})		

Command / *Parameter*	**IA** (49 41_{hex}) / ***Left_Char*** / ***Left_Dot*** / ***Right_Char*** / ***Right_Dot***
Description	This command writes the characters specified in the parameters to the display.
Parameter	***Left_Char*** see above table ***Left_Dot*** 20_{hex} ('Space') or $2E_{hex}$ (.) ***Right_Char*** see above table ***Right_Dot*** 20_{hex} ('Space') or $2E_{hex}$ (.)
Data type parameter	***Left_Char***: *byte* ***Left_Dot***: *byte* ***Right_Char***: *byte* ***Right_Dot***: *byte*
Response/parameter	**IA ES**
Check SW command	Y (59_{hex})

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Clear display

Command / *Parameter*	**IB** (49 42_{hex})
Description	This command clears all characters in the display.
Parameter	**–**
Response/parameter	**IB ES**
Check SW command	y (79_{hex})

Read out display characters

Command / *Parameter*	**IC** (49 43_{hex})
Description	This command outputs all characters currently in the display.
Parameter	**–**
Response/parameter	**IC ES** / ***Left_Char*** / ***Left_Dot*** / ***Right_Char*** / ***Right_Dot***
Parameter	***Left_Char*** see above table ***Left_Dot*** 20_{hex} ('Space') or $2E_{hex}$ (.) ***Right_Char*** see above table ***Right_Dot*** 20_{hex} ('Space') or $2E_{hex}$ (.)
Data type parameter	***Left_Char***: *byte* ***Left_Dot***: *byte* ***Right_Char***: *byte* ***Right_Dot***: *byte*
Check SW command	–

Activate pushbutton monitoring

Command / *Parameter*	**MA** (4D 41_{hex})
Description	This command activates monitoring of the two push-buttons on the control panel. If one or more buttons are pressed, these events can be analyzed by means of event handling (see command PA).
Parameter	**–**
Response/parameter	**MA ES**
Check SW command	–

Issue date 25.06.98

Deactivate pushbutton monitoring

Command / ***Parameter***	**MB** (4D 41_{hex})
Description	This command deactivates monitoring of the two push-buttons on the control panel (see command **MA**).
Parameter	**–**
Response/parameter	**MB ES**
Check SW command	–

7.3.10 Command group: inputs/outputs, DTMF port

Initialize outputs

Command / ***Parameter***	**JA** (4A 41_{hex}) / ***Address*** / ***Bit_No***
Description	This command initializes one of the three outputs. The parameter ***Address*** specifies the address of the output byte in memory. The parameter ***Bit_No*** specifies the bit of the output byte assigned to the corresponding output.
Parameter	***Address***: FE $8E_{hex}$ (fixed) ***Bit_No***: 2 = optical coupling output 1 3 = optical coupling output 2 6 = relay output
Data type parameter	***Address***: *Long* ***Bit_No***: *integer*
Response/parameter	**JA ES *Par_Out_Id***
Parameter	***Par_Out_Id***: The ID allocated by the device for the corresponding output under which this output can be addressed (see commands **JB** and **JC**)
Data type parameter	***Par_Out_Id***: *byte*
Check SW command	–

Issue date 25.06.98

Set status of outputs

Command / *Parameter*	**JB** (4A 41_{hex}) / ***Par_Out_Id*** / ***Value***
Description	This command determines the status of the output specified by ***Par_Out_Id***. The parameter ***Value*** indicates the status of the corresponding output.
Parameter	***Par_Out_Id***:see command **JA** ***Value***: 00_{hex} = output active (transistor switched on or relay picked up) 01_{hex} = output not active
Data type parameter	***Par_Out_Id***:*byte* ***Value***: *byte*
Response/parameter	**JB ES**
Check SW command	Output 1 / Output 2 / Relay ON: + ($2B_{hex}$) / * ($2A_{hex}$) / A (41_{hex}) OFF: - ($2D_{hex}$) / / ($2F_{hex}$) / a (61_{hex})

Fetch status of outputs

Command / *Parameter*	**JC** (4A 41_{hex}) / ***Par_Out_Id***
Description	This command queries the status of the output specified by ***Par_Out_Id***.
Parameter	***Par_Out_Id***:see command **JA**
Data type parameter	***Par_Out_Id***:*byte*
Response/parameter	**JC ES *Value***
Parameter	***Value***: 00_{hex} = output active (transistor switched on or relay picked up) 01_{hex} = output not active
Data type parameter	***Value***: *byte*
Check SW command	–

Issue date 25.06.98

Initialize inputs

Command / *Parameter*	**KA** (4B 41_{hex}) / ***Address*** / ***Bit_No*** / ***Int_Signal***
Description	This command initializes one of the three inputs. The parameter ***Address*** specifies the address of the input byte in memory; the parameter ***Bit_No*** specifies the bit of the input byte assigned to the corresponding input. An interrupt source is assigned to the input via parameter ***Int_Signal***.
Parameter	***Address***: F6 $1C_{hex}$ (fixed) ***Bit_No***: 0 = optical coupling input 1 1 = optical coupling input 2 2 = optical coupling input 3 ***Int_Signal***: 1 = housing switch 2 = real time clock (RTC) 3 = pushbutton 1 4 = pushbutton 2 5 = DTMF-interface 6 = optical coupling input 1 7 = optical coupling input 2 8 = optical coupling input 3
Data type parameter	***Address***: *Long* ***Bit_No***: *integer* ***Item_Size***: *byte*
Response/parameter	**KA ES *Par_In_Id***
Parameter	***Par_In_Id***: The ID allocated by the device for the corresponding input under which this input can be addressed. (see commands **KB** and **KC**)
Data type parameter	***Par_In_Id***: *byte*
Check SW command	I (49_{hex})

Deactivate inputs

Command / *Parameter*	**KB** (4B 42_{hex}) / ***Par_In_Id***
Description	This command deactivates the input specified by ***Par_In_Id***, i.e. the input is no longer analyzed and no interrupt is set if the status of the input changes.
Parameter	***Par_In_Id***: see command **KA**
Data type parameter	***Par_In_Id***: *byte*
Response/parameter	**KB ES**
Check SW command	i (69_{hex})

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Fetch status of inputs

Command / ***Parameter***	**KC** (4B 43_{hex}) / ***Par_In_Id***
Description	This command queries the status of the input specified by ***Par_In_Id***.
Parameter	***Par_In_Id***: see command **KA**
Data type parameter	***Par_In_Id***: *byte*
Response/parameter	**KC ES** ***Value***
Parameter	***Value***: 00_{hex} = input active (voltage present) 01_{hex} = input not active
Data type parameter	***Value***: *byte*
Check SW command	, ($2C_{hex}$)

Start DTMF-port monitoring

Command / ***Parameter***	**LA** (4C 41_{hex})
Description	This command starts the monitoring of the DTMF port. If signals are received from the DTMF port, an interrupt is triggered and, as a result, an event is triggered (see section 7.3.12).
Parameter	**–**
Response/parameter	**LA ES**
Check SW command	M ($4D_{hex}$)

Stop DTMF-port monitoring

Command / ***Parameter***	**LB** (4C 42_{hex})
Description	This command stops the monitoring of the DTMF port. Signals from the DTMF port are no longer analyzed.
Parameter	**–**
Response/parameter	**LB ES**
Check SW command	m ($6D_{hex}$)

Issue date 25.06.98

7.3.11 Command group: real time clock, timer

The read/write device is equipped with a real time clock (RTC) which can analyze time of day, day of week, etc. As such, it can be used for access control. Moreover, up to 70 timers can be defined.

Two types of timers are available:

Absolute timer

An absolute timer is set to a date (without year) and time in the future, where the maximum timer time is one year. The timer expires when this point in time is reached by the RTC.

