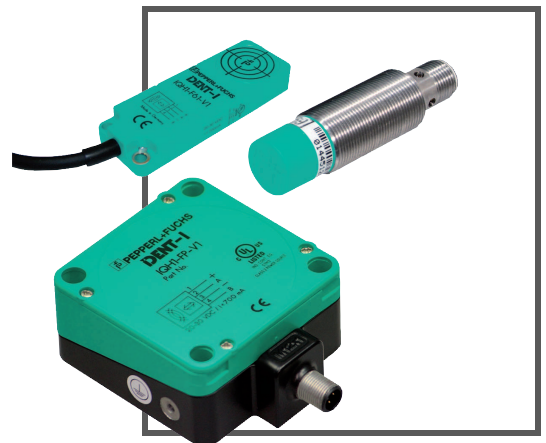


MANUAL

**IQT1-\*-R4-V1**

**RFID R/W systems, 13.56 MHz**



CE

With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

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# 1 Introduction

## Congratulations

You have chosen a device manufactured by Pepperl+Fuchs. Pepperl+Fuchs develops, produces and distributes electronic sensors and interface modules for the market of automation technology on a worldwide scale.

Before installing this equipment and put into operation, read this manual carefully. This manual contains instructions and notes to help you through the installation and commissioning step by step. This makes sure bring such a trouble-free use of this product. This is for your benefit, since this:

- ensures the safe operation of the device
- helps you to exploit the full functionality of the device
- avoids errors and related malfunctions
- avoids costs by disruptions and any repairs
- increases the effectiveness and efficiency of your plant

Keep this manual at hand for subsequent operations on the device.

After opening the packaging please check the integrity of the device and the number of pieces of supplied.

## Symbols used

The following symbols are used in this manual:



### **Note!**

This symbol draws your attention to important information.



### Handling instructions

You will find handling instructions beside this symbol

### Contact

If you have any questions about the device, its functions, or accessories, please contact us at:

Pepperl+Fuchs GmbH  
Lilienthalstraße 200  
68307 Mannheim  
Telephone: +49 621 776-4411  
Fax: +49 621 776-274411  
E-Mail: [fa-info@pepperl-fuchs.com](mailto:fa-info@pepperl-fuchs.com)



## 2 Declaration of Conformity

### 2.1 Declaration of Conformity

This product was developed and manufactured under observance of the applicable European standards and guidelines.



**Note!**

A Declaration of Conformity can be requested from the manufacturer.

The product manufacturer, Pepperl+Fuchs GmbH, D-68307 Mannheim, has a certified quality assurance system that conforms to ISO 9001.





## 3 Safety

### 3.1 Symbols Relevant to Safety



**Danger!**

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.



**Warning!**

This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.



**Caution!**

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

### 3.2 Intended Use

The read/write station is intended to identify RFID Transponders in the defined frequency and is only to be used for this purpose.

Read through these instructions thoroughly. Familiarize yourself with the device before installing, mounting, or operating.

Always operate the device as described in these instructions to ensure that the device and connected systems function correctly. The protection of operating personnel and plant is only guaranteed if the device is operated in accordance with its intended use.

### 3.3 General Notes on Safety

Only instructed specialist staff may operate the device in accordance with the operating manual.

User modification and or repair are dangerous and will void the warranty and exclude the manufacturer from any liability. If serious faults occur, stop using the device. Secure the device against inadvertent operation. In the event of repairs, return the device to your local Pepperl+Fuchs representative or sales office.

The connection of the device and maintenance work when live may only be carried out by a qualified electrical specialist.

The operating company bears responsibility for observing locally applicable safety regulations.

Store the not used device in the original packaging. This offers the device optimal protection against impact and moisture.

Ensure that the ambient conditions comply with regulations.



**Note!**

**Disposal**

Electronic waste is hazardous waste. When disposing of the equipment, observe the current statutory requirements in the respective country of use, as well as local regulations.



### 3.4 Specific Safety Instructions

#### 3.4.1 IQT\*-\* -R4-V1 R/W System



**Warning!**

Processes started in an uncontrolled manner jeopardize the plant

Before commissioning, ensure that there are no risks involved in using the device that may endanger the plant.

**Power supply**

The device may only be operated using a limited-power current source, in accordance with EN 60950.



## 4 Product Description

These products are R/W systems equipped with a RS485 serial interface. The R/W systems write to and read from read/write tags in the 13.56 MHz frequency range. The devices are connected via M12 plugs.



