Electronic-Key-System
Manual
EKS and EKS FSA
with PROFINET Interface
Order no. 109 283
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1 General notes

1.1 Use of the manual

This manual describes the technical features and the function of the EKS PROFINET read/write stations listed below (also referred to as "devices" for short in the rest of the document).

With the compact version, the Electronic-Key adapter and the evaluation and interface electronics for data transmission are accommodated completely in one housing:

- Compact Electronic-Key adapter EKS-A-IIX-G01-ST02/03 (order no. 106305) with PROFINET interface
- Compact Electronic-Key adapter EKS-A-IIXA-G01-ST02/03/04 (order no. 106306) with PROFINET interface; version FSA (For Safety Applications)

With the modular version, the Electronic-Key adapter and the interface adapter with the evaluation and interface electronics for data transmission are accommodated in two separate housings:


1.1.1 Explanation of symbols

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

- **Danger!**
  Identifies an immediate hazard. If not avoided, the consequence will be fatality or very serious injuries.

- **Warning!**
  Identifies a possible hazard. If not avoided, the consequence may be fatality or very serious injuries.

- **Caution!**
  Identifies a possible hazard. If not avoided, minor injuries or damage may result.

- **Attention!**
  Risk of damage to material or machine or degradation of function.

- **Information!**
  Important information is provided to the user here.
1.1.2 Abbreviations

The following abbreviations are used in this manual:

- **DCP** Discovery and Configuration Protocol
- **DIP** Dual Inline Package
- **E²PROM** Electrically Erasable Programmable Read-Only Memory
- **EKS** Electronic-Key-System
- **EKS FSA** Electronic-Key-System For Safety Applications
- **FHM** Front Hook Modular
- **GSD** Geräte Stammdaten (device data)
- **GSDML** Generic Station Description Markup Language (special XML file with device parameters for configuration in the control system)
- **IP** Internet Protocol
- **LED** Light Emitting Diode
- **LSB** Least Significant Bit
- **MSB** Most Significant Bit
- **NO** Normally Open
- **PA** PolyAmide
- **RD** Receive Data
- **ROM** Read-Only Memory
- **TCP/IP** Transmission Control Protocol / Internet Protocol
- **TD** Transmit Data

1.2 CE conformity


The devices comply with the following European/international standards:

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

1.3 Approvals

The EKS devices with PROFINET interface are certified in accordance with **(UL file number E240367)**.

For use and operation as per the requirements, a power supply with the feature "for use in class 2 circuits" must be used.
1.4 Correct use

As part of a higher-level overall system, the EKS read/write station is used for access control and monitoring on control systems or parts of control systems for machine installations. EKS can be used, for example, as part of an overall system for checking access rights for operating mode selection. However, it is not permitted to directly derive the operating mode from the access rights on the Electronic-Key. If the selection of the operating mode is relevant for safety, this must not be performed by means of the EKS; instead an additional device must be used to select the operating mode. This is possible using a pushbutton or selector switch, for example.

The version EKS FSA has outputs that can be utilized to form a safe shut-down signal (for block diagram, see section 3.1.2). For this purpose a safe evaluation must be included downstream. The EKS FSA can then be used for safety-relevant tasks. The machine must be reset to a safe operating mode by removing the Electronic-Key. A hazard analysis on this aspect must be prepared as per the requirements in the machinery directive. The risk and the necessary risk minimization by technical means must be determined using a suitable standard. The following requirements must be met for use:

- The data signal (channel LB) and the switching contact LA1/LA2 (channel LA) must be polled by a safe downstream evaluation to suit the risk determined. The data line (channel LB) is used to supply the information as to whether or not an Electronic-Key is in place and which access rights are assigned to the Electronic-Key. The switching contact LA1/LA2 (channel LA) is used for the redundant supply of the information as to whether or not an Electronic-Key is in place (independent of the access rights). The switching contact LB1/LB2 is used to supply (like LA1/LA2) only the information as to whether or not an Electronic-Key is in place (independent of the access rights). Use of the switching contact LB1/LB2 is optional.

- The control system must check whether the Electronic-Key in place is authorized to select the operating mode and whether the access rights on the Electronic-Key permit operation in the operating mode currently selected.