Relative timer

A relative timer is set to a length of time. The time is entered in milliseconds. The resolution is approx. 100 milliseconds. The maximum length of time which can be set is 2,147,483,647 milliseconds, which is just short of 25 days. The timer expires when the set time has passed.

If the real time clock is set or stopped, the absolute timers are affected!

Set RTC

Command / *Parameter*	**NA** (4E 41_{hex}) / ***Year*** / ***Month*** / ***Day*** / ***Day_of_Week*** / ***Hour*** / ***Minute*** / ***Second***
Description	This command sets the date and time of the real time clock.
Parameter	***Year***: 1990 ... ***Month***: 1 = January, ..., 12 = December ***Day***: 0 ... 31 ***Day_of_Week***: 0 = Sunday, ...; 6 = Saturday ***Hour***: 0 ... 23 ***Minute***: 0 ... 59 ***Second***: 0 ... 59
Data type parameter	***Year***: *unsigned integer* ***Month***: *byte* ***Day***: *byte* ***Day_of_Week***: *byte* ***Hour***: *byte* ***Minute***: *byte* ***Second***: *byte*
Response/parameter	**NA ES**
Check SW command	C (43_{hex})

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Fetch date and time from RTC

Command / *Parameter*	**NB** (4E 42_{hex})
Description	This command queries the date and time of the real time clock.
Parameter	**–**
Response/parameter	**NB ES** / ***Year*** / ***Month*** / ***Day*** / ***Day_of_Week*** / ***Hour*** / ***Minute*** / ***Second***
Parameter	***Year***: 1990 ... ***Month***: 1 = January, ..., 12 = December ***Day***: 0 ... 31 ***Day_of_Week***: 0 = Sunday, ...; 6 = Saturday ***Hour***: 0 ... 23 ***Minute***: 0 ... 59 ***Second***: 0 ... 59
Data type parameter	***Year***: *unsigned integer* ***Month***: *byte* ***Day***: *byte* ***Day_of_Week***: *byte* ***Hour***: *byte* ***Minute***: *byte* ***Second***: *byte*
Check SW command	c (63_{hex})

Query RTC status

Command / *Parameter*	**NC** (4E 43_{hex})
Description	This command queries the status of the real time clock.
Parameter	**–**
Response/parameter	**NC ES *Running***: 00_{hex} = real time clock not running 01_{hex} = real time clock running
Data type parameter	***Running***: *byte*
Check SW command	–

Start RTC

Command / *Parameter*	**ND** (4E 44_{hex})
Description	This command starts the real time clock.
Parameter	**–**
Response/parameter	**ND ES**
Check SW command	–

Issue date 25.06.98

Stop RTC

Command / ***Parameter***	**NE** (4E 45_{hex})
Description	This command stops the real time clock.
Parameter	**–**
Response/parameter	**NE ES**
Check SW command	–

Initialize timer

Command / ***Parameter***	**OA** (4F 41_{hex})
Description	This command initializes a timer.
Parameter	**–**
Response/parameter	**OA ES** / ***Timer_Id***
Parameter	***Timer_Id***: ID allocated by the device for the initialized timer
Data type parameter	***Timer_Id***: *byte*
Check SW command	–

Set timer (absolute)

Command / ***Parameter***	**OB** (4F 42_{hex}) / ***Timer_Id*** / ***00_{hex}*** / ***Month*** / ***Day*** / ***Hour*** / ***Minute*** / ***Second***
Description	This command sets the absolute timer specified by ***Timer_Id***.
Parameter	***Timer_Id***: see command **OA** ***00_{hex}***: defined as absolute timer ***Month***: 0 ... 12 ***Day***: 0 ... 31 ***Hour***: 0 ... 23 ***Minute***: 0 ... 59 ***Second***: 0 ... 59
Data type parameter	***Timer_Id***: *byte* ***Month***: *byte* ***Day***: *byte* ***Hour***: *byte* ***Minute***: *byte* ***Second***: *byte*
Response/parameter	**OB ES**
Check SW command	–

Issue date 25.06.98

Set timer (relative)

Command / *Parameter*	**OB** (4F 42_{hex}) / ***Timer_Id*** / ***01_{hex}*** / ***Milliseconds***
Description	This command sets the relative timer specified by ***Timer_Id***.
Parameter	***Timer_Id***: see command **OA** ***01_{hex}***: defined as relative timer ***Milliseconds***: 0 ... 2,147,483,647 ms
Data type parameter	***Timer_Id***: *byte* ***Milliseconds***: *long*
Response/parameter	**OB ES**
Check SW command	–

Clear timer

Command / *Parameter*	**OC** (4F 43_{hex}) / ***Timer_Id***
Description	This command clears the timer specified by ***Timer_Id***.
Parameter	***Timer_Id***: see command **OA**
Data type parameter	***Timer_Id***: *byte*
Response/parameter	**OC ES**
Check SW command	–

7.3.12 Command group: event handling

The read/write device is provided with event handling with interrupts. All events, such as pushing a button, reading a code/data carrier or activating an input, can be queried easily by the user via software.

Fetch event

Command / *Parameter*	**PA** (50 41_{hex})
Description	The command queries whether an event has taken place. If an event has taken place, the event is determined. The response parameters are, with reference to the number and contents, dependent on the event type (parameter ***Event_type***).
Parameter	–
Response/parameter	**PA ES *Event_Type*** / additional event parameters
Parameter	***Event_Type***: 0 = event: DTMF-port input additional parameters: ***Digit***: DTMF-digit, range 0 ... 15

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Command / ***Parameter***	**PA** ($50\ 41_{hex}$)
	Event_Type: 1 = event: pushbutton input additional parameters: ***Button***: 00_{hex} = right pushbutton 01_{hex} = left pushbutton ***Event_Type***: 2 = event: motion detected additional parameters: ***Speed***: speed of detected object in (0.1 x m/s), range: 0 ... 255 ***Direction***: 00_{hex} = object retreating 01_{hex} = object advancing ***Event_Type***: 3 = event: input activated additional parameters: ***Par_In_Id***: see command **KA** ***Value***: 00_{hex} = input active (voltage present) 01_{hex} = input not active ***Event_Type***: 4 = event: timer expired additional parameters: ***Timer_Id***: see command **OA** ***Type***: 00_{hex} = absolute timer 01_{hex} = relative timer ***Forced***: 00_{hex} = normal timer execution 01_{hex} = forced timer execution

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Command / ***Parameter***	**PA** (50 41_{hex})
	Event_Type: 5 = event: read result additional parameters: ***Mark1*** ... ***Mark9***: see command **CP** ***Ctrl1*** / ***Ctrl2*** see command **CP** ***UDS*** see command **CP** ***UD1*** ... ***UDn*** see command **CP** ***Status***: For data carriers Bit 7 (MSB): 0 = battery ok 1 = battery almost dead Bit 6: 0 = no unsuccessful write attempt 1 = unsuccessful write attempt Bits 5 and 4: 0 = input 1 activated 1 = input 1 not activated Bits 3, 2 and 1: 0 = input 2 activated 1 = input 2 not activated Bit 0 (LSB): not used (= 0) For code carriers Bit 7...0 (MSB): 0 = battery ok 1 = battery almost dead ***Event_Type***: 6 = event: housing switch activated additional parameters: ***Open***: 00_{hex} = housing closed 01_{hex} = housing opened ***Event_Type***: 7 = no event no additional parameters ***Event_Type***: 8 = event: reset additional parameters: ***2_Buttons***: 00_{hex} = neither pushbutton was pushed when operating voltage applied 01_{hex} = both pushbuttons were pushed when operating voltage applied
Data type parameter	*Byte (applies for all response parameters)*
Check SW command	–