Figure 4.1 IQT1-18GM-R4-V1

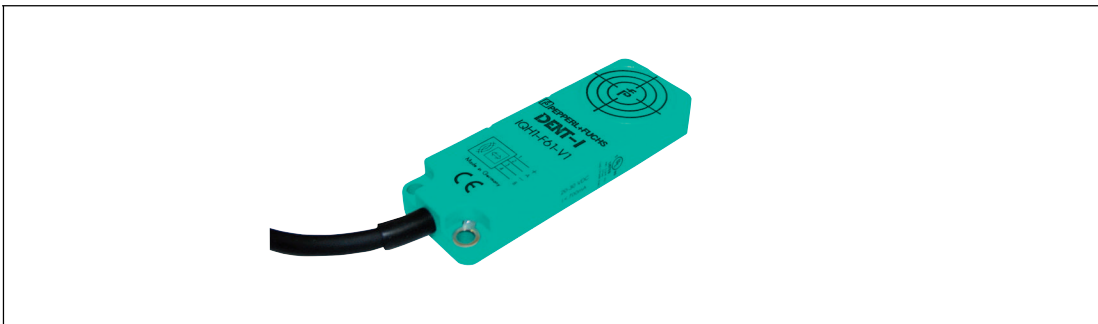


Figure 4.2 IQT1-F61-R4-V1



Figure 4.3 IQT1-FP-R4-V1



## 5 Installation

### 5.1 Storage and transport

For storage and transport purposes, package the unit using shockproof packaging material and protect it against moisture. The best method of protection is to package the unit using the original packaging. Furthermore, ensure that the ambient conditions are within allowable range.

### 5.2 Unpacking

Check the product for damage while unpacking. In the event of damage to the product, inform the post office or parcel service and notify the supplier.

Retain the original packaging in case you have to store or ship the device again at a later date.

Should you have any questions, please contact Pepperl+Fuchs.

### 5.3 Mounting and Connecting the R/W System



#### **Note!**

Do not mount the R/W system in metal surfaces. Maintain a **minimum distance of 50 mm** between the device and any metals.

If you want to mount multiple devices side by side, keep a **minimum distance of 210 mm** between them to avoid interference.

Ensure the device is mounted on a level surface.



#### Mounting and Connecting

1. Attach the IQT\*-F61-R4-V1 R/W system using two screws or the IQT\*-FP-R4-V1 R/W system using four screws by feeding the screws through the mounting holes in the housing. Attach the IQT\*-18GM-R4-V1 system using suitable mounting materials, e.g., nuts or mounting aids.
2. Connect the device to a higher-level computer that features an RS485 interface.
3. The R/W systems have an internal terminator on the RS485 interface. For this reason, only one R/W system is provided within an RS485 network. It is not possible to build an RS485 network with multiple R/W systems.

## 6 Operation

### 6.1 General Information about Tag Types

#### Read/write tag 13.56 MHz (inductive)

Read/write tags in this frequency range offer a considerably higher reading speed than read/write tags for the 125 kHz system. Since this is a nonproprietary system, cost-effective read/write tags are available from many third-party manufacturers.

By using a command, you can tell the device the specific read/write tag with which it is to communicate.

IQT1-\*  
-V1 R/W systems currently support the following read/write tags:

#### 13.56 MHz/ISO 15693 Tag Types

Tag type	Chip type	Details	Pepperl+Fuchs designation	Access	Bit
20	ISO 15693-conformant	All ISO 15693-conformant read/write tags	1	Read/write read-only code	- 64
21	I-Code SLI	Philips	IQC21	Read/write read-only code	896 64
22	Tag-it HF-I	'Plus' from Texas Instruments	IQC22	Read/write read-only code	2k 64
23	SRF55V02P	my-D from Infineon	IQC23	Read/write read-only code	2k 64
24	SRF55V10P	my-D from Infineon	IQC24	Read/write read-only code	10k 64
33	MB89R118	FRAM from Fujitsu	IQC33 2	Read/write read-only code	16k 64
35	I-Code SLI-S	NXP	IQC35	Read/write read-only code	1280 64
36	I-Code SLI-L	NXP	IQC36	Read/write read-only code	512 64
37	MB89R112	FRAM from Fujitsu	IQC37 3	Read/write read-only code	64k 64

Table 6.1 13.56 MHz tag types in accordance with ISO 15693

1. This tag type is used to read the UID (read-only code) from all ISO 15693-conformant tags supported by Pepperl+Fuchs.

2. Exception: Block size = 8 bytes  
'Wordnum' must be a multiple of 2 (2 blocks of 4 bytes = 8 bytes)

3. Exception: Block size = 32 bytes  
'Wordnum' must be a multiple of 8 (8 blocks of 4 bytes = 32 bytes)

The memory of most read/write tags is divided into blocks that are four bytes in length. When a read/write command is issued, the start address and requested number of data blocks is indicated for access purposes.