- The user must select the related operating mode using the control system or another suitable circuit.

- The manufacturer of the system must check which safety level is reached with the overall system and whether the overall system provides adequate safety against hazards in the intended application.

Information!

The machinery directive 2006/42/EC provides information on selection of the operating mode. It is imperative that this information be followed.

When designing machines and using the read/write station, the national and international regulations and standards specific to the application must be observed, e.g.:

- EN 60204, Safety of machinery – Electrical equipment of machines
- EN 12100-1, Safety of machinery – Basic concepts, general principles for design – Part 1: basic terminology, methodology
- EN 62061, Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems
- EN ISO 13849-1, Safety of machinery – Safety related parts of control systems – Part 1: General principles for design

Modifications to the electronics of the read/write station and any other changes, especially mechanical modifications and reworking, are not permissible and will result in the loss of the warranty and exclusion of liability.
The read/write station must be employed and used only in accordance with

- this manual and
- other documentation referred to in this manual.

The EKS read/write station is not a safety component in the sense of the machinery directive. Without additional precautions the EKS read/write station must not be used to provide a safety function, particularly if failure or malfunction of the device could endanger the safety or health of people in the operating area of a machine.

### 1.5 Obligations on the operating organization

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

**Warning!**
The EKS read/write station is not a safety component in the sense of the machinery directive. Without additional precautions the read/write station must not be used to provide a safety function, particularly if failure or malfunction of the device could endanger the safety or health of people in the operating area of a machine. On this topic, pay particular attention to the sections **Correct use** (see section 1.4) and **Electrical connection** (see section 6).

**Warning!**
Mounting and electrical connection are allowed to be performed only by authorized personnel who are familiar with the applicable regulations on accident prevention and have read and understood this manual.
Furthermore, installation and electrical connection of the version EKS FSA must be performed only by personnel familiar with handling safety components.

**Caution!**
Modifications to the electronics of the read/write station and any other changes, especially mechanical modifications and reworking, are not permissible and will result in the loss of the warranty.
3 Function

3.1 Functional description

3.1.1 Common functions of EKS Standard and version EKS FSA

The EKS is used for access control and monitoring on control systems 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 consists at least of:

- Electronic-Key
- Electronic-Key adapter EKS compact or Electronic-Key adapter FHM with interface adapter EKS modular

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.

Information!

For easier organization and management of your Electronic-Keys and the data they contain, EUCHNER also offers the Electronic-Key-Manager (EKM) software. To enter data in the EKM software, an Electronic-Key adapter with serial interface or USB interface must be in operation on the PC.

EKS PROFINET devices are read/write systems with electronics for the inductive bidirectional interface to the transponder and interface electronics.

Due to the non-contact transfer of data, the Electronic-Key adapter is designed with a high degree of protection suitable for industry from the access side. The Electronic-Key adapter is fastened from the rear side of the panel in order to exclude unauthorized tampering from the operator side.

The system is connected via the integrated PROFINET interface, which is designed as an RJ45 socket. A separate switch may be required for the PROFINET connection. The device does not have an integrated switch.

Setup and system integration can be realized straightforwardly and quickly on the Electronic-Key adapter with PROFINET interface.

The current state of the Electronic-Key adapter is displayed using a 3-color LED.

The Electronic-Key is placed on the Electronic-Key adapter for operation. The power supply for the transponder and the data are transferred contactlessly between the Electronic-Key adapter and the Electronic-Key.

Figure 1: Cut-away illustration of an Electronic-Key adapter with Electronic-Key in the compact version
The Electronic-Keys are tag shaped. The complete transponder with memory chip and antenna is integrated into the Electronic-Key. The transponder does not have a battery.

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

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

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.

### 3.1.2 Additional functions of the version EKS FSA

The version EKS FSA has additional switching contacts (semiconductor relay) that are switched off as long as there is no Electronic-Key in the Electronic-Key adapter or if the Electronic-Key cannot be read.

- Compact version of the device: switching contacts LA1/LA2 and optionally LB1/LB2
- Modular version of the device: only switching contact LA1/LA2

The switching contacts are electrically isolated from the device electronics and from each other. Either AC or DC can be switched.