Issue date 25.06.98

7.3.13 Command group: serial communication RS 232 / RS 485

Initialize serial port

Command / *Parameter*	**RA** (52 41_{hex}) / ***Port*** / ***Baud rate*** / ***Databits*** / ***Stopbits*** / ***Parity***
Description	This command initializes the serial port specified by the parameter ***Port*** and sets the transmission parameters.
Parameter	***Port***: 00_{hex} = Port A, RS 232 01_{hex} = Port B, RS 232 02_{hex} = Port B, RS 485 2-wire 03_{hex} = Port B, RS 485 4-wire ***Baud rate***: 00_{hex} = 1200 Bit/s 01_{hex} = 2400 Bit/s 02_{hex} = 4800 Bit/s 03_{hex} = 9600 Bit/s 04_{hex} = 19200 Bit/s 05_{hex} = 38400 Bit/s ***Databits***: 00_{hex} = 7 databits, 01_{hex} = 8 databits ***Stopbits***: 00_{hex} = 1 stopbit, 01_{hex} = 2 stopbits ***Parity***: 00_{hex} = no parity 01_{hex} = odd parity 02_{hex} = even parity
Data type parameter	***Port***: *byte* ***Baud rate***: *byte* ***Databits***: *byte* ***Stopbits***: *byte* ***Parity***: *byte*
Response/parameter	**RA ES**
Check SW command	! (21_{hex}) = Port A, RS 232 " (22_{hex}) = Port B, RS 232 = ($3D_{hex}$) = Port B, RS 485 2-wire $ (24_{hex}) = Port B, RS 485 4-wire ' (27_{hex}) = Port setup V (56_{hex}) = Set address

Issue date 25.06.98

Fetch serial port settings

Command / ***Parameter***	**RB** (52 42_{hex}) / ***Port***
Description	This command queries the transmission parameters of the serial port specified by the parameter ***Port***.
Parameter	***Port***: 00_{hex} = Port A, RS 232 01_{hex} = Port B, RS 232 02_{hex} = Port B, RS 485 2-wire 03_{hex} = Port B, RS 485 4-wire
Data type parameter	***Port***: *byte*
Response/parameter	**RB ES** / ***Baud rate*** / ***Databits*** / ***Stopbits*** / ***Parity***
Parameter	***Baud rate***: 00_{hex} = 1200 Bit/s 01_{hex} = 2400 Bit/s 02_{hex} = 4800 Bit/s 03_{hex} = 9600 Bit/s 04_{hex} = 19200 Bit/s 05_{hex} = 38400 Bit/s ***Databits***: 00_{hex} = 7 databits, 01_{hex} = 8 databits ***Stopbits***: 00_{hex} = 1 Stopbits, 01_{hex} = 2 Stopbits ***Parity***: 00_{hex} = no parity 01_{hex} = odd parity 02_{hex} = even parity
Data type parameter	***Baud rate***: *byte* ***Databits***: *byte* ***Stopbits***: *byte* ***Parity***: *byte*
Check SW command	v (56_{hex}) = fetch address

Issue date 25.06.98

Fetch serial port status

Command / *Parameter*	**RC** (52 43_{hex}) / ***Port***
Description	This command queries the current status of the port specified by the parameter ***Port***.
Parameter	***Port*** 00_{hex} = Port A, RS 232 01_{hex} = Port B, RS 232 02_{hex} = Port B, RS 485 2-wire 03_{hex} = Port B, RS 485 4-wire
Data type parameter	***Port***: *byte*
Response/parameter	**RC ES *Status*** Status description: Bit 15: transmission error, new frames received prematurely Bit 14: parity error Bit 13: transmission error, Stopbits = 0 detected Bit 12: buffer overflow, buffer full Bit 11: buffer is empty Bit 10: timeout, RS 485 2-wire transmission error Bit 9 ... 0: = 0, not used
Data type parameter	*unsigned integer*
Check SW command	–

Read-out serial port reception buffer

Command / *Parameter*	**RD** (52 44_{hex}) / ***Port***
Description	This command fetches a character from the reception buffer of the port specified by ***Port***. It should first be ensured that the buffer is not empty by using the command **RC**.
Parameter	***Port*** 00_{hex} = Port A, RS 232 01_{hex} = Port B, RS 232 02_{hex} = Port B, RS 485 2-wire 03_{hex} = Port B, RS 485 4-wire
Data type parameter	***Port***: *byte*
Response/parameter	**RD ES *Data***
Parameter	***Data***: 1 character from the reception buffer
Data type parameter	***Data***: *byte*
Check SW command	, ($2C_{hex}$)

Issue date 25.06.98

Write to serial port transmission buffer

Command / ***Parameter***	**RE** (52 45_{hex}) / ***Port*** / ***Length*** / ***Data_1*** / ***...*** / ***Data_n***
Description	This command writes n characters in the transmission buffer of the port specified by ***Port*** and starts transmission of these characters.
Parameter	***Port***: 00_{hex} = Port A, RS 232 01_{hex} = Port B, RS 232 02_{hex} = Port B, RS 485 2-wire 03_{hex} = Port B, RS 485 4-wire ***Length***: n, number of transmission bytes ***Data_1 ... Data_n***: transmission data
Data type parameter	***Port***: *byte* ***Length***: *integer* ***Data_1 ... Data_n***: *byte*
Response/parameter	**RE ES**
Check SW command	–

Set timeout of the RS 485 (2-wire)

Command / ***Parameter***	**RG** (52 47_{hex}) / ***Timeout***
Description	This command sets the timeout time of the RS 485 2-wire interface. While transmitting data, the MTT .. monitors data traffic for 10 ms. If no data traffic is detected, its own message is transmitted. Otherwise, no new transmission attempts will be made until the timeout time has expired. This command can be entered before or after initializing the RS 485 ports.
Parameter	***Timeout***: 200 ... 2000 ms (default: 500 ms)
Data type parameter	***Timeout***: *integer*
Response/parameter	**RG ES**
Check SW command	–

Fetch timeout of the RS 485 (2-wire)

Command / ***Parameter***	**RH** (52 48_{hex})
Description	This command queries the timeout time of the RS 485 2-wire interface (see command **RG**).
Response/parameter	**RH ES** ***Timeout***
Parameter	***Timeout***: 200 ... 2000 ms (default: 500 ms)
Data type parameter	***Timeout***: *integer*
Check SW command	–

Issue date 25.06.98

7.3.14 Command group: System administration

Fetch version

Command / *Parameter*	**QA** (51 41_{hex})
Description	This command queries the version of the MTT-internal software. The string ***Ver_1*** ... ***Ver_n*** in the response data contains the following information: 1. SW library name 2. SW library version 3. Date/time of library creation 4. Version no. of the MTT operating system Example:' \ConfiLib\1.0\May 15 1998 15:00:00\2.0\'
Response/parameter	**QA ES *Length* / *Ver_1* / *...* / *Ver_n***
Parameter	***Length***: n, number of following bytes
Data type parameter	***Length***: *byte* ***Ver_1 ... Ver_n*** *byte*
Check SW command	–

Write data to EEPROM

Command / *Parameter*	**QD** (51 44_{hex}) / ***Offset*** / ***Length*** / ***Data_1*** / ***...*** / ***Data_n***
Description	This command writes n 16-bit words to the MTT EEPROM (size: 60 16-bit words) which contain the default settings for the device (factory settings).
Parameter	***Offset***: 0 ... 59 ***Length***: n, number of following words 0 ... (60-***Offset***) ***Data_1 ... Data_n***: write data words
Data type parameter	***Offset***: *byte* ***Length***: *byte* ***Data_1 ... Data_n***: *unsigned integer*
Response/parameter	**QD ES**
Check SW command	–

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Read data from EEPROM

Command / ***Parameter***	**QE** (51 45_{hex}) / ***Offset*** / ***Length***
Description	This command fetches n 16-bit words from the MTT EEPROM (size: 60 16-bit words) which contain the default settings for the device (factory settings).
Parameter	***Offset***: 0 ... 59 ***Length***: n, number of words to be read 0 ... (60-***Offset***)
Data type parameter	***Offset***: *byte* ***Length***: *byte*
Response/parameter	**QE ES** / ***Data_1*** / ***...*** / ***Data_n***
Parameter	***Data_1 ... Data_n***: read data words
Data type parameter	***Data_1 ... Data_n***: *unsigned integer*
Check SW command	–

Restore default values

Attention

Upon restoring the device configuration to the default values, all previously made settings are lost and the database deleted.