## 6.2 Command Overview

The commands in the list are described in detail on the following pages.

### System commands

Command description	Abbreviation	Page
version	<b>VE</b>	See "version VE" on page 15, see "Version VE" on page 12
set device address	<b>SD</b>	See "Set Device Address SD" on page 16
get device address	<b>GA</b>	See "Get Device Address GA" on page 16
change tag	<b>CT</b>	See "Change Tag CT" on page 16, see "Change Tag CT" on page 12
quit	<b>QU</b>	See "quit QU" on page 16, see "Quit QU" on page 12
configure interface	<b>CI</b>	See "configure interface CI" on page 16, see "Configure Interface CI" on page 13
reset	<b>RS</b>	See "reset RS" on page 17, see "Reset RS" on page 13
command store	<b>CS</b>	See "Command Store CS" on page 17
get data	<b>GD</b>	see "Get Data GD" on page 17
get state	<b>GS</b>	See "Get State GS" on page 17, see "Get State GS" on page 13

### Standard read/write commands

#### Reading Data

Command description	Abbreviation	Page
single read words	<b>SR</b>	See "Single Read Words SR" on page 17, see "Single Read Words SR" on page 13
enhanced buffered read words	<b>ER</b>	See "Enhanced Buffered Read Words ER" on page 17, see "Enhanced Buffered Write Words EW" on page 14

#### Writing Data

Command description	Abbreviation	Page
single write words	<b>SW</b>	See "Single Write Words SW" on page 18, see "Single Write Words SW" on page 14
enhanced buffered write words	<b>EW</b>	See "Enhanced Buffered Write Words EW" on page 18, see "Enhanced Buffered Write Words EW" on page 14
single write words with lock	<b>SL</b>	See "Single Write Words with Lock SL" on page 18, see "Single Write Words with Lock SL" on page 14
enhanced write words with lock	<b>EL</b>	See "Enhanced Write Words with Lock EL" on page 18, see "Enhanced Write Words with Lock EL" on page 14
fill datacarrier	<b>S#</b>	See "Fill Datacarrier S#" on page 18, see "Fill Datacarrier S#" on page 14

### Read-Only Code

Command description	Abbreviation	Page
single read read-only code	<b>SF</b>	See "Single Read Read-Only Code SF" on page 18, see "Single Read Words SR" on page 17
enhanced buffered read read-only code	<b>EF</b>	See "Enhanced Buffered Read Read-Only Code EF" on page 18, see "Enhanced Buffered Read Read-Only Code EF" on page 15

## 6.3 System Commands in Point-to-Point Operation (Single Drop)



### Note!

#### Command Syntax

IQT1-\*-R4-V1 R/W systems are set to single-drop mode at the factory. In this mode, the R/W system first executes the respective command and then sends the response. This can take a few seconds, depending on the command.

If your R/W system is not operating in multidrop mode, omit the device address (= <DeviceNo>) from the command.

#### Example:

Command: <CommandCode><CommandParameters><CHCK><ETX>

Response <Status><Data><CHCK><ETX>

You also have the option of replacing <CHCK><ETX> with #<CR>.

A new command can be sent only after a response to the previous command has been received.

### Version VE

This command transfers the software version.

Command: VE <CHCK> <ETX>

Response: <Status> (c) P+F IDENT-I  
<Type code>  
<Part no.>  
<SW no.>  
<Date> <CHCK> <ETX>

### Change Tag CT

This command configures the tag type with which the read/write unit is communicating. Type "21" is active by default.

Command: CT <TagType> <CHCK> <ETX>

Response: <Status> <CHCK> <ETX>

For supported read/write tags, please see see table "13.56 MHz/ISO 15693 Tag Types" on page 10.

Using type <TagType> = "20", it is possible to achieve mixed operation of different read-only and read/write tags. However, this setting can only be used to read read-only codes (UID).

### Quit QU

All active enhanced-buffered read or write commands are canceled.