Each of the outputs is operated with diversity by a dedicated processor that switches off the outputs on removal of the Electronic-Key (see figure Block diagram EKS FSA).

![Block diagram EKS FSA](image)

Due to separate evaluation of channel LA and channel LB, the EKS FSA device can be used in conjunction with a safe evaluation device in safety-related applications. Integrated voltage monitoring switches off the switching contacts LA and LB if the power supply is outside the permitted tolerance (see sections 4.4 and 4.5).

**Information!**

The switching contacts FSA close when the Electronic-Key is in place, irrespective of the data allocation in the memory.
4 Technical data

4.1 Dimension drawing of Electronic-Key adapter compact

For installation in a control panel you must provide a cut-out 33 mm x 68 mm according to DIN 43700.

4.1.1 Version EKS-A-IIX-G01-ST02/03 with PROFINET interface

4.1.2 Version EKS-A-IIXA-G01-ST02/03/04 (EKS FSA) with PROFINET interface
4.2 Dimension drawing of FHM Electronic-Key adapter modular

4.3 Dimension drawing of interface adapter PROFINET modular

passend für Hutschiene 35 mm nach DIN EN 60715 TH35 / suitable for rail 35 mm acc. to DIN EN 60715 TH35
4.4 Technical data of compact version

Attention!

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

<table>
<thead>
<tr>
<th>General parameters</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing</td>
<td>Plastic (PA 6 GF30 gray)</td>
</tr>
<tr>
<td>Degree of protection acc. to EN 60529</td>
<td>IP 67 in installed state</td>
</tr>
<tr>
<td>Ambient temperature at $U_B = DC 24 V$</td>
<td>$0 \pm 55$ °C</td>
</tr>
<tr>
<td>Mounting cut-out acc. to DIN 43700</td>
<td>33 x 68 mm</td>
</tr>
<tr>
<td>Connection for power supply</td>
<td>Plug-in connection terminal, 3-pole, with screw terminal (tightening torque 0.22 Nm), conductor cross-section 0.14 ... 1.5 mm²</td>
</tr>
<tr>
<td>Operating voltage $U_B$ (regulated, residual ripple &lt; 5%)</td>
<td>20 24 28 DC V</td>
</tr>
<tr>
<td>Current consumption $I_B$</td>
<td>150 mA</td>
</tr>
</tbody>
</table>

Interface, data transfer

Interface to the control system: Industrial Ethernet (IEEE 802.3)

Transfer protocol: PROFINET acc. to IEC 61158 / IEC 61784-1 and -2

Data transfer rate (full duplex): 10/100 Mbit/s

Connection for Ethernet interface: 1 x RJ45 socket

Data line: 2 x 2 twisted-pair copper cables, screened; min. category 5

LED indicator: Green: "Ready" (in operation) Yellow: "Electronic-Key active" * Red: "Error"

Version FSA (For Safety Applications) – parameters for floating semiconductor switching contacts LA and LB

Connection for switching contacts: Plug-in connection terminal, 4-pole, with screw terminal (tightening torque 0.22 Nm), conductor cross-section 0.14 ... 1.5 mm²

Power supply $U$ for load (LA, LB): 24 30 V

Switching current (with overload protection): 1 10 50 mA

Output voltage $U_A$ (LA, LB) in switched state: $U \times 0.9$

Resistance in switched state: 35 ohm

Capacitive load: 1 µF

Utilization category according to EN IEC 60947-5-2

- AC-12
- AC-15
- DC-12
- DC-13

50 mA/24 V

Difference time of the outputs** (LB first): 200 ms

Reliability values according to EN ISO 13849-1 (FSA version only)

Category (with downstream safe evaluation): 3

MTTF\(d\) Evaluation of data channel and one switching contact LA: 416 years

MTTF\(d\) Evaluation of data channel and both switching contacts LA and LB: 803 years

DC: 92 %

* The LED illuminates yellow if there is a functional Electronic-Key in the Electronic-Key adapter.
** If the Ethernet interface is accessed during placement or removal of the Electronic-Key, the difference time can be more than 200 ms.
4.5 Technical data of modular version

Attention!

