Electronic-Key-System

Manual
Electronic-Key Adapter
with serial Interface

Order No. 088 796

More than safety.

EUCHNER

Table of contents

1 General notes

1.1 Use of the manual

This manual describes the technical features and the function of the EKS Electronic-Key adapter EKS-A-ISX-G01-ST09/03 with serial interface (order no. 084 750). The complete evaluation and interface electronics are integrated in this unit.

1.2 CE conformity

The EKS Electronic-Key adapter with serial interface conforms to the **EMC directive** 89/336/EEC (92/31/EEC, 93/68/EEC) and the **low voltage directive** 73/23/EEC (93/68/EEC, 98/79/EC).

The Electronic-Key adapter complies with the following European / international standards:

- EN 61000-6-2 Electromagnetic compatibility (EMC). Generic standards - Immunity for industrial environments
- EN 55011 Industrial, scientific and medical (ISM) radio-frequency equipment - Radio disturbance characteristics - Limits and methods of measurement

1.3 Approvals

The EKS Electronic-Key adapter with serial interface is certified to c UL us (certificate number 170205 – E240367).

For use and operation as per the c UL us requirements, a power supply **for use in class 2 circuits** must be used.

1.4 Correct use

As part of a higher-level overall system, the EKS Electronic-Key adapter is used for access control and monitoring on control systems (PC/PLC) or parts of control systems for machine installations.

1.5 Incorrect use

The EKS Electronic-Key adapter is not a safety component in the context of the machinery directive.

Without additional precautions the EKS Electronic-Key adapter must not be used to provide a safety function, particularly if failure or malfunction of the unit could endanger the safety or health of persons in the operating area of a machine.

1.6 Obligations on the operating organization

The manufacturer and the organization operating the higher-level overall system, e.g. a machine installation, is responsible for the observance of national and international safety and accident prevention regulations applicable in the specific case.

1.7 Explanation of symbols

The following symbols are used in this manual to identify important instructions and useful information:

Information!
Important information is provided to the user here.

Warning!
Risk of damage to material or machine.

Danger!
Risk to life and limb.

1.8 Abbreviations

The following abbreviations are used in this manual:

- **ADT** **A**cknowledgement **D**elay **T**ime
- **BCC** **B**lock **C**heck **C**haracter
- **CDT** **C**haracter **D**elay **T**ime
- **CTS** **C**lear **T**o **S**end
- **DIP** **D**ual **I**nline **P**ackage
- **DLE** **D**ata **L**ink **E**scape
- **E²PROM** **E**lectrically **E**rasable **P**rogrammable **R**ead-**O**nly **M**emory
- **EKS** **E**lectronic-**K**ey-**S**ystem
- **ETX** **E**nd of **T**e**X**t
- **GND** Signal **G**rou**ND**
- **LED** **L**ight **E**mitting **D**iode
- **NAK** **N**egative **A**c**K**nowledgement
- **PA** **P**oly**A**mide
- **PLC** **P**rogrammable **L**ogic **C**ontrol
- **ROM** **R**ead-**O**nly **M**emory
- **RxD** **R**eceive **D**ata
- **STX** **S**tart of **T**e**X**t
- **TxD** **T**ransmit **D**ata

2 Safety precautions

The Electronic-Key adapter must only be employed and used in accordance with this manual. The Electronic-Key adapter is typically operated as part of a higher-level overall system, e. g. a machine installation.

When designing machines and using the Electronic-Key adapter, the national and international safety and accident prevention regulations specific to the application must be observed, e.g.:

- EN 60204, Safety of machinery. Electrical equipment of machines
- EN 292, Safety of machinery. Basic concepts, general principles for design
- EN 954, Safety of machinery. Safety related parts of control systems. General principles for design

The Electronic-Key adapter is not a safety component in the context of the machinery directive. Without additional precautions the EKS Electronic-Key adapter must not be used to provide a safety function, particularly if failure or malfunction of the unit could endanger the safety or health of persons in the operating area of a machine.

The organization operating the overall higher-level system is responsible for conformity with the national and international safety and accident prevention regulations applicable to the special application.

Mounting and electrical connection must be performed only by authorized personnel.

For use and operation as per the c UL us requirements, a power supply **for use in class 2 circuits** must be used.

Modifications to the electronics of the Electronic-Key adapter and any other changes, especially mechanical modifications and reworking, are not permissible.