Command: QU <CHCK> <ETX>

Response: <Status> <CHCK> <ETX>

## Configure Interface CI

This command configures the timeout and the baud rate. The values are stored in the nonvolatile memory. Any modifications become active only after a reset has been performed.

The timeout is the time after which the R/W system no longer waits for characters in a command. After the timeout expires, the user receives an error message. To deactivate the timeout, the time must be set to "0".

The number of data bits is always eight. A parity bit is not used.

Command: CI <Timeout>, <Baud> <CHCK> <ETX>  
Response: <Status> <CHCK> <ETX>

The following settings are possible:

<Timeout>: "0" ... "100" (x 100 ms, timeout in 100-ms steps)  
<Baud>: "1200", "2400", "4800", "9600", "19200", "38400"

The default values are a timeout of "0" and a baud rate of "38400".

## Reset RS

This command reloads modified system settings, e.g., timeout and baud rate, from the nonvolatile memory.

Command: RS <CHCK> <ETX>  
Response: "2" <CHCK> <ETX>

## Configuration Store CS

<Param> = "1" stores the next command in this setting in the nonvolatile memory. This command is executed. Following a reset, this command is automatically reactivated.

If <Param> = "0", the stored command is deleted.

Command: CS <Param> <CHCK> <ETX>  
Response: <Status> <CHCK> <ETX>

## Get State GS

This command is used to read the settings stored in the nonvolatile memory of the R/W system. These settings become active after the next system reset.

Command: GS <CHCK> <ETX>  
Response: <Status> TO:<Timeout> BD:<Baud>  
HD1:<Status><TagType><CHCK><ETX>

## 6.4 Read/Write Commands in Point-to-Point Operation

### Single Read Words SR

The R/W system makes only one attempt to read <WordNum> 32-bit words from the address <WordAddr>.

Command: SR <WordAddr> <WordNum> <CHCK> <ETX>  
Response: <Status> <Data> <CHCK> <ETX>

### Enhanced Buffered Read Words ER

The R/W system continuously attempts to read <WordNum> 32-bit words from the address <WordAddr>. Variable data is transferred via the interface.

When a read/write tag leaves the detection range, the status '05h' (read command) is output.

Command: ER <WordAddr> <WordNum> <CHCK> <ETX>  
Response: <Status> <Data> <CHCK> <ETX>

### Single Write Words SW

The R/W system makes only one attempt to write <WordNum> 32-bit words from the address <WordAddr>.

Command: SW <WordAddr> <WordNum> <Data> <CHCK> <ETX>  
Response: <Status> <CHCK> <ETX>

### Enhanced Buffered Write Words EW

The R/W system repeatedly attempts to write <WordNum> 32-bit words from the address <WordAddr> until successful. Once it has successfully read a code, the status '00h' is output.

The status '05h' is only output when a read/write tag leaves the detection range or is not yet within the detection range. The command remains active.

Command: EW <WordAddr> <WordNum> <Data> <CHCK> <ETX>  
Response: <Status> <CHCK> <ETX>

### Single Write Words with Lock SL

This command works in the same way as a normal write command. Once writing is completed, the data from before the overwriting process is protected, provided that the read/write tags offer this function. The write protection is permanent and cannot be undone.

Command: SL <WordAddr> <WordNum> <Data> <CHCK> <ETX>  
Response: <Status> <CHCK> <ETX>

### Enhanced Write Words with Lock EL

This command works in the same way as a normal write command. Once writing is completed, the data from before the overwriting process is protected, provided that the read/write tags offer this function. The write protection is permanent and cannot be undone.

Command: EL <WordAddr> <WordNum> <Data> <CHCK> <ETX>  
Response: <Status> <CHCK> <ETX>

### Fill Datacarrier S#

The word number <WordNum> of fill signs <Fill Sign> is written to the read/write tag from the specified start address <WordAddr>.

Command: S# <WordAddr> <WordNum> <Fill Sign> <CHCK> <ETX>  
Response: <Status> <CHCK> <ETX>

### Single Read Read-Only Code SF

The R/W system makes only one attempt to read a read-only code.

Command: SF <CHCK> <ETX>  
Response: <Status> <Data> <CHCK> <ETX>

### Enhanced Buffered Read Read-Only Code EF

The R/W head makes attempts until successful to read a read-only code. Once it has successfully read a code, the status '00h' is output.

The status '05h' (read command) is output whenever a read/write tag leaves the detection range. The command remains active.