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

<table>
<thead>
<tr>
<th>General parameters</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>min.</td>
<td>typ.</td>
<td>max.</td>
</tr>
<tr>
<td>General parameters of Electronic-Key adapter Front Hook Modular FHM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing</td>
<td>Plastic (PVDF GF30, gray)</td>
<td></td>
</tr>
<tr>
<td>Degree of protection acc. to EN 60529</td>
<td>IP 65, IP 67, IP 69K in installed state</td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-20</td>
<td>+70 / +100* °C</td>
</tr>
<tr>
<td>Mounting hole</td>
<td>∅ 22.5</td>
<td>mm</td>
</tr>
<tr>
<td>Connection</td>
<td>Connection cable permanently connected to Electronic-Key adapter or with plug connector in the cable, with flying lead</td>
<td></td>
</tr>
<tr>
<td>Connection cable length</td>
<td>2, 5, 10, 15</td>
<td>m</td>
</tr>
<tr>
<td>Connection cable cross-section</td>
<td>4 x 0.25 screened</td>
<td>mm²</td>
</tr>
<tr>
<td>Connection cable outer sheath</td>
<td>PVC</td>
<td></td>
</tr>
</tbody>
</table>

| General parameters of modular interface adapter | | |
| Housing | Plastic (PA 6.6, gray) | |
| Ambient temperature at U_B = DC 24 V | 0 | +55 °C |
| Mounting | 35-mm mounting rail acc. to DIN EN 60715 TH35 | |
| Number of connectible Electronic-Key adapters | 1 | |
| Connection for power supply and Electronic-Key adapter | Plug-in connection terminals, 4-pole and 5-pole, with screw connection (tightening torque 0.22 Nm) or spring connection, conductor cross-section 0.2 ... 1.5 mm² | |
| Cable length to Electronic-Key adapter | 2 | 15 | m |
| Operating voltage U_B (regulated, residual ripple < 5%) | 20 | 24 | 28 | DC V |
| Current consumption I_B | 150 | mA | |

| Interface, data transfer | | |
| Interface to the control system | Industrial Ethernet (IEEE 802.3) | |
| Transfer protocol | PROFINET acc. to IEC 61158 / IEC 61784-1 and -2 | |
| Data transfer rate (full duplex) | 10/100 | Mbit/s |
| Connection for Ethernet interface | 1 x RJ45 socket | |
| Data line | 2 x 2 twisted-pair copper cables, screened; min. category 5 | |
| Cable length | 100 | m | |
| LED indicator read head | Green (STATE): "Ready" (in operation) Yellow (ACTIVE): "Electronic-Key active" ** Red (DIA): "Error" | |
| LED indicator PROFINET | Green (ON): "active" Yellow (SF): "System error" Red (BF): "Bus error" | |

| Version FSA (For Safety Applications) – parameters for floating semiconductor switching contact LA | | |
| Connection switching contacts | Plug-in connection terminal, 5-pole, with screw connection (tightening torque 0.22 Nm) or spring connection, conductor cross-section 0.2 ... 1.5 mm² | |
| Power supply U for load (LA) | 24 | 30 | V |
| Switching current (with overload protection) | 1 | 10 | 50 mA |
| Output voltage U_A (LA) in switched state | U x 0.9 | U | V |
| Resistance in switched state | 35 | Ohm | |
| Capacitive load | 1 | µF | |
| Utilization category according to EN IEC 60947-5-2 | AC-12 | AC-15 | DC-12 | DC-13 |
| | | | 50 mA/24 V | |

| Reliability values according to EN ISO 13849-1 (FSA version only) | | |
| Category (with connected safe evaluation) | 3 | |
| MTTF_d Evaluation of data channel and one switching contact LA | 416 | years | |
| DC | 92 | % | |

* This is no ambient temperature for operation. It is valid for a time of max. 3 minutes, e.g. for cleaning purposes.
** The LED illuminates yellow if there is a functional Electronic-Key in the Electronic-Key adapter.
4.6 Connector assignment

4.6.1 Connection socket for PROFINET interface

The connection on the Electronic-Key adapter is realized as an RJ45 (8P8C) socket corresponding to ISO IEC 61754-24.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Transmit Data + (TD+)</td>
</tr>
<tr>
<td>2</td>
<td>Transmit Data - (TD-)</td>
</tr>
<tr>
<td>3</td>
<td>Receive Data + (RD+)</td>
</tr>
<tr>
<td>6</td>
<td>Receive Data - (RD-)</td>
</tr>
</tbody>
</table>

4.6.2 Connection terminal assignment for compact version

Information!
The plug-in screw terminals are included with the Electronic-Key adapter.