3 Function

3.1 Functional description

The EKS is used for access control and monitoring on control systems (PC/PLC) or parts of control systems for machine installations.

Instead of passwords, coded Electronic-Keys are assigned. In this way unauthorized access to control and display systems is prevented to the greatest possible extent.

The EKS uses a non-contact, inductive read/write identification system.

It comprises:

- Electronic-Key
- Electronic-Key adapter

The user is responsible for organizing the programming of the application, integration in an overall system and the assignment and use of the freely programmable memory in the Electronic-Key.

The Electronic-Key adapter is a read/write system with integrated evaluation unit and interface.

Due to the non-contact transfer of data, it was possible to design the Electronic-Key adapter with the high degree of protection of IP 67 from the access side, i.e. it is suitable for industrial use. The Electronic-Key adapter can be installed as per DIN 43700 in any control panel with a standard cut-out of 33 mm x 68 mm. The Electronic-Key adapter is fastened by means of screw clamp elements from the rear side of the panel in order to exclude unauthorized manipulation from the operator side.

The system connection is made using the integrated serial interface (RS232/RS422 switchable).

Setup and system integration can be realized straightforwardly and quickly on the Electronic-Key adapter with serial interface. Data communication is in accordance with the transfer protocol 3964R.

On Electronic-Keys read/write with 116 bytes, the memory is organized in 4-byte blocks. This means a multiple of 4-byte sized blocks must always be written.

The current state of the Electronic-Key adapter is displayed using a 2-color LED.

The Electronic-Keys are tag shaped. The complete, battery-less transponder with memory chip and antenna is integrated into the Electronic-Key.

For operation, the Electronic-Key is inserted in the Electronic-Key adapter and is held in place by a spring clip. The power supply for the transponder and the data are transferred without contact between the Electronic-Key adapter and the Electronic-Key.

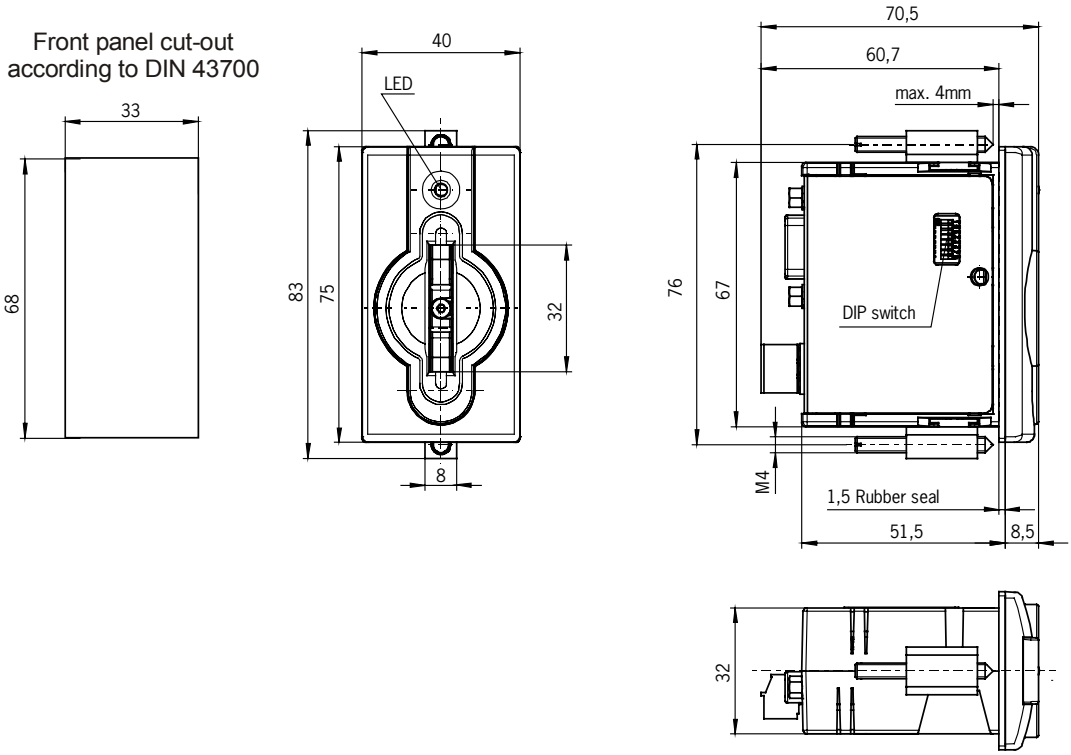
Cut-away illustration of Electronic-Key adapter