Command: EF <CHCK> <ETX>  
Response: <Status> <Data> <CHCK> <ETX>

## 6.5 System Commands in Multidrop Mode



### **Note!**

#### **Command Syntax**

IQT1-\*-R4-V1 R/W systems can be set to multidrop mode. In this mode, the R/W system responds immediately, i.e., confirms whether the reader has understood the command. The reader then starts to execute the command. The 'GD' command must be used to determine whether the command has actually been executed successfully (polling mode). The device address must be specified in the commands.

If your R/W system is not operating in multidrop mode, omit the device address (= <DeviceNo>) from the command.

#### **Example:**

Command: <CommandCode><DeviceNo><CommandParameters><CHCK><ETX>  
Response: <Status><DeviceNo><Data><CHCK><ETX>

You also have the option of replacing <CHCK><ETX> with #<CR>.

A new command can be sent only after a response to the previous command has been received.

### Define Function DF

This command switches the system from single-drop mode to multidrop mode and vice versa:

Single drop --> multidrop:  
DF42<CHCK><ETX>

Multidrop --> single drop:  
DF<DeviceNo>41<CHCK><ETX>

After changing the operating mode, a power supply reset or an 'RS' command must be executed to activate the required operating mode.

### version VE

This command transfers the software version.

Command: VE <DeviceNo> <CHCK> <ETX>  
Response: <Status> <DeviceNo> (c) P+F IDENT-I  
<Type code>  
<Part no.>  
<SW no.>  
<Date> <CHCK> <ETX>

### Set Device Address SD

This command changes the device address in multidrop mode from <OldDeviceNo> to <NewDeviceNo>. The default device address is "FF".

Command: SD <OldDeviceNo> <NewDeviceNo> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

### Get Device Address GA

This command reads the device address of a R/W system.

Command: GA <CHCK> <ETX>  
Response: <Status> <DeviceNo> <DeviceNo> <CHCK> <ETX>

### Change Tag CT

This command configures the tag type with which the read/write unit is communicating. Type "21" is active by default.

Command: CT <DeviceNo> <TagType> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

For supported read/write tags, please see see table "13.56 MHz/ISO 15693 Tag Types" on page 10.

Using type <TagType> = "20", it is possible to achieve mixed operation of different read-only and read/write tags. However, this setting can only be used to read read-only codes (UID).

### quit QU

The running enhanced-buffered read or write commands are canceled.

Command: QU <DeviceNo> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

### configure interface CI

This command sets the timeout and the baud rate. The values are stored in a non-volatile manner. A change always requires a reset to take effect.

The timeout indicates the amount of time, after which the device no longer waits for more characters in a command. After the timeout runs through, the user gets an error message. To deactivate the timeout, the time must be set to "0".

The number of data bits is always 8. A parity bit is never used.

Command: CI <DeviceNo> <Timeout>, <Baud> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

The following settings are possible:

<Timeout>: "0" ... "100" (x 100 ms, timeout in 100-ms steps)  
<Baud>: "1200" , "2400" , "4800" , "9600" , "19200" , "38400"

The default values are a timeout of "0" and a baud rate of "38400".



### reset RS

This command sets the changed system settings, e.g. timeout and baud rate, newly loaded from the non-volatile memory.

Command: RS <DeviceNo> <CHCK> <ETX>  
Response: "2" <DeviceNo> <CHCK> <ETX>

### Command Store CS

<Param> = "1" stores the next command in this setting in the nonvolatile memory. This command is executed. After a reset or an interruption of the power supply, this command is automatically reactivated.

If <Param> = "0", the stored command is deleted.

Command: CS <DeviceNo> <Param> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

### Get Data GD

This command retrieves the data from the read station. Each data record is transferred only once.

Data is only available for read commands. There is no data component for write commands.

Command: GD <DeviceNo> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <ExecCounter>{<Data>}<CHCK> <ETX>

### Repeat Response RR

This command triggers a repeat of the last telegram received on 'GD'.

Command: RR <DeviceNo><CHCK> <ETX>  
Response: <Status> <DeviceNo> <ExecCounter>{<Data>}<CHCK> <ETX>

### Get State GS

This command is used to read the settings stored in the nonvolatile memory of the R/W system.

Command: GS <DeviceNo> <CHCK> <ETX>  
Response: <Status> <DeviceNo> TT: <TagType>, TO:<Timeout> ms, BD:<Baud> <CHCK><ETX>

## 6.6 Read/Write Commands in Multidrop Mode

### Single Read Words SR

The R/W system makes only one attempt to read <WordNum> 32-bit words from the address <WordAddr>.