Command / ***Parameter***	**QF** (51 46_{hex})
Description	This command resets all device settings to the default settings.
Parameter	**–**
Response/parameter	**QF ES**
Check SW command	. ($2E_{hex}$)

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7.3.15 Command group: Mail communication

Transmit mail

Command / *Parameter*	**$EOT** (24 04_{hex}) / ***Size*** / ***Data_1*** / ***...*** / ***Data_n***
Description	This command transmits a mail string up to 154 characters (bytes) long to the MTT mailbox. Up to 25 mail messages can be buffered in this mailbox. A mail typically consists of a series of parameter values. Once a mail has been 'processed', it is deleted from the mailbox.
Parameter	***Size***: n, 1 ... 154 characters ***Data_1 ... Data_n***: databytes of the mail message
Data type parameter	***Size***: *byte* ***Data_1 ... Data_n***: *byte*
Response/parameter	**$EOT ES**
Check SW command	–

Fetch mail

Command / *Parameter*	**$ENQ** (24 05_{hex})
Description	This command fetches a mail up to 255 characters (bytes) long from the MTT mailbox (see command **$EOT**).
Parameter	**–**
Response/parameter	**$ENQ ES** / ***Size*** / ***Data_1*** / ***...*** / ***Data_n***
Parameter	***Size***: n, 1 ... 255 characters ***Data_1 ... Data_n***: databytes of the mail message
Data type parameter	***Size***: *byte* ***Data_1 ... Data_n***: *byte*
Check SW command	–

Complex messages can be exchanged with the MTT mail communication system, e.g. setting and querying device configuration, querying events etc. Following are selected important mail functions:

Query device configuration

If you send an 'S' (53_{hex}) via mail to the MTT, the MTT then generates two response mail messages which can be retrieved from the MTT with the command **$ENQ** (Fetch mail). The first mail message contains information regarding the operating system of the MTT; the second mail message contains a 36-character-long string containing the current device configuration.

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Example:

1. Response mail: 'S1500 Pyramid 1.10'
2. Response mail: 'On5004HIOF23019601 nOFOFALOFALdo01OF'

In the character string for the device configuration, pairs of characters indicate the current values of the device parameters. The characters are in the order in which the parameters were described in the tables in Section 6.2.

The character string in the example returns the following settings:

On	operating mode 'On'
50	frequency channel 50
04	read range 4
HI	high data transfer speed
OF	code carrier with quartz oscillator
23	port B: RS 232 interface
01	ConfiTalk address: 1
96	transfer rate 9600 Bit/s
01	1 stopbit
n	no parity
OF	no search in database
OF	motion recognition not active
AL	logging all read code/data carriers
OF	relay output without function
AL	buzzer activation when a code/data carrier has been read
do	control yellow LED on all detected motion
01	tripping time 1 s
OF	housing cover monitoring deactivated

Set device configuration

The device configuration can also be set via mail by transmitting a 36-character-long string which contains the new parameter values in the sequence described above. If a given parameter is not to be changed, two periods are to be entered for the value (example see section 7.4).

Event mails

Event mails are only generated in the operating mode 'On' and only when the logging for the corresponding event has been activated (parameters Lo and tS).

Examples:

Read data carrier

Response mail: 'MMMMMMMM YYYYMMDD HHMMSS F read data'

Explanation: The first 8 characters contain the permanently programmed ID of the code/data carrier. Next follow the date and time at which the read operation took place, the result of the database search (F = found, N = not found, blank space= no search performed) and, finally, the read data.

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Motion detected

Response mail: 'Movement YYYYMMDD HHMMSS X.X m/s a'

Explanation: The first 8 characters identify the event. Next follow the date and time of the motion recognition, the speed of the object in m/s and its direction (a = advancing, r = retreating).

Housing has been opened/closed

Response mail: 'Tamper YYYYMMDD HHMMSS xxxxxx'

Explanation: The first 6 characters identify the event. Next follow the date and time at which the housing was accessed and the text xxxxxx (xxxxxx = 'opened' or 'closed').

Device RESET

Response mail: 'Reset YYYYMMDD HHMMSS x'

Explanation: The first 5 characters identify the event. Next follow the date and time of the reset and the source (B = Reset by simultaneously pushing the buttons when applying the operating voltage, blank space = buttons were not pushed).

7.4 Command examples

Following are selected examples of complete commands including start-of-text character, address, command with parameter(s), checksum and end-of-text character (see section 7.3.1).

Synchronization:

Synchronization should always be carried out as the first command :

Command: 02_{hex} 01_{hex} 16_{hex} 10_{hex} 15_{hex} 03_{hex}
or 02_{hex} 81_{hex} 16_{hex} 95_{hex} 03_{hex} with toggled synchronization bit
Response: none

Query of device settings via mail commands

Send mail 'S'
Command: 02_{hex} 81_{hex} 24_{hex} 04_{hex} 01_{hex} 'S' $F1_{hex}$ 03_{hex}
Response: 02_{hex} 81_{hex} 24_{hex} 04_{hex} 80_{hex} 00_{hex} 23_{hex} 03_{hex}

Fetch mail
Command 02_{hex} 01_{hex} 24_{hex} 05_{hex} 22_{hex} 03_{hex}
Response: 02_{hex} 01_{hex} 24_{hex} 05_{hex} 80_{hex} 00_{hex} 12_{hex} 'S1500 Pyramid 1,10' $A3_{hex}$ 03_{hex}

Fetch mail
Command 02_{hex} 81_{hex} 24_{hex} 05_{hex} $A2_{hex}$ 03_{hex}
Response: 02_{hex} 81_{hex} 24_{hex} 05_{hex} 80_{hex} 00_{hex} 24_{hex}
'On5004HIOF23019601 nOFOFALOFALdo01OF' 64_{hex} 03_{hex}

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Set operating mode 'OF':

Send mail

Command: 02_{hex} 01_{hex} 24_{hex} 04_{hex} 24_{hex} 'OF.....' $0E_{hex}$ 03_{hex}
Response: 02_{hex} 01_{hex} 24_{hex} 04_{hex} 80_{hex} 00_{hex} 23_{hex} 03_{hex}

If the command is correctly received, the read/write device beeps.

Read data carrier:

In order to read code or data carriers, read is switched on.

Command: 02_{hex} 81_{hex} 43_{hex} $4D_{hex}$ $8D_{hex}$ 03_{hex}
Response: 02_{hex} 81_{hex} 43_{hex} $4D_{hex}$ 80_{hex} 00_{hex} $0D_{hex}$ 03_{hex}

After a code or data carrier has been read, the read data can no longer be retrieved in the operating mode 'OF' via the mail function, but, rather, must be retrieved using the command **PA** 'Fetch event'.

Command: 02_{hex} 01_{hex} 50_{hex} 41_{hex} 12_{hex} 03_{hex}
Response: 02_{hex} 01_{hex} 50_{hex} 41_{hex} 80_{hex} 00_{hex} 05_{hex} 00_{hex} 00_{hex} $3B_{hex}$ $2A_{hex}$ $D8_{hex}$
25_{hex} FD_{hex} AE_{hex} 88_{hex} 91_{hex} 00_{hex} 01_{hex} 31_{hex} 33_{hex} 32_{hex} 34_{hex} 00_{hex}
00_{hex} 00_{hex} 00_{hex} 00_{hex} 00_{hex} 00_{hex} 00_{hex} 00_{hex} 00_{hex} 00_{hex} 00_{hex} 00_{hex}
00_{hex} 00_{hex} 00_{hex} $3E_{hex}$ $0A_{hex}$ 03_{hex}

The following function switches read off again.

Stop read process

Command: 02_{hex} 81_{hex} 43_{hex} $4E_{hex}$ $8E_{hex}$ 03_{hex}
Response: 02_{hex} 81_{hex} 43_{hex} $4E_{hex}$ 80_{hex} 00_{hex} $0E_{hex}$ 03_{hex}

Write data carrier

The commands **CP** and **CY** are available for writing. The command **CY** writes the data carrier regardless of to which data rate the data carrier is set. In the following example, a data carrier is formatted to quarter capacity, random interval, interval length 8 and high transfer rate, and the character string "ABCDEFGHIJKLMNOPQRST" is written.

Command: 02_{hex} 81_{hex} 43_{hex} 59_{hex} 01_{hex} 00_{hex} 00_{hex} 00_{hex} 00_{hex} 00_{hex} 00_{hex} 00_{hex}
00_{hex} 00_{hex} $F4_{hex}$ 00_{hex} 01_{hex} 41_{hex} 42_{hex} 43_{hex} 44_{hex} 45_{hex} 46_{hex} 47_{hex}
48_{hex} 49_{hex} $4A_{hex}$ $4B_{hex}$ $4C_{hex}$ $4D_{hex}$ $4E_{hex}$ $4F_{hex}$ 50_{hex} 51_{hex} 52_{hex} 53_{hex}
54_{hex} 79_{hex} 03_{hex}
Response: 02_{hex} 81_{hex} 43_{hex} 59_{hex} 80_{hex} 00_{hex} 19_{hex} 03_{hex}

To check whether the write operation was successful, the command **CO** 'Query status' can be used. If the write operation was correct, a dialog similar to the following is returned:

Command: 02_{hex} 01_{hex} 43_{hex} $4F_{hex}$ $0F_{hex}$ 03_{hex}
Response: 02_{hex} 01_{hex} 43_{hex} $4F_{hex}$ 80_{hex} 00_{hex} 00_{hex} 00_{hex} $8F_{hex}$ 03_{hex}

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8 Fault Diagnostics

8.1 Functional test

Device initialization

With the control LED you can easily see if the read/write device is correctly initialized after applying the operating voltage. The LED must flash briefly after approx. 4 s. In addition, the message '$_{CS}$' (Checking System) appears briefly during device initialization.

If the device does not initialize as described and does not function properly, carry out a RESET to restore the default values.


Attention

Upon restoring the device configuration to the default values, all previously made settings are lost and the database deleted.

Testing other device functions

You can test other device functions by changing the device configuration via the internal control panel (see section 6.2).

Examples:

Function to be tested	Parameter/value	Meaning
Reading from code/data carriers	$_{OP}$ / $_{rb}$	'read-beep' mode
Write to data carrier	$_{OP}$ / $_{Pb}$	'program-beep' mode
Motion recognition	$_{dr}$ / $_{5}$	activate motion recognition

8.2 Device diagnosis via one of the serial interfaces

Testing the communication via the serial interfaces

If communication does not function via the serial interfaces, first test the following points:

- Are the electrical connections (cables, plugs, solder connections etc.) in working order ?
- Is the interface cable connected to the correct COM port?
- Do the transmission parameters set on the MTT.. (default: 9600 Bit/s, 8 databits, 1 stopbit, no parity) match the transmission parameters set on the Host/Terminal?


Note

The demo software included in the scope of delivery automatically sets the COM port of the PC to the correct transmission parameters.

- Does communication function properly via other serial interfaces on the read/write device?

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If serial communication with the MTT is in proper working order, you can test individual device functions in various manners:

- All important device functions can easily tested with the aid of the supplied demo software.
- In the 'Check SW' mode (see section 7.2), you can, with the aid of a simple terminal program, transmit 'Check SW' commands to the MTT and, in this way, test the device functions (see section 7.3.2, Command overview).

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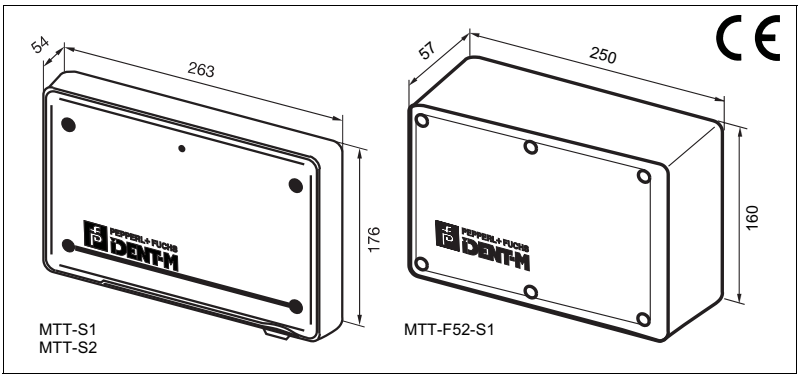
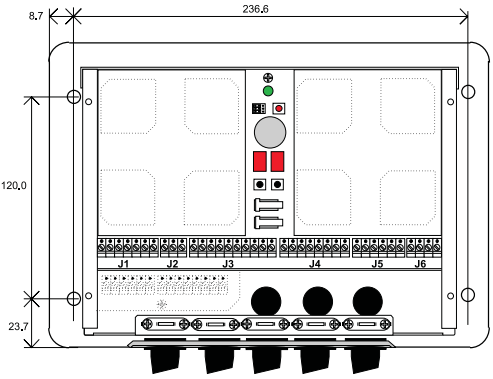
9 Technical Data

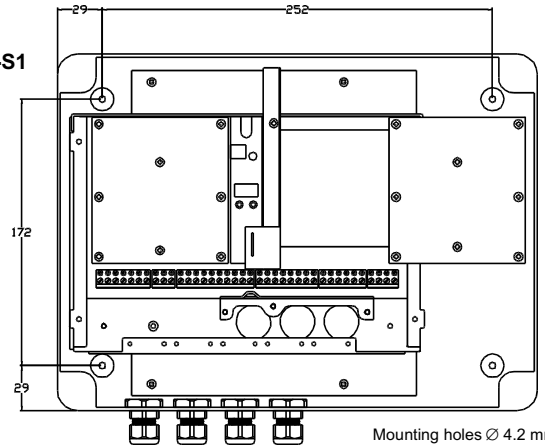


MTT-S1
MTT-S2



Mounting holes ∅ 4.2 mm

MTT6000-F51-S1



Mounting holes ∅ 4.2 mm

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Technical Data Ordering code	MTT-S1	MTT-F52-S1	MTT6000-F51-S1	MTT-S2
Nominal ratings:				
Operating Frequency	2.435 ... 2.465 GHz, 100 ID-channels Channel spacing 300 kHz			
Polarization	circular			
Read Transfer Rate	4 kBit/s, 16 kBit/s			
Read Range	0 ... 4 m	0 ... 4 m	0 ... 6 m	0 ... 4 m
Write Transfer Rate	4 kBit/s			
Write Range	0 ... 0.5 m			
Motion Recognition	0.3 ... 9.2 m/s			
Motion Recognition Range	max. 5 m			
Flash EEPROM Storage	384 kByte	384 kByte	384 kByte	128 kByte
SRAM Storage	128 kByte	128 kByte	128 kByte	128 kByte
Environmental conditions				
Operating Temperature	253 Kelvin ... 333 Kelvin (-20 °C ... +60 °C)			
Storage Temperature	253 Kelvin ... 333 Kelvin (-20 °C ... +60 °C)			
Impact Resistance	40G, 6 ms, 1000x in all 3 spatial axes per IEC 68-2-29 Eb			
Shock Resistance	15G, 6 ms, 10x in all 3 spatial axes per IEC 68-2-27 test Ea			
Vibration Resistance	5G, 0,55 mm, 50 Hz per IEC 68-2-6 Fc			
Solar Irradiation	1120 W/m^2, 56 days per IEC 68-2-5 Sa C			
Protection Class to EN 60529	IP 43	IP 65	IP 56	IP 43
Type-examination certificate	BPT No. A131866J	Test certificate applied for		BPT No. A131866J
Mechanical				
Dimensions (W x H x D)	263 x 176 x 54	250 x 160 x 57	315 x 234 x 128	263 x 176 x 54
Mounting	4 mounting holes, 4.2 mm diameter			
Housing material (face)	PC	ABS	PC	PC
Housing Material (back)	stainless steel	ABS	PP	stainless steel
Weight	1.9 kg	1.7 kg	3.0 kg	1.9 kg
Power Supply				
Supply Voltage DC	20 ... 28 V, switchable 10 ... 14 V	20 ... 28 V, switchable 10 ... 14 V	20 ... 28 V, switchable 10 ... 14 V	10 ... 14 V
Current consumpt. at 24 V DC	150 mA	150 mA	150 mA	–
Current consumpt. at 12 V DC	500 mA	500 mA	500 mA	500 mA

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Internal View MTT-S1

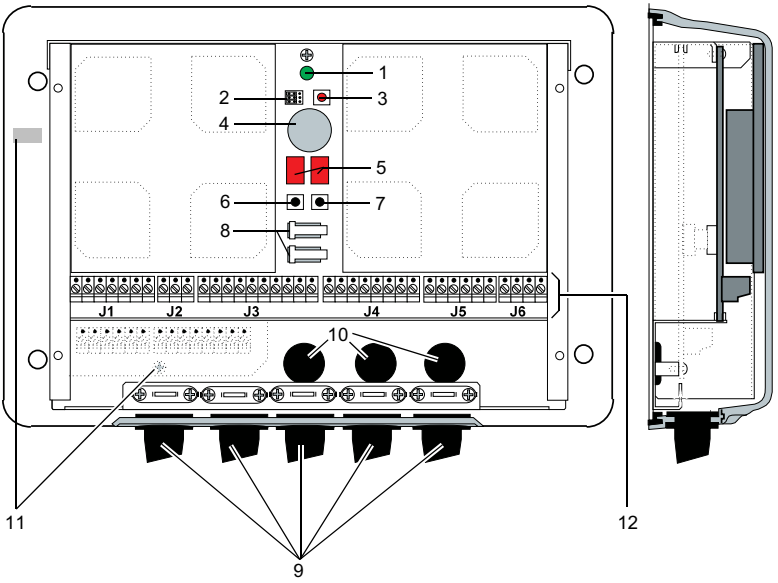
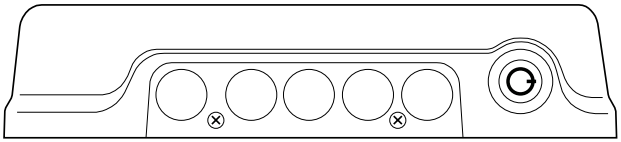


Illustration of Hardware Features:

1 Multicolored LED
2 Jumper field
3 RESET button
4 Buzzer
5 7-segment display, two-digit
6 'Parameter-Selection' button
7 'Value-Selection' button
8 Housing switch
9 Cable connection access, bottom
10 Cable connection access, back (prepared)
11 Earth terminals
12 Connection terminal block

Cable Entry, Bottom

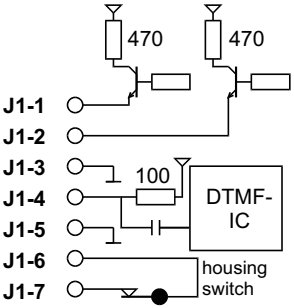


Issue date 25.06.98

Assignments of the Connection Terminal Block

Terminal block J1:

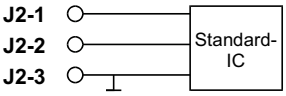
Terminals	Signal	Meaning
J1-1	LED 1	LED output 1
J1-2	LED 2	LED output 2
J1-3	GndLED	Ground LED output
J1-4	SDTMF	DTMF interface
J1-5	RtnDTMF	
J1-6	Tamp a	Housing switch
J1-7	Tamp b	



Technical Data DTMF interface	MTT-S1	MTT-F52-S1	MTT6000-F51-S1	MTT-S2
	2-wire interface for the reception of a dual tone signal and the power supply of a DTMF device			
Line voltage at 10 mA	min. 4.1 V; max. 4.5 V			
Sound level	min. -26 dB; max. 0 dB			

Terminal block J2:

Terminals	Signal	Meaning
J2-1	Tx 232a	RS 232 interface A
J2-2	Rx 232a	
J2-3	Gnd 232a	



Technical Data serial Port A, RS 232	MTT-S1	MTT-F52-S1	MTT6000-F51-S1	MTT-S2
Standard values	9600 Bit/s, 8 Bits, no parity, 1 Stop-Bit			
Transfer rate	1200, 2400, 4800, 9600 or 19200 Bit/s			
No. of data bits	7 or 8			
No. of stop bits	1 or 2			
Parity	no, odd or even			

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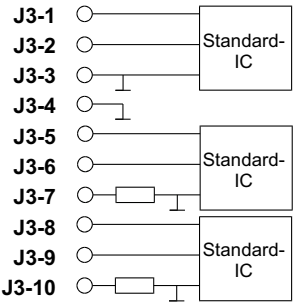
Terminal block J3:

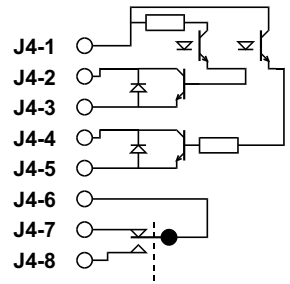
Terminals	Signal	Meaning
J3-1	Tx 232b	RS 232 interface B
J3-2	Rx 232b	
J3-3	Gnd 232b	
J3-4	CGnd	Common ground
J3-5	Tx–/Rx– 485	RS 485 interface
J3-6	Tx+/Rx+ 485	
J3-7	Gnd485t	
J3-8	Rx 485–	
J3-9	Rx 485	
J3-10	Gnd 485r	



Technical Data serial Port B, RS 232 / RS 485	MTT-S1	MTT-F52-S1	MTT6000-F51-S1	MTT-S2
RS 485 selection	Full-duplex (4-wire) or half-duplex (2-wire)			
Standard values	9600 Bit/s, 8 Bits, no parity, 1 Stop-Bit			
Transfer rate	1200, 2400, 4800, 9600, 19200 or 38400 Bit/s			
No. of data bits	7 or 8			
No. of stop bits	1 or 2			
Parity	no, odd or even			

Terminal block J4:

Terminals	Signal	Meaning
J4-1	Outspl1	Voltage outputs
J4-2	Out 1c	Output 1, collector
J4-3	Out 1e	Output 1, emitter
J4-4	Out 2c	Output 2, collector
J4-5	Out 2e	Output 2, emitter
J4-6	R1c	Relay output
J4-7	R1b	
J4-8	R1m	