The data carrier in the Electronic-Key is equipped with a combined memory:

- 116 bytes E²PROM (programmable) plus an additional 8 bytes ROM (serial number)

4 Technical data

4.1 Dimension drawing, Electronic-Key adapter/front panel cut-out



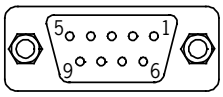
4.2 Technical data, Electronic-Key adapter

General parameters	Value			Unit
	min.	typ.	max.	
Housing	Plastic (PA 6 GF30 gray)			
Degree of protection according to EN 60529	IP 67 in mounted condition			
Ambient temperature at UB = DC 24 V	0		+ 55	°C
Mounting cut-out according to DIN 43700	33 x 68			mm
Connection type for power supply	Miniature plug connector 3-pin, Conductor cross-section max. 1.5 mm², tightening torque 0.22 Nm			
Operating voltage UB (regulated, residual ripple < 5 %)	20	24	28	DC V
Current consumption			100	mA
Interface, data transfer				
Interface to host control	serial RS232 / RS422 (selectable via DIP switch)			
Transfer protocol	3964R			
Baud rate	9.6			kbaud
Data format	1 start bit, 8 data bits, 1 parity bit (even parity), 1 stop bit			
Connection type for serial interface	Sub-D 9-pin socket			
Cable length RS232			5	m
Cable length RS422			1000	m
Out output	Active if there is a functional Electronic-Key in the Electronic-Key adapter (Electronic-Key active).			
Level	Pin 8 Sub-D socket serial interface: RS232 Pin 3 screw terminal power supply: +24 V DC			
LED display	Green: "Ready" (in operation) Yellow: "Electronic-Key active" *			

* The LED illuminates yellow if there is a functional Electronic-Key in the Electronic-Key adapter.

4.3 Pin assignment

4.3.1 Serial interface socket

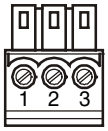


SUB-D socket
9-pin

PIN	Pin assignment RS232	Pin assignment RS422	Function
1	-	RxD -	Data wire B1 receive data (signal B1 receive data)
2	TxD	-	Transmit data
3	RxD	-	Receive data
4	-	-	-
5	GND	-	Signal ground
6	-	TxD -	Data wire B transmit data (signal B transmit data)
7	-	TxD +	Data wire A transmit data (signal A transmit data)
8	OUT	-	Active if there is a functional Electronic-Key in the Electronic-Key adapter, level RS232 (Electronic-Key active). Used as CTS signal
9	-	RxD +	Data wire A1 receive data (signal A1 receive data)
Housing	Function earth	Function earth	Electrically connected to the housing

4.3.2 Power supply and Out signal 24 V screw terminals

The coded plug for the connection of the power supply is included with the Electronic-Key adapter.



Coded plug, 3-pin
with screw terminals
Max. conductor cross-section 1.5 mm²
Tightening torque 0.22 Nm

PIN	Designation	Function
1	UB	Power supply DC + 24 V
2	0V	Power supply DC 0 V
3	OUT	Active if there is a functional Electronic-Key in the Electronic-Key adapter, level DC +24 V (Electronic-Key active)

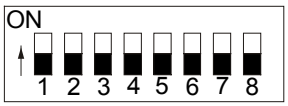
4.4 DIP switch settings

Using the DIP switches S1 to S8, various parameters can be set.

Write protection can be enabled using DIP switch S1. In this way the writing of data to the Electronic-Key read/write is prevented.

The settings are only applied when the power supply is switched on.

DIP switches, 8-pole:



DIP switch	Functions				Factory setting
S8	OFF = Electronic-Key read/write ON = Electronic-Key read-only *				OFF
S7					OFF
S6					OFF
S5					OFF
S4	ON	RS232	OFF	RS422	ON
S3	ON		ON		ON
S2					OFF
S1	ON = write protection for Electronic-Key read/write				OFF

* The read-only transponder type can also be read using the Electronic-Key adapter with serial interface. However, we do not recommend using this transponder type in new installations.

It is **imperative** that all DIP switches without a function (S2 and S5 to S7) are set to **OFF**! In this way problems with any functions added in the future will be avoided.

4.5 OUT output

The **OUT** output signal changes from inactive (0) to active (1) if there is a functional Electronic-Key in the Electronic-Key adapter. This signal can be used for control purposes to detect whether there is a Electronic-Key in the Electronic-Key adapter. The function is identical to the "Electronic-Key active" LED display (yellow).