4.6.2.1 Connection of power supply

<table>
<thead>
<tr>
<th>Pin</th>
<th>Designation</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>UB</td>
<td>Power supply DC + 24 V</td>
</tr>
<tr>
<td>2</td>
<td>0V</td>
<td>Power supply DC 0 V</td>
</tr>
<tr>
<td>3</td>
<td>Function</td>
<td>Electrically connected to</td>
</tr>
<tr>
<td></td>
<td>earth</td>
<td>the housing</td>
</tr>
</tbody>
</table>

4.6.2.2 Connection of switching contacts LA1/LA2 and LB1/LB2 (EKS FSA only)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Channel</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LA</td>
<td>LA1- LA2 NO contact, channel</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>LB</td>
<td>LB1- LB2 NO contact, channel</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.6.3 Connection terminal assignment for modular version

Information!
The plug-in connection terminals are not included with the interface adapter.

### 4.6.3.1 Connection to Electronic-Key adapter

<table>
<thead>
<tr>
<th>Pin</th>
<th>Designation</th>
<th>Function</th>
<th>Core color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SH</td>
<td>Shield of FHM Electronic-Key adapter</td>
<td>BK</td>
</tr>
<tr>
<td>2</td>
<td>LED1</td>
<td>LED of FHM Electronic-Key adapter</td>
<td>YE</td>
</tr>
<tr>
<td>3</td>
<td>LED2</td>
<td>LED of FHM Electronic-Key adapter</td>
<td>GN</td>
</tr>
<tr>
<td>4</td>
<td>H2</td>
<td>Antenna of FHM Electronic-Key adapter</td>
<td>WH</td>
</tr>
<tr>
<td>5</td>
<td>H1</td>
<td>Antenna of FHM Electronic-Key adapter</td>
<td>BN</td>
</tr>
</tbody>
</table>

### 4.6.3.2 Connection of power supply

<table>
<thead>
<tr>
<th>Pin</th>
<th>Designation</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0V</td>
<td>Power supply DC 0 V</td>
</tr>
<tr>
<td>4</td>
<td>UB</td>
<td>Power supply DC + 24 V</td>
</tr>
</tbody>
</table>

### 4.6.3.3 Connection of switching contact LA1/LA2 (EKS FSA only)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Designation</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>LA1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0V</td>
<td>NO contact, channel LA</td>
</tr>
<tr>
<td>5</td>
<td>LA2</td>
<td></td>
</tr>
</tbody>
</table>
4.7 DIP switch settings

The device has three DIP switches (S1, S2, S3).

<table>
<thead>
<tr>
<th>Compact device</th>
<th>DIP switch</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1 (4-fold)</td>
<td>S1.1 … S1.4; write and read settings</td>
<td></td>
</tr>
<tr>
<td>S2 (8-fold)</td>
<td>S2.1 … S2.8; setting of a fixed DCP name (depending on the setting for S3)</td>
<td></td>
</tr>
<tr>
<td>S3 (4-fold)</td>
<td>S3.1 … S3.4; settings for network connection and service</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Modular device</th>
<th>DIP switch</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1 (4-fold)</td>
<td>S1.1 … S1.4; write and read settings</td>
<td></td>
</tr>
<tr>
<td>S2 (10-fold)</td>
<td>S2.1 … S2.10; setting of a fixed DCP name (depending on the setting for S3)</td>
<td></td>
</tr>
<tr>
<td>S3 (4-fold)</td>
<td>S3.1 … S3.4; settings for network connection and service</td>
<td></td>
</tr>
</tbody>
</table>