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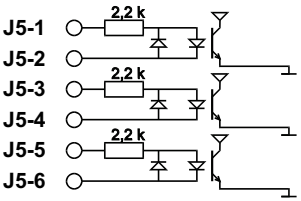
Technical Data outputs	MTT-S1	MTT-F52-S1	MTT6000-F51-S1	MTT-S2
Optical coupling outputs	2, open-collector, galvanically isolated			
Allowable voltage Range	min. 1.0 V; max. 30.0 V			
Current range, output 1	min. 0.0 mA; max. 500 mA			
Current range, output 2	min. 0.0 mA; max. 100 mA			
Relay Output				
Switch voltage DC	max. 220 V			
Switch voltage AC	max. 48 V			
Switch current	max. 2 A			
Switch load	max. 50 W			

Terminal block J5:

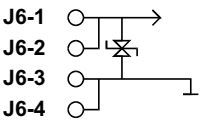
Terminals	Signal	Meaning
J5-1	In 1a	Optical coupling inputs 1
J5-2	In 1c	
J5-3	In 2a	Optical coupling inputs 2
J5-4	In 2c	
J5-5	In 3a	Optical coupling inputs 3
J5-6	In 3c	



Technical Data Optical Coupling Inputs	MTT-S1	MTT-F52-S1	MTT6000-F51-S1	MTT-S2
Number	3, galvanically isolated			
Voltage level 'High'	min. 2.4 V; max. 30.0 V			
Voltage level 'Low'	min. 0.0 V; max. 0.2 V			

Terminal block J6:

Terminals	Signal	Meaning
J6-1	Spl 1	Supply voltage +
J6-2	Spl 2	
J6-3	Rtnspl 1	Supply voltage –
J6-4	Rtnspl 2	



Technical Data Supply Voltage	MTT-S1	MTT-F52-S1	MTT6000-F51-S1	MTT-S2
Supply voltage DC	20 ... 28 V, switchable 10 ... 14 V	20 ... 28 V, switchable 10 ... 14 V	20 ... 28 V, switchable 10 ... 14 V	10 ... 14 V
Current consumpt. at 24 V DC	150 mA	150 mA	150 mA	–
Current consumpt. at 12 V DC	500 mA	500 mA	500 mA	500 mA

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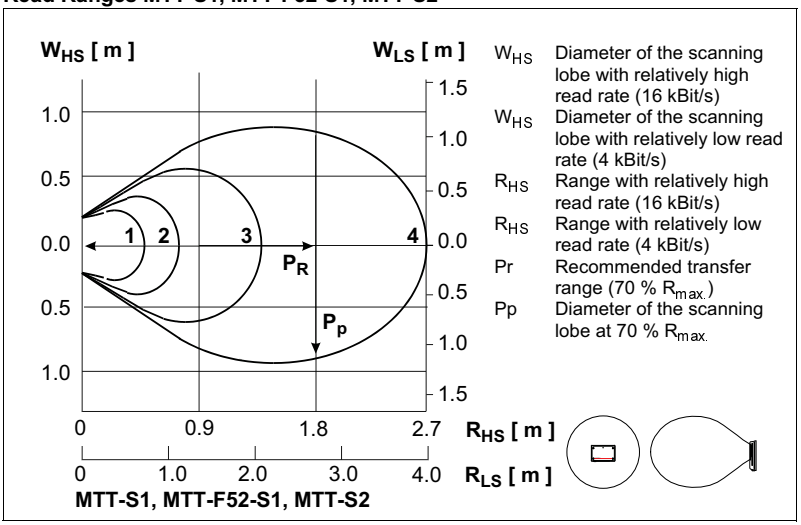
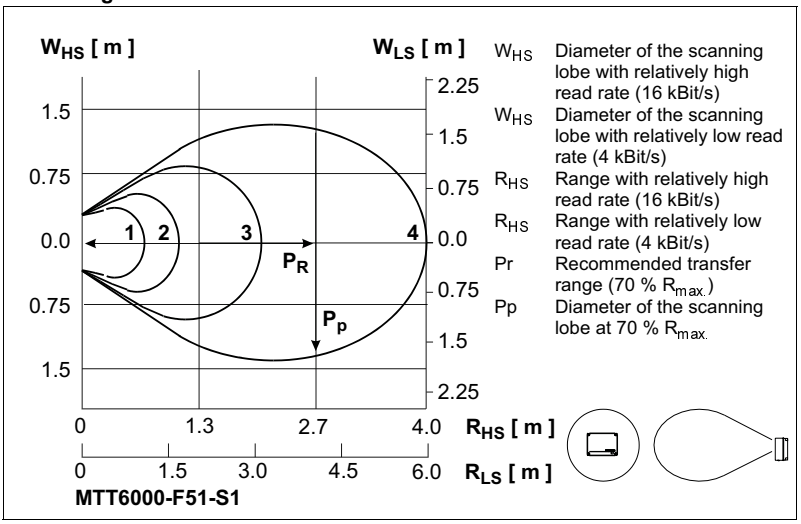
Read Ranges MTT-S1, MTT-F52-S1, MTT-S2



MTT-S1, MTT-F52-S1, MTT-S2

Read Ranges MTT6000-F51-S1



MTT6000-F51-S1

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10 Appendix

10.1 Character table

The following table contains the Microsoft Windows standard character set, where characters 0 ... 127 are identical to the ASCII character set. Characters above 127 may differ for other operating systems.

Dec	Hex	Bin	Char	Ctrl
0	00	0000 0000	Ctrl-@	NUL
1	01	0000 0001	Ctrl-A	SOH
2	02	0000 0010	Ctrl-B	STX
3	03	0000 0011	Ctrl-C	ETX
4	04	0000 0100	Ctrl-D	EOT
5	05	0000 0101	Ctrl-E	ENQ
6	06	0000 0110	Ctrl-F	ACK
7	07	0000 0111	Ctrl-G	BEL
8	08	0000 1000	Ctrl-H	BS
9	09	0000 1001	Ctrl-I	HT
10	A0	0000 1010	Ctrl-J	LF
11	0b	0000 1011	Ctrl-K	VT
12	0C	0000 1100	Ctrl-L	FF
13	0d	0000 1101	Ctrl-M	CR
14	0E	0000 1110	Ctrl-N	SO
15	0F	0000 1111	Ctrl-O	SI
16	10	0001 0000	Ctrl-P	DLE
17	11	0001 0001	Ctrl-Q	DC1
18	12	0001 0010	Ctrl-R	DC2
19	13	0001 0011	Ctrl-S	DC3
20	14	0001 0100	Ctrl-T	DC4
21	15	0001 0101	Ctrl-U	NAK
22	16	0001 0110	Ctrl-V	SYN
23	17	0001 0111	Ctrl-W	ETB
24	18	0001 1000	Ctrl-X	CAN
25	19	0001 1001	Ctrl-Y	EM
26	A1	0001 1010	Ctrl-Z	SUB
27	B1	0001 1011	Ctrl-[	ESC
28	1C	0001 1100	Ctrl-\	FS
29	1d	0001 1101	Ctrl-]	GS
30	1E	0001 1110	Ctrl-^	RS
31	1F	0001 1111	Ctrl-/	US
32	20	0010 0000		SP
33	21	0010 0001	!	