The **OUT** output is available on the Electronic-Key adapter with two different levels. On pin 8 of the serial interface socket with RS232 level (for use as **CTS** signal on the RS232 interface) and on pin 3 of the power supply screw terminal with a level of DC + 24 V (inactive = 0 V, active = DC + 24 V) for use as a handshake signal e.g. with a PLC.

4.6 LED display

The operating statuses of the Electronic-Key adapter are displayed on a 2-color LED on the front.
The illumination of the LED with any color indicates that the operating voltage is present.

Color	Operating status	Description
Green	Ready	Electronic-Key adapter supplied with power and ready.
Yellow	Electronic-Key active	There is an Electronic-Key in the Electronic-Key adapter and it has been detected.

5 Mounting

Mounting must be performed only by authorized personnel.

! To achieve the degree of protection IP 67, it is necessary to install the Electronic-Key adapter in a clean, flat metal plate at least 2 mm thick and to tighten the screws to a tightening torque of at least 0.25 Nm.

The Electronic-Key adapter is intended for mounting in control panels with a cut-out measuring 33 mm x 68 mm according to DIN 43700 (see page 8 chapter 4.1 Dimension drawing, Electronic-Key adapter/front panel cut-out). The device is fastened using screw clamp elements from the rear side of the panel.

The screw clamp elements for front panel mounting are included with the Electronic-Key adapter.

1. Insert Electronic-Key adapter, **with seal already bonded in place**, into the mounting cut-out from the front.
2. Insert screw clamp elements in the housing of the Electronic-Key adapter and tighten to min. 0.25 Nm.

! After mounting, again check the Electronic-Key adapter for firm seating and correct sealing of the front plate.

6 Electrical connection

Electrical connection may only be performed by **authorized personnel trained in EMC and with the device and wiring isolated**.

For use and operation as per the cULus requirements, a power supply **for use in class 2 circuits** must be used.

The Electronic-Key adapter is only allowed to be connected if it is electrically isolated.
Otherwise the Electronic-Key adapter may be damaged.

If connected incorrectly, the Electronic-Key adapter may be damaged.
Observe electrical characteristics and pin assignment (see page 8 chapter 4.2 Technical data, Electronic-Key adapter).

All the electrical connections must either be isolated from the mains supply by a safety transformer according to IEC/EN 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures.

When installing connections, the operating organization must ensure compliance with the EMC safety requirements in accordance with EN 55011 and EN 61000-6-2.

The equipotential bonding system of the machine installation must comply with EN 60204-1, chapter 8, Potentialausgleich (Equipotential bonding).

Do not lay connection cables in the immediate vicinity of sources of interference.

6.1 Connection of power supply

(For information on pin assignment see page 9 chapter 4.3.2 Power supply)

It is imperative that the following points are observed:

- The connections must be made as appropriate to maintain EMC performance.
- A power supply of suitable EMC performance must be used for the power supply.
- Conductor cross-section maximum 1.5 mm².
- Tighten the terminal screws on the plug to 0.22 Nm.

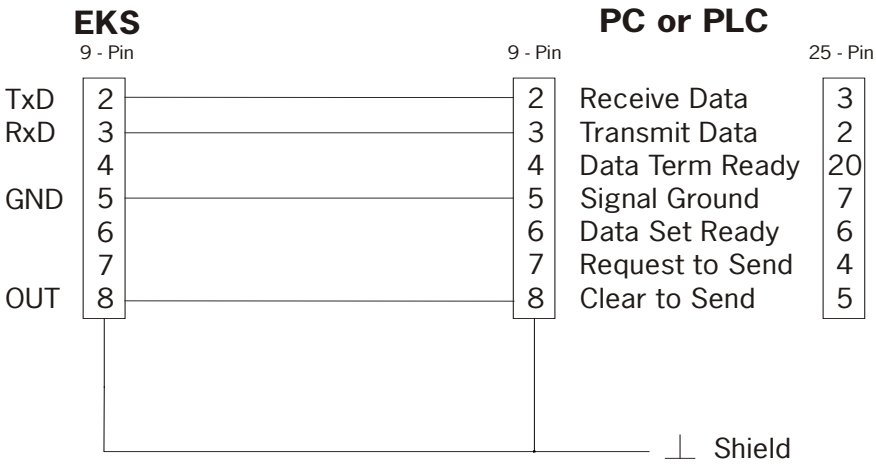
6.2 Connection of function earth

The function earth must be electrically connected via the interface cable screen and the electrically conductive connector housing to the Electronic-Key adapter housing.

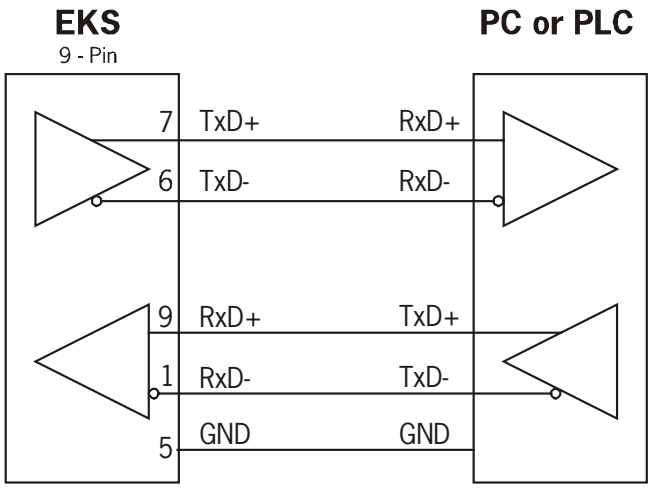
The function earth must be connected to PE!

6.3 Serial interface connection

6.3.1 RS232 wiring diagram



6.3.2 RS422 wiring diagram



7 Setup

Setup is to be performed in the following sequence:

1. Set the DIP switches on the Electronic-Key adapter
   (see page 10 chapter 4.4).
2. Check mounting and electrical connection are correct
   (see page 11 chapter 5 Mounting and page 12 chapter 6 Electrical connection).
3. After the power supply is switched on, the LED on the front of the Electronic-Key adapter illuminates green. This indicates that the power supply is present.
4. Insert Electronic-Key in the Electronic-Key adapter. The LED changes to yellow.

8 Operating the Electronic-Key-System using the serial interface

8.1 Special features of the serial interface

If there is an Electronic-Key within the operating distance of the Electronic-Key adapter, the LED on the front changes from green to yellow. At the same time the **OUT** handshake signal (for use as **CTS** signal) changes from inactive (0) to active (1). This signal can be used for control purposes to detect whether there is an Electronic-Key in the Electronic-Key adapter.

8.2 Communication

In this chapter primarily the communication between PC/PLC and the Electronic-Key adapter (referred to as *device* in the following tables) is described.

The Electronic-Key adapter is addressed over the serial interface. The commands are given over this serial interface.

The transfer messages for the commands

- Program (write) Electronic-Key
- Read Electronic-Key

are based on the transfer protocol 3964R [1]

8.3 Basic message structure

Every command and any related data blocks are transferred from and to the Electronic-Key adapter in a message core within the message frame as per the protocol 3964R (Figure 1: Basic command structure in the 3964R protocol).

In the 3964R protocol, the recipient acknowledges the message received by sending back an acknowledgement character (DLE). If the acknowledgement is negative (NAK), the complete protocol is repeated. If it is not possible to correctly transfer the protocol after a total of six attempts, the process is aborted.

	Description	Byte no.	Transmit data in ASCII format	Acknowledgement from the recipient	
				+	-
Connection setup	3964R procedure start		STX		
				DLE	NAK
Message data max. 128 bytes	Number of message bytes	0			
Message core	Command identification	1 2	T or R command		
	Device address	3	01_{hex}		
	User data description	4 5 6	Start address Start address Number of items of data		
	User data	7 ... n			
Connection termination	3964R procedure termination		DLE ETX BCC		
				DLE	NAK

Figure 1: Basic command structure in the 3964R protocol

8.3.1 Special features of the 3964R data transfer protocol [1]

The 3964R data transfer protocol is a comparatively reliable protocol for the electronic exchange of data between PC/control system and a peripheral connected, because the data transfer is performed using a standardized protocol.

On control systems with an integrated 3964R driver (see e. g. [1]) it is **not** necessary for the user to become involved in the details of setting up the connection and data integrity. Here it is sufficient to use the program to pass the message core to the 3964R driver.

However, on control systems without a 3964R driver or on the connection of the Electronic-Key adapter to the PC, the user must also program the connection setup as well as retries and DLE duplication.