**Information!**
The settings are adopted only when the power supply is switched on.

### 4.7.1 DIP switch S1

<table>
<thead>
<tr>
<th>DIP switch</th>
<th>Function</th>
<th>Factory setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1.1</td>
<td>ON = write protection for Electronic-Key read/write</td>
<td>OFF</td>
</tr>
<tr>
<td>S1.2</td>
<td>Internal function</td>
<td>OFF</td>
</tr>
<tr>
<td>S1.3</td>
<td>Internal function</td>
<td>OFF</td>
</tr>
<tr>
<td>S1.4</td>
<td>Internal function</td>
<td>OFF</td>
</tr>
</tbody>
</table>

**Information!**
It is imperative that all switches without a function (S1.2, S1.3 and S1.4) are set to OFF! In this way problems with any functions added in the future will be avoided.
4.7.2 DIP switch S2

**Information!**

To be able to define the DCP name using DIP switch S2, all of DIP switch S3 must first be set to OFF. The use of the switches to assign the DCP name and the IP address is described in the following in section 6.1.1.

---

<table>
<thead>
<tr>
<th>DCP name</th>
<th>LSB S2.1</th>
<th>S2.2</th>
<th>S2.3</th>
<th>S2.4</th>
<th>S2.5</th>
<th>S2.6</th>
<th>S2.7</th>
<th>MSB</th>
<th>S2.8</th>
<th>S2.9**</th>
<th>S2.10**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adopt from configuration software*</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>EKS-PN-1</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>EKS-PN-2</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>EKS-PN-3</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>EKS-PN-254</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>EKS-PN-255</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>

* The name that was last set in the configuration software is used (factory setting: all in OFF position)
** Present only on modular interface adapter. Internal function. Retain default setting.

---

**Information!**

If a DCP name is set on DIP switch S2, a name set previously will be overwritten.

4.7.3 DIP switch S3

Using DIP switch S3, you define the way the device is to receive its DCP name.

---

<table>
<thead>
<tr>
<th>Function</th>
<th>S3.1</th>
<th>S3.2</th>
<th>S3.3</th>
<th>S3.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assign DCP name via the configuration software or set it via DIP switch S2</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Set DCP name via the web interface</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Set default IP address</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>Internal function, leave switch OFF</td>
<td></td>
<td>OFF</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Factory setting: all in OFF position)

---

**Information!**

The use of the switches to assign the DCP name and the IP address is described in the following in section 6.1.1.

The IP address is always set automatically via the configuration software and assigned via the DCP CPU.

To prevent unauthorized changes to the network, it is sensible to deactivate the web interface after use. For this purpose switch S3.1 is set to OFF.
4.8 Indicator LED of compact version

The operating states of the Electronic-Key adapter are indicated via a 3-color LED on the front. The illumination of the LED in any color indicates the presence of the operating voltage.

<table>
<thead>
<tr>
<th>Operating state</th>
<th>Description</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic-Key adapter power-up</td>
<td>After the application of the power supply, the LED is constantly illuminated red during power-up. The completion of the process is indicated by a change in this state after approx. 20 seconds. If the LED then remains red, it is an indication of a PROFINET network fault. The LED also remains red during communication via TCP/IP.</td>
<td>Red</td>
</tr>
<tr>
<td>Ready</td>
<td>Network connected.</td>
<td>Green</td>
</tr>
<tr>
<td>Electronic key active</td>
<td>Network connected. Electronic-Key is in the Electronic-Key adapter.</td>
<td>Yellow</td>
</tr>
<tr>
<td>Acknowledgment</td>
<td>LED flashes red/green after approx. 35 seconds. Default IP address is restored.</td>
<td>Red/green</td>
</tr>
</tbody>
</table>

4.9 Indicator LEDs of modular version

The operating states of the read/write stations are indicated via LEDs in three colors.

On the FHM Electronic-Key adapter, the state of the identification system is signaled by a single three-color LED. On the interface adapter, the same state is signaled by three individual LEDs (read head) in different colors. The illumination of the LED in any color indicates the presence of the operating voltage.

The state of the data interface is additionally signaled via three individual LEDs in different colors on the interface adapter (PROFINET).

<table>
<thead>
<tr>
<th>Operating state Description</th>
<th>Green ON</th>
<th>PROFINET Red SF</th>
<th>Red BF</th>
<th>Green STATE</th>
<th>Read head Yellow ACTIVE</th>
<th>Red DIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power-up of the Electronic-Key adapter</td>
<td>flashing (2 Hz)</td>
<td>x*</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Fault: PROFINET error</td>
<td>on</td>
<td>on</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Fault: No bus connection with control system</td>
<td>on</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Fault: Error in EKS (no Electronic-Key in place)</td>
<td>on</td>
<td>x</td>
<td>x</td>
<td>flashing</td>
<td>off</td>
<td>flashing</td>
</tr>
<tr>
<td>Fault: Error in EKS (Electronic-Key in place)</td>
<td>on</td>
<td>x</td>
<td>x</td>
<td>flashing</td>
<td>flashing</td>
<td>off</td>
</tr>
<tr>
<td>Ready: Network connected</td>
<td>on</td>
<td>off</td>
<td>off</td>
<td>on</td>
<td>off</td>
<td>off</td>
</tr>
<tr>
<td>Electronic-Key active: Network connected. Electronic-Key is in the Electronic-Key adapter</td>
<td>on</td>
<td>off</td>
<td>off</td>
<td>on**</td>
<td>on</td>
<td>off</td>
</tr>
<tr>
<td>Acknowledgment: Default IP address is restored</td>
<td>flashing (1 Hz)</td>
<td>flashing (1 Hz)</td>
<td>flashing (1 Hz)</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

* x = Any state
** Only the yellow LED is illuminated on the FHM Electronic-Key adapter
5 Mounting

**Warning!**
Mounting must be performed only by authorized personnel.
After mounting, again check the Electronic-Key adapter for firm seating and correct sealing on the front panel.

5.1 Electronic-Key adapter compact

**Attention!**
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 with a tightening torque of 0.25 … 0.35 Nm.
A suitable strain relief must be provided for the connection cables in order to avoid damage to the connection sockets or malfunctions.

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 section 4.1). The device is fastened using screw clamp elements from the rear side of the panel.

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

1. Insert the 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 from the side up to the stop and tighten with 0.25 … 0.35 Nm.

**Attention!**
The device may be damaged if the tightening torque exceeds 0.35 Nm.

5.2 Electronic-Key adapter FHM

**Attention!**
To achieve the degree of protection IP 69K, it is necessary to install the FHM Electronic-Key adapter in a clean, flat metal plate at least 2 mm thick and to tighten the central fixing nut with a tightening torque of 2 Nm.
A suitable strain relief must be provided for the connection cables in order to avoid damage to the connection sockets or malfunctions.

The Electronic-Key adapter is intended for mounting in control panels with a cut-out Ø 22.5 mm (see section 4.2).
6 Electrical connection

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

**Warning!**
For use and operation as per the requirements, a power supply with the feature "**for use in class 2 circuits**" must be used.

**Attention!**
The read/write station is allowed to be connected only if it is electrically isolated. Otherwise the device can be damaged.

**Attention!**
If connected incorrectly, the device can be damaged. 
Observe electrical characteristics and terminal assignment (see section 4.4 Technical data of compact version and section 4.5 Technical data of modular version).

**Attention!**
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.

**Attention!**
When connecting, the operating organization must ensure compliance with the EMC safety requirements in accordance with EN 55011 and EN 61000-6-2.

**Attention!**
The equipotential bonding system of the machine installation must comply with EN 60204-1, section 8, Equipotential bonding.

**Attention!**
Do not lay connection cables in the immediate vicinity of sources of interference.
6.1 PROFINET connection

The interface for the read/write station is compatible with the standards ISO/IEC 61754-24 and IEC 61158. The device is operated in full-duplex mode with 10 Mbit/s or 100 Mbit/s.

Information!
- Only a screened 100 BaseTX cable, twisted pair, Cat 5 or higher, is permitted for use as the connection cable. The maximum cable length is 100 m.
- It may be necessary to provide additional screening in conditions with a high level of EMC interference.
- A separate switch may be required for the PROFINET connection.

6.1.1 PROFINET configuration

It is necessary to assign a unique DCP name for the unambiguous addressing of a subscriber in the PROFINET network. The DCP name EKS-PN is saved in the device as the factory setting.

In the first step a DCP name is assigned to the device (see DIP switch settings in section 4.7). There exist the following three possibilities:

1. Assignment via the configuration software
2. Assignment via setting of DIP switch S2
3. Assignment via web interface

This DCP name is saved in the device. In the second step the IP address is always set automatically via the configuration software based on the unique DCP name used and assigned via the DCP CPU.

In addition, the following service functions can be set with DIP switch S3:
- Reset to default IP address (see sections 4.7.3 and 6.1.1.1)
- Permit or prohibit configuration via web interface (see sections 4.7.3 and 9.2)

The individual functions are described below in detail.

6.1.1.1 Default IP address

Each device has the factory-set default IP address 192.168.1.1 and the subnet mask 255.255.255.0.

To reset the device to the default IP address, proceed as follows. The device must be disconnected from the PROFINET network during this routine.

1. Disconnect the device from the power supply.
2. Set switch S3.1, S3.3 and S3.4 (see DIP switch settings in section 4.7.3) to ON.
3. Apply power supply. Wait until the device has adopted the default IP address. This situation is indicated by the LED flashing red/green (lasts approx. 35 s).
4. Disconnect the device from the power supply. Then set all switches of DIP switch S3 to OFF (factory setting) (see section 4.7.3).

After the application of the power supply, the device now powers up again with the default IP address. The DCP name is deleted during this process.

Information!
With the modular interface adapter, the RESET button on the front can be used to disconnect the power supply and restart the device.
6.1.1.2 Setting DCP name via DIP switch S2

In this operating mode the DCP name for the EKS is defined by the DIP switch S2. During this process DIP switch S2 defines the suffix for the DCP name EKS-PN-XXX, where XXX can have the values 001 – 255. A prerequisite for this operating mode is that the DCP name EKS-PN-XXX is used during configuration.

**Information!**

With this setting it is also possible to easily change an EKS in case of need for replacement. For this purpose the suffix number for the old EKS is set on the new EKS via DIP switch S2 and the new EKS then fitted.

6.2 Connection of power supply

(For the connector assignment, see section 4.6.2.1 and 4.6.3.2 Connection of 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 screws on the terminal plug to 0.22 Nm.

**Information!**

With the modular interface adapter, the RESET button on the front can be used to disconnect the power supply and restart the device.

6.3 Connection of function earth

The function earth is connected via terminal 3 on the plug-in screw terminals for the power supply. This connection is electrically connected internally to the housing of the compact Electronic-Key adapter.

**Information!**

The function earth must be connected to PE!

6.4 Connection of the semiconductor switching contacts (for EKS FSA only)

**Warning!**

Incorrect connection or errors in the safety-related integration of the EKS FSA can lead to fatal injury. For this reason, observe the following safety aspects:

- It is not possible to generate a safe signal by using only the switching contacts LA1/LA2 and LB1/LB2. Safe, downstream evaluation is always necessary (e.g. using a safety relay). Use of the switching contact LB1/LB2 (for the compact version only) is optional.
- The safe evaluation must always be dual-channel: Evaluation of switching contact LA1/LA2 as channel LA together with evaluation of the data line as channel LB.
- Integrate the EKS FSA if possible as defined in the following connection examples from EUCHNER.

**Information!**

With EKS version FSA, safe shutdown can be achieved by the dual-channel feature according to category 3 as per EN ISO 13849-1. For this purpose a safe evaluation must be included downstream. The machine must be reset to a safe operating mode after removal of the Electronic-Key, i.e. automatic mode with closed safety guard. For this safe shutoff, Performance Level PL d can be achieved in the overall system.
6.4.1 Connection example with enabling switch

Figure 4: Principle of operation (illustration with selected operating mode and all components in actuated position)

6.4.1.1 Description of the application example with enabling switch

The danger area on a machine is secured with a fence. To make set-up work on the machine possible with the safety door open, an EKS FSA system is integrated in conjunction with a control system, an enabling switch and a safety relay. The safety relