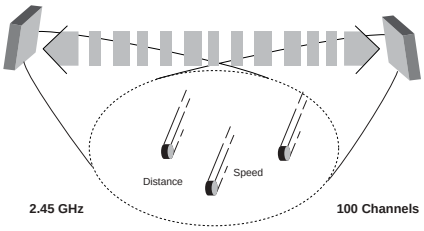
6 System MT

6.1 System overview



The System MT consists of a read/write device and the code or data carriers. The code or data carriers contain an unchangeable code or memory for changeable data. The read/write devices are responsible for the data transfer to the code and data carriers and can be connected directly to a higher-level computer, e.g. PC or PLC, via serial interfaces. The read/write devices can also be used in stand-alone operation.

The microprocessor-controlled read/write station of the System MT operates at 2.45 GHz with 100 adjustable channels. This way, multiple stations can be located close to each other and transfer encrypted data without faults. The data transfer rate can be set to 4 or 16 Kbauds.

The station is addressed via a serial RS 232/485 interface. With an integrated application software, it can also operate independently from the control. Additionally, 3 semiconductor inputs, 2 semiconductor outputs and one relay output are available. The system can communicate with several data carriers in the read range (multitag-capable) and analyse the direction of travel and the speed. Read distances of up to 4 m and write distances of 0.5 m are achieved. The connection is realised via screwings.

The typical application area of this system is the identification as access control or the identification of very fast moving objects.

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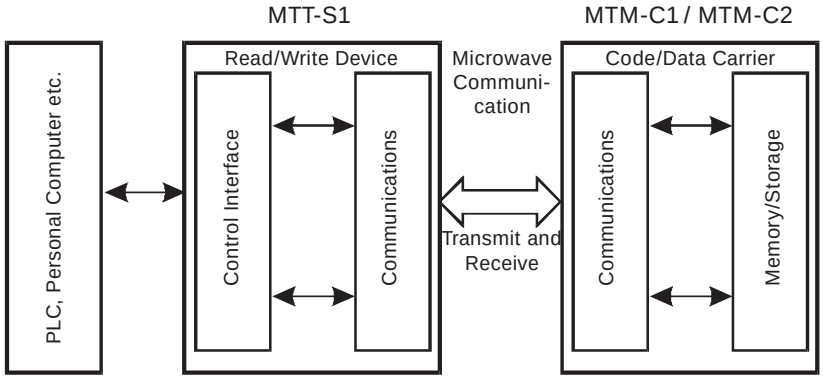
6.2 Read/write device

The read/write device MTT-S1 is a communication device between the actual data carriers and the computer. It receives its commands from the computer via a serial interface RS 232 or RS 485 (2- or 4-wire). As the computer, a PC and PLC are normally used.

The data exchange between the data carriers MTM-C1/-C2, the code carriers MTO-C1/-C2 and the read/write device is realised by means of microwaves in the range of 2.45 GHz. The emitted microwaves are circularly polarised and are radiated vertically through the front cover in the form of a "cone".

The read/write station detects moving objects such as people and vehicles. It can also register whether they are approaching or moving away.



After the housing has been opened, all cable connections can be easily accessed. In addition there is a service field with a triple LED, two 7-segment displays, two pushbuttons for different settings, a jumper field for adjusting the interface and for the internal battery as well as the RESET button. The service field can be used to set the address and check the device. A default setting is also possible via a PC.

Two Flash EEPROMs with a capacity of 128 Kbytes each are provided for storing the data such as in a database. The second memory, a 128 Kbyte SRAM is reserved for the application software, for lists and logs.

The front cover made of polycarbonate as well as the rear panel made of high-grade steel protect the device effectively and guarantee a protection class IP 65. The standard version of the read/write device MTT-S1 is equipped with a motherboard (memory, processor, input/output block with analogue and digital circuits). The microwave transmitter and the antenna block are mounted in the immediate vicinity.

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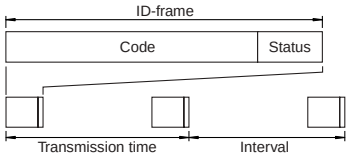
6.3 Code/data carriers

Communication

The code/data carriers repeatedly reflect the information to any sending read/write device, regardless of the frequency between 2.435 and 2.465 GHz at which the information is sent. If different read/write devices send information to the data carrier at the same time, all can be read safely without interferences.