Command: SR <DeviceNo> <WordAddr> <WordNum> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

### Enhanced Buffered Read Words ER

The R/W system continuously attempts to read <WordNum> 32-bit words from the address <WordAddr>.



Command: ER <DeviceNo> <WordAddr> <WordNum> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

### Single Write Words SW

The R/W system makes only one attempt to write <WordNum> 32-bit words from the address <WordAddr>.

Command: SW <DeviceNo> <WordAddr> <WordNum> <Data> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

### Enhanced Buffered Write Words EW

The R/W system repeatedly attempts to write <WordNum> 32-bit words from the address <WordAddr> until successful.

The command remains active.

Command: EW <DeviceNo> <WordAddr> <WordNum> <Data> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

### Single Write Words with Lock SL

This command works in the same way as a normal write command. Once writing is completed, the data from before the overwriting process is protected, provided that the read/write tags offer this function. The write protection is permanent and cannot be undone.

Command: SL <DeviceNo> <WordAddr> <WordNum> <Data> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

### Enhanced Write Words with Lock EL

This command works in the same way as a normal write command. Once writing is completed, the data from before the overwriting process is protected, provided that the read/write tags offer this function. The write protection is permanent and cannot be undone.

Command: EL <DeviceNo> <WordAddr> <WordNum> <Data> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

### Fill Datacarrier S#

The word number <WordNum> of fill signs <Fill Sign> is written to the read/write tag from the specified start address <WordAddr>.

Command: S# <DeviceNo> <WordAddr> <WordNum> <Fill Sign> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

### Single Read Read-Only Code SF

The R/W system makes only one attempt to read a read-only code.

Command: SF <DeviceNo> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

### Enhanced Buffered Read Read-Only Code EF

The R/W head makes attempts until successful to read a read-only code.



Command: EF <DeviceNo> <CHCK> <ETX>  
Response: <Status> <DeviceNo> <CHCK> <ETX>

## 6.7

### Legend

<CHCK>:	1 ASCII character, 8 bit checksum with the addition of all preceding characters, without overrun.
<CR>:	1 ASCII character 13
<Data>:	<WordNum> times 4 octets.
<DeviceNo>:	2 ASCII characters
<ExecCounter>:	<ul style="list-style-type: none"> <li>■ ' ': No command active</li> <li>■ 'Ø': Command active, no new read/write tags read or written since last polling.</li> <li>■ '1': Read/write tag successfully read or written</li> <li>■ '≥2': Several tags detected in read/write range since last polling. There is a risk that data read has not been transferred!</li> </ul>
<ETX>:	1 ASCII character 03
<Status>:	1 ASCII character: <ul style="list-style-type: none"> <li>■ '0': Command executed successfully</li> <li>■ '2': Switch-on message</li> <li>■ '4': Syntax error in command</li> <li>■ '5': No read/write tag in detection range</li> <li>■ '6': Hardware error</li> </ul>
<SW-No>:	Application software number
<TagType>:	2 ASCII characters
<Timeout>:	Interface timeout: An error message is sent after this time runs out. 1–3 ASCII characters, in ms.
<WordAddr>:	Word start address in the read/write tag, 4 ASCII characters, range from "0000" to "FFFF" depending on tag type.
<WordNum>:	Number of data blocks to be read or written (each 4 octets), 2 ASCII characters. Range from "01" to "20" depending on tag type (see table "13.56 MHz/ISO 15693 Tag Types" on page 10).

# FACTORY AUTOMATION – SENSING YOUR NEEDS



## Worldwide Headquarters

Pepperl+Fuchs GmbH  
68307 Mannheim · Germany  
Tel. +49 621 776-0  
E-mail: [info@de.pepperl-fuchs.com](mailto:info@de.pepperl-fuchs.com)

## USA Headquarters

Pepperl+Fuchs Inc.  
Twinsburg, Ohio 44087 · USA  
Tel. +1 330 4253555  
E-mail: [sales@us.pepperl-fuchs.com](mailto:sales@us.pepperl-fuchs.com)

## Asia Pacific Headquarters

Pepperl+Fuchs Pte Ltd.  
Company Registration No. 199003130E  
Singapore 139942  
Tel. +65 67799091  
E-mail: [sales@sg.pepperl-fuchs.com](mailto:sales@sg.pepperl-fuchs.com)

[www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

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