Integration of the Electronic-Key adapter with serial interface into the user's PC application is supported by an optionally available ActiveX module (order no. 084 708) (usable if user programs on MS Windows® support ActiveX). EKS can thus be used in conjunction with process visualization.

8.3.1.1 Basic information on data transfer procedures using a protocol [1]

Numerous conventions must be agreed for a data transfer procedure; codes, operating modes, transfer speeds and the algorithmic process for the transfer. The definition of this algorithmic process is termed the **transfer protocol** (for short: protocol).

A transfer protocol in general defines the following phases of the data transfer:

- Connection setup: request from A to B for the transfer of data
- Data transfer from A to B
- Connection termination: conclusion of the transfer of data

8.3.1.2 The 3964R transfer protocol [1]

Unlike protocol-free data transfer procedures, 3964R is a data transfer with protocol. This means that the actual data that need to be transferred are enclosed in specific control characters. The 3964R driver permits comparatively reliable data transfer as the recipient must signal to the sender readiness to receive (connection setup) and acknowledge correct reception after completion of the data transfer. With the 3964R transfer protocol, data integrity is increased by an additional block check character.

The 3964R driver interprets the following control characters:

- **DLE** (10_{hex}) **D**ata **L**ink **E**scape
- **STX** (02_{hex}) **S**tart of **Tex**t
- **NAK** (15_{hex}) **N**egative **Ac**knowledgement
- **ETX** (03_{hex}) **E**nd of **Tex**t

At the end of each data block in the 3964R transfer protocol, a **block check character** (for short: BCC) is sent to assure data integrity. The block check character is the **even longitudinal parity** (XOR operator on all data bytes) of a block sent or received. The block check character is formed **starting** with the **first byte** of the message core after the connection is setup and **ends after** the characters **DLE** and **ETX** during connection termination.

8.3.1.3 The control system sends [1]

To setup the connection, the control system sends the control character **STX**. If, before the acknowledgement delay time (ADT, typically: 2 s) elapses the peripheral responds with the control character **DLE**, the control system switches to transfer mode. If the peripheral responds with the control character **NAK**, any other character (except **DLE**) or the acknowledgement delay time elapses without a reaction, the attempt to setup the connection has failed. After a total of 6 unsuccessful attempts (3964R protocol specification) the process is aborted. If the attempt to setup the connection is successful, the characters with the information as contained in the send buffer in the control system are transferred to the peripheral at the selected transfer speed.

The peripheral monitors the amount of time between the incoming characters. The gap between two characters must not be more than the character delay time (CDT, typically: 100 ms).

All 10_{hex} values contained in the message core **must be sent twice** so that the recipient recognizes that here information is being transferred and not the control character **DLE (DLE duplication)**.

After the data has been sent, the control system adds the following characters as an **end identifier**: **DLE ETX BCC**.

Then the control system waits for an acknowledgement character from the peripheral. If the peripheral sends the control character **DLE** within the acknowledgement delay time (ADT, typically: 2 s), the data block has been received correctly. If, on the other hand, the peripheral responds with the control character **NAK**, any other character or the acknowledgement delay time elapses without a reaction, the control system starts again from the beginning by setting up a connection with **STX**. After a total of 6 unsuccessful attempts (3964R protocol specification) to send the data block, the process is aborted and the control system sends the control character **NAK** to the peripheral.

8.3.1.4 The control system receives [1]

If the control system receives the control character **STX** from the peripheral when the control system is idle, it responds with **DLE**. If the control system receives another character (except **STX**) when it is idle, it waits until the character delay time (CDT, typically: 100 ms) has elapsed and then sends the control character **NAK**.

After each character, the next character is awaited during the character delay time (CDT). If the character delay time elapses without the reception of a character, the control character **NAK** is sent to the peripheral.

When the control system detects the character string **DLE ETX BCC**, it ends reception. The control system compares the block check character **BCC** with the longitudinal parity calculated internally. If the block check character is correct and no other reception errors have occurred, the control system sends the control character **DLE**. If the **BCC** is erroneous, the control character **NAK** is sent to the peripheral. A retry is then expected. If it is not possible to receive the block correctly after a total of 6 attempts (3964R protocol specification) or the retry is not started by the peripheral within the block waiting time of 4 s, the control system aborts the reception.

If transfer errors occur during reception (lost characters, frame errors, parity errors), the control system continues to receive data until the connection is terminated and then sends the control character **NAK** to the peripheral. Then a retry in the form described above is awaited.