Dec	Hex	Bin	Char	Ctrl
34	22	0010 0010	"	
35	23	0010 0011	#	
36	24	0010 0100	$	
37	25	0010 0101	%	
38	26	0010 0110	&	
39	27	0010 0111	'	
40	28	0010 1000	(	
41	29	0010 1001	)	
42	A2	0010 1010	*	
43	B2	0010 1011	+	
44	2C	0010 1100	,	
45	2d	0010 1101	-	
46	2E	0010 1110	.	
47	2F	0010 1111	/	
48	30	0011 0000	0	
49	31	0011 0001	1	
50	32	0011 0010	2	
51	33	0011 0011	3	
52	34	0011 0100	4	
53	35	0011 0101	5	
54	36	0011 0110	6	
55	37	0011 0111	7	
56	38	0011 1000	8	
57	39	0011 1001	9	
58	A3	0011 1010	:	
59	B3	0011 1011	;	
60	3C	0011 1100	<	
61	3d	0011 1101	=	
62	3E	0011 1110	>	
63	3F	0011 1111	?	
64	40	0100 0000	@	
65	41	0100 0001	A	
66	42	0100 0010	B	
67	43	0100 0011	C	

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Dec	Hex	Bin	Char	Ctrl
68	44	0100 0100	D	
69	45	0100 0101	E	
70	46	0100 0110	F	
71	47	0100 0111	G	
72	48	0100 1000	H	
73	49	0100 1001	I	
74	A4	0100 1010	J	
75	B4	0100 1011	K	
76	4C	0100 1100	L	
77	4d	0100 1101	M	
78	4E	0100 1110	N	
79	4F	0100 1111	O	
80	50	0101 0000	P	
81	51	0101 0001	Q	
82	52	0101 0010	R	
83	53	0101 0011	S	
84	54	0101 0100	T	
85	55	0101 0101	U	
86	56	0101 0110	V	
87	57	0101 0111	W	
88	58	0101 1000	X	
89	59	0101 1001	Y	
90	A5	0101 1010	Z	
91	5b	0101 1011	[	
92	5C	0101 1100	\	
93	5d	0101 1101	]	
94	5E	0101 1110	^	
95	5F	0101 1111	_	
96	60	0110 0000	,	
97	61	0110 0001	a	
98	62	0110 0010	B	
99	63	0110 0011	c	
100	64	0110 0100	d	
101	65	0110 0101	E	
102	66	0110 0110	f	
103	67	0110 0111	g	
104	68	0110 1000	h	
105	69	0110 1001	i	
106	A6	0110 1010	J	
107	6b	0110 1011	K	
108	6C	0110 1100	L	

Dec	Hex	Bin	Char	Ctrl
109	6d	0110 1101	m	
110	6E	0110 1110	N	
111	6F	0110 1111	o	
112	70	0111 0000	p	
113	71	0111 0001	q	
114	72	0111 0010	R	
115	73	0111 0011	S	
116	74	0111 0100	T	
117	75	0111 0101	u	
118	76	0111 0110	v	
119	77	0111 0111	W	
120	78	0111 1000	x	
121	79	0111 1001	y	
122	A7	0111 1010	z	
123	7b	0111 1011	{	
124	7C	0111 1100	|	
125	7d	0111 1101	}	
126	7E	0111 1110	~	
127	7F	0111 1111	Ctrl-0	DEL
128	80	1000 0000	_	
129	81	1000 0001	_	
130	82	1000 0010	,	
131	83	1000 0011	*ƒ*	
132	84	1000 0100	ì	
133	85	1000 0101	…	
134	86	1000 0110	†	
135	87	1000 0111	‡	
136	88	1000 1000	ˆ	
137	89	1000 1001	‰	
138	A8	1000 1010	Š	
139	8b	1000 1011	‹	
140	8C	1000 1100	Œ	
141	8d	1000 1101	_	
142	8E	1000 1110	_	
143	8F	1000 1111	_	
144	90	1001 0000	_	
145	91	1001 0001	ë	
146	92	1001 0010	í	
147	93	1001 0011	î	
148	94	1001 0100	”	
149	95	1001 0101	ï	

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Dec	Hex	Bin	Char	Ctrl
150	96	1001 0110	ñ	
151	97	1001 0111	ó	
152	98	1001 1000	˜	
153	99	1001 1001	™	
154	A9	1001 1010	š	
155	9b	1001 1011	›	
156	9C	1001 1100	œ	
157	9d	1001 1101	_	
158	9E	1001 1110	_	
159	9F	1001 1111	Ÿ	
160	A0	1010 0000		
161	A1	1010 0001	¡	
162	A2	1010 0010	¢	
163	A3	1010 0011	£	
164	A4	1010 0100	¤	
165	A5	1010 0101	¥	
166	A6	1010 0110	¦	
167	A7	1010 0111	§	
168	A8	1010 1000	¨	
169	A9	1010 1001	©	
170	AA	1010 1010	ª	
171	AB	1010 1011	«	
172	AC	1010 1100	¬	
173	AD	1010 1101	-	
174	AE	1010 1110	®	
175	AF	1010 1111	¯	
176	0b	1011 0000	°	
177	B1	1011 0001	±	
178	B2	1011 0010	²	
179	B3	1011 0011	³	
180	B4	1011 0100	´	
181	5b	1011 0101	µ	
182	6b	1011 0110	¶	
183	7b	1011 0111	·	
184	8b	1011 1000	¸	
185	9b	1011 1001	¹	
186	BA	1011 1010	º	
187	BB	1011 1011	»	
188	BC	1011 1100	¼	
189	BD	1011 1101	½	
190	BE	1011 1110	¾	

Dec	Hex	Bin	Char	Ctrl
191	BF	1011 1111	¿	
192	C0	1100 0000	À	
193	C1	1100 0001	Á	
194	C2	1100 0010	Â	
195	C3	1100 0011	Ã	
196	C4	1100 0100	Ä	
197	C5	1100 0101	Å	
198	C6	1100 0110	Æ	
199	C7	1100 0111	Ç	
200	C8	1100 1000	È	
201	C9	1100 1001	É	
202	CA	1100 1010	Ê	
203	CB	1100 1011	Ë	
204	CC	1100 1100	Ì	
205	CD	1100 1101	Í	
206	CE	1100 1110	Î	
207	CF	1100 1111	Ï	
208	0d	1101 0000	Ð	
209	1d	1101 0001	Ñ	
210	2d	1101 0010	Ò	
211	3d	1101 0011	Ó	
212	4d	1101 0100	Ô	
213	5d	1101 0101	Õ	
214	6d	1101 0110	Ö	
215	7d	1101 0111	×	
216	8d	1101 1000	Ø	
217	9d	1101 1001	Ù	
218	DA	1101 1010	Ú	
219	DB	1101 1011	Û	
220	DC	1101 1100	Ü	
221	DD	1101 1101	Ý	
222	DE	1101 1110	Þ	
223	DF	1101 1111	ß	
224	E0	1110 0000	à	
225	E1	1110 0001	á	
226	E2	1110 0010	â	
227	E3	1110 0011	ã	
228	E4	1110 0100	ä	
229	E5	1110 0101	å	
230	E6	1110 0110	æ	
231	E7	1110 0111	ç	

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Dec	Hex	Bin	Char	Ctrl
232	E8	1110 1000	è	
233	E9	1110 1001	é	
234	EA	1110 1010	ê	
235	EB	1110 1011	ë	
236	EC	1110 1100	ì	
237	ED	1110 1101	í	
238	EE	1110 1110	î	
239	EF	1110 1111	ï	
240	F0	1111 0000	ð	
241	F1	1111 0001	ñ	
242	F2	1111 0010	ò	
243	F3	1111 0011	ó	
244	F4	1111 0100	ô	
245	F5	1111 0101	õ	
246	F6	1111 0110	ö	
247	F7	1111 0111	÷	
248	F8	1111 1000	ø	
249	F9	1111 1001	ù	
250	FA	1111 1010	ú	
251	FB	1111 1011	û	
252	FC	1111 1100	ü	
253	FD	1111 1101	ý	
254	FE	1111 1110	þ	
255	FF	1111 1111	ÿ	

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