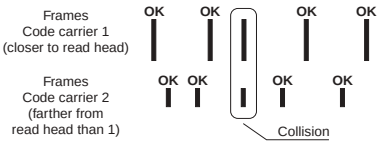
The reflecting data consists of a tag, an 8-digit decimal number from the code memory including a 32-bit check sum, the data from the read/write memory and a status field. A sequence consisting of tag/check sum, data and status is called ID frame. According to the formatting of the data carrier, this ID frame is transmitted with a constant or random interval. For two successive ID frames in an enclosed interval the term message time has been selected. When the data carriers are set to random mode, multiple data carriers can be evaluated within the read range.

The maximum message time (T_{max}) is always below 150 ms, the average is 80 ms. This means that the code carrier is able to reflect the ID frame 12 times per second. (see figure on the left)



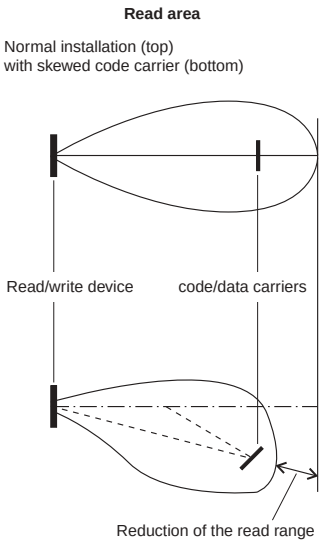
Multiple detection

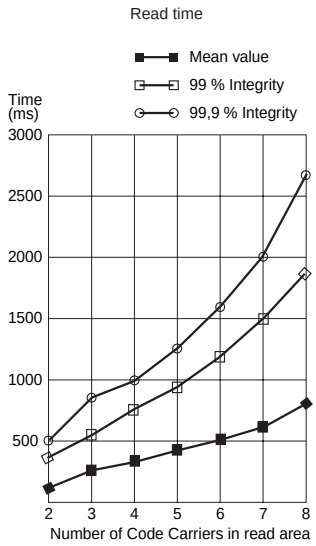
When the code/data carriers are set to random mode, multiple code/data carriers can be evaluated within the read range, as shown in the figure on the left. In the case of collisions, a check sum algorithm in the read/write device invalidates these ID frames. In the most unfavourable situation, e.g. when all data carriers are far away or in the case of strong interferences, the probability of an error due to wrong interpretation is less than 1 in relation to 5 x 10^9 thanks to the 32-bit check sum.

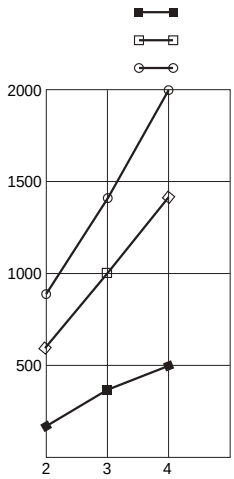


Read time

The time required for reading all code/data carriers in the read range is shown in the graphic.







Remark:
The graphic applies to MR4H-formatted data carriers, i.e. minimum memory size, interval 4 and high speed (see section "Operating modes").

If more than 4 data carriers are expected in the read range, it may be necessary to set a greater interval length for the data carriers.

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Operating modes

The format commands for the different modes are transmitted via microwaves up to the same distance at which the data carriers can still be written to. The parameters are the memory size to be used, interval type, interval length and the data transmission rate.

Due to the formatting, several characteristics can be optimised in the application. With the different memory modes, the memory partition is optimised with regard to speed. Using the two interval type option, you can determine whether there is to be multiple detection, i.e. the evaluation of multiple data carriers in the read range. Multiple detection is only possible in random mode. The interval length and the selected data transmission rate have an influence on the transmission time. The read range is linked to the transmission rate.

The characters M, Q, F etc. are the abbreviations of the terms which are described in more detail in the text and must be used for programming.