8.3.1.5 Summary of the most important points

- **DLE duplication:**
  For the control system to be able to differentiate between the control character **DLE** and a randomly occurring 10_{hex} value as a character in the information to be transferred, **on the occurrence of a 10_{hex} value in the information to be transferred, a 10_{hex} value must be sent again**. This means that if a byte with the 10_{hex} value occurs in the message core, this character must be transferred again so that it is not interpreted by the receiving end as the control character **DLE** for terminating the connection.
- **The block check character (BCC):**
  At the end of each data block, a block check character is sent to assure data integrity. The block check character is the **even longitudinal parity** (XOR operator on all data bytes) of a block sent or received. The block check character is formed **starting** with the **first byte** of the message core after the connection is setup and **ends after** the characters **DLE** and **ETX** during connection termination.
- **Retries on errors:**
  If an error occurs for any reason during the data transfer, **a total of 6 attempts** are made to transfer the data correctly.

8.4 Commands for writing and reading an Electronic-Key read/write

Write and read processes are always initiated by the PC/PLC (control system) using a "command message".

The Electronic-Key-System then sends a reply message to the control system.

PC/PLC (control system)	Electronic-Key-System
Command message ⟶	
	Reply message ⟵

On Electronic-Keys read/write with 116 bytes, the memory is organized in 4-byte blocks. This means a multiple of 4-byte sized blocks must always be written.

The start address must be given in the range byte number 0 to byte number 112, always in 4-byte steps (byte number 0, 4, 8 ... 112)!

However, during **reading** it is possible to access the memory by bytes without the above mentioned restriction during writing.

8.4.1 Write process

When this command is used, the Electronic-Key must be in the Electronic-Key adapter and is only allowed to be removed from within the operating distance after reception of the reply message.

Command message (message core, PC/PLC → EKS, see Figure 2):

- TP (device addr.) (start addr. user data) (number of bytes of user data) (user data)

Reply message (message core, EKS → PC/PLC, see Figure 3):

- RF (device addr.) (00_{hex},00_{hex}) (status number)

Byte no.	Description	Contents ASCII	hexadecimal	decimal
0	Number of message bytes		0B ... 7B	11 ... 123
1	Command identification	T	54	84
2		P	50	80
3	Device address		01	1
4	Start address for the user data		00	0
5			00 ... 70	0 ... 112
6	Number of bytes of user data		04 ... 74	4 ... 116
7 ... 122	User data	ASCII or hexadecimal or BCD (code transparent)		

Figure 2: Command message **write Electronic-Key read/write** (message core)

Byte no.	Description	Contents ASCII	Contents hexadecimal	Contents decimal
0	Number of message bytes		07	7
1	Command identification	R	52	82
2		F	46	70
3	Device address		01	1
4	Padding data		00	0
5			00	0
6	Status number		*	

Figure 3: Reply message **write Electronic-Key read/write - status** (message core)

* Status number 00_{hex}: No error

02_{hex}: Electronic-Key not in the operating distance

(For further status numbers see chapter 8.7)

8.4.2 Read process

Command message (message core, PC/PLC → EKS, see Figure 3):

- TL (device addr.) (start addr. user data) (number of bytes of user data)

Reply message (message core, EKS → PC/PLC, see Figure 5 or Figure 6):

For this command there are two possible replies:

- RL (device addr.) (start addr. user data) (number of bytes of user data) (user data)

  or

- RF (device addr.) (00_{hex},00_{hex}) (status number)

The reply message RL (see Figure 5) stands for correct reception of the data.

If an Electronic-Key cannot be read, an RF reply message is received (see Figure 6). The status number then indicates the cause of the error.

Byte no.	Description	Contents ASCII	Contents hexadecimal	Contents decimal
0	Number of message bytes		07	7
1	Command identification	T	54	84
2		L	4C	76
3	Device address		01	1
4			00	0
5	Start address for the user data		00 ... 73	0 ... 115
6	Number of bytes of user data		01 ... 74	1 ... 116

Figure 4: Command message **read Electronic-Key read/write** (message core)

Byte no.	Description	Contents		
		ASCII	hexadecimal	decimal
0	Number of message bytes		08 ... 7B	8 ... 123
1 2	Command identification	R L	52 4C	82 76
3	Device address		01	1
4 5	Start address for the user data		00 00 ... 73	0 0 ... 115
6	Number of bytes of user data		01 ... 74	1 ... 116
7 ... 122	User data	ASCII or hexadecimal or BCD (code transparent)		