Memory modes

M - mini (small capacity), 46 bits, 14 data bits plus check sum

Q - quarter (quarter capacity), 186 bits, 154 data bits plus check sum

F - full (full capacity), 606 bits, 574 data bits plus check sum

Interval type

C - constant the interval together with the ID frame is always constant

R - random the interval changes randomly (random mode)

Interval length

0 - zero i.e. continuous

4 - small i.e. 4 times in the ID frame time

8 - medium i.e. 8 times in the ID frame time

Data transmission rate

L - low Read and write with 4 Kbytes/s

H - high Read with 16 Kbytes/s. Write with 4 Kbytes/s

The modes are called **MC0L, MR4H, FC0H** etc. Interval 16 modes are also available. However, for most applications the above-mentioned modes are sufficient.

The read times depend on the selected operating mode. The table shows the maximum read times for the different operating modes, each for a high and a low data transmission rate. Additionally, the battery life for the selected operating mode is specified.

	Read time in [ms] at data transmission rate		Battery life [years]
Mini memory	High	Low	
MC0-H/L	50	130	6
MC4-H/L	100	360	6
MC8-H/L	170	660	10
MR4-H/L	170	660	9
Quarter memory			
QC0-H/L	70	240	6
QC4-H/L	180	700	9
QC8-H/L	350	-	10
QR4-H/L	350	1300	9
Full memory			
FC0-H/L	140	520	6
FC4-H/L	370	1400	6
FC8-H/L	750	-	10
FR4-H/L	750	-	10

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Write range

The write range is cone-shaped. It depends on the field of the microwave and the sensitivity of the data carrier. For the data carrier MTM-C1 there is a safe write range within a cone of 0 to 0.5 m.

Write time

The write time depends on the formatting of the data carrier and has a statistically firm value. For the formatting MC0H it is 200, for QC0H 300 and for FC0H 400 ms in the normal case. At a desired writing reliability of 99.999%, i.e. 1 error in 100000 writing processes, these times increase to 600, 800 and 3000 ms respectively.

Writing reliability

If the data carrier is accidentally removed from the write zone during writing while it is receiving the data to be written via the microwave, there is a backup memory. It automatically saves the old data. In the status register of the data carrier, the "write error bit" is set. The system receives an automatic warning from this bit.

Status register

- The status register has 7 bits.
- Bit 7 = 1, Battery capacity discharged
- Bit 7 = 0, Battery okay
- Bit 6 = 1, Unsuccessful write attempt
- Bit 6 = 0, Successful write attempt
- Bit 5 and 4 = 1, Monitor input 1 open
- Bit 5 and 4 = 0, Monitor input 1 on earth
- Bit 3, 2 and 1 = 1, Monitor input 2 open
- Bit 3,2 and 1 = 0, Monitor input 2 on earth

6.4 Read/write distances

Read/write distances in air (at 25 °C, in m)

Read/write device	MTT-S1		MTT-F52-S1		MTT6000-F51-S1	
Code/data carriers	read	write	read	write	read	write
MTO-C1	...3.3	-	…3.3	-	…6.0	-
MTO-C2	...3.3	-	...3.3	-	...6.0	-
MTM-C1	…4.0	…0.5	…4.0	…0.5	…6.0	…0.5
MTM-C2	…4.0	…0.5	…4.0	…0.5	…6.0	…0.5

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6.5 Overview of the available products

Read/write devices for Ident-M System T

Design		Type code	Interface	Features	Page
		MTT-S1	Serial: RS 232, RS 485,	Stand-alone functionality	148
F52		MTT-F52-S1	Serial: RS 232, RS 485	Stand-alone functionality Protection class IP65	151
F51		MTT6000-F51-S1	Serial: RS 232, RS 485	Stand-alone functionality Increased read distance Protection class IP56	154

Code/data carriers for IDENT-M System T

	Code carrier			Data carrier	
Design		Type code	Page	Type code	Page
		MTO-C1	157	MTM-C1	159
		MTO-C2	158	MTM-C2	160

Accessories for IDENT-M System T

	
MTA-C1V1	MTA-C1V2
Card holder with fixing clip	Card holder for window mounting in vehicles
Page 161	Page 161

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