Figure 5: Reply message **read Electronic-Key read/write** (message core)

Byte no.	Description	Contents		
		ASCII	hexadecimal	decimal
0	Number of message bytes		07	7
1 2	Command identification	R F	52 46	82 70
3	Device address		01	1
4 5	Padding data		00 00	0 0
6	Status number		*	

Figure 6: Reply message **read Electronic-Key read/write - status** (message core)

* Status number 02_{hex}: Electronic-Key not in the operating distance

(For further status numbers see chapter 8.7)

8.4.3 Reading the serial number

The Electronic-Key read/write contains a unique 8-byte serial number. This number is written by laser during the Electronic-Key production process and can never be changed or deleted. The serial number is used for reliable identification of each individual Electronic-Key. It is necessary that all 8 bytes are completely evaluated for reliable differentiation. The serial number is appended to the freely programmable user data.

The serial number can be read using the command **TL** (see section 8.4.2 Read process) using the start address byte no. 116 and 8 as the number of bytes.

8.5 Command for resetting

Using the command message **TA** the Electronic-Key adapter can be reset to its initial condition via the software.

Command message (message core, PC/PLC → EKS, see Figure 7):

- TA (device addr.) (00_{hex}, 00_{hex}) (00_{hex})

Reply message (message core, EKS → PC/PLC, see Figure 8):

- RF (device addr.) (00_{hex}, 00_{hex}) (00_{hex})

The reply message RF with status number 00_{hex} (see Figure 8) stands for correct processing of the cancel command.

Byte no.	Description	Contents		
		ASCII	hexadecimal	decimal
0	Number of message bytes		07	7
1	Command identification	T	54	84
2		A	41	65
3	Device address		01	1
4	Start address for the user data		00	0
5			00	0
6	Number of bytes of user data		00	0

Figure 7: Command message **cancel** (message core)

Byte no.	Description	Contents		
		ASCII	hexadecimal	decimal
0	Number of message bytes		07	7
1	Command identification	R	52	82
2		F	46	70
3	Device address		01	1
4	Padding data		00	0
5			00	0
6	Status number		00	0

Figure 8: Reply message **cancel** (message core)

8.6 Command overview

Description	Command message	Reply message
Program (write) Electronic-Key	**TP** (see chapter 8.4.1)	**RF** (see chapter 8.4.1)
Read Electronic-Key (also read the serial number)	**TL** (see chapter 8.4.2 and 8.4.3)	**RL** (see chapter 8.4.2) or **RF** (see chapter 8.4.2)
Reset device	**TA** (see chapter 8.5)	**RF** (see chapter 8.5)

8.7 Status numbers

Value	Description
00_{hex}	No error
02_{hex}	Electronic-Key not in the operating distance
03_{hex}	Parity bit error on Electronic-Key read-only
06_{hex}	Write process aborted. Start address or number of bytes is not a multiple of the block size 4
17_{hex}	Read attempt when the Electronic-Key adapter is set to Electronic-Key read/write and an Electronic-Key read-only is inserted
18_{hex}	Read attempt when the Electronic-Key adapter is set to Electronic-Key read-only and an Electronic-Key read/write is inserted
$4x_{hex}$	General Electronic-Key communication error (renewed write or read necessary)
50_{hex}	Write attempt despite enabled write protection

9 Exclusion of liability

Exclusion of liability under the following conditions:

- if the unit is not used for its intended purpose
- non-compliance with safety regulations
- if mounting and electrical connection are carried out by unauthorized personnel
- if modifications are made

10 Service and repair

- No servicing is required.
- Remove dirt from the Electronic-Key and the Electronic-Key adapter using a soft cloth and solvent-free, non-abrasive cleaning agents.
- Repairs are only to be made by the manufacturer.

11 Guarantee

The “General Terms and Conditions” of EUCHNER GmbH + Co. KG apply.

12 Bibliography

[1] SIEMENS AG manuals, connection components for S7 control systems

Controler (PLC) S7-300CPU-Data

CPUs 312C to 314C-2DP/PtP

Only RS422/485

Point-to-point communication CP 340	SIEMENS order No.
Installation and parameter assignment	6ES7340-1AH00-8BA0

Point-to-point communication CP 341	SIEMENS order No.
Installation and parameter assignment	6ES7341-1AH00-8BA0

Point-to-point communication CP 441	SIEMENS order No.
Installation and parameter assignment	6ES7441-2AA00-8BA0

More than safety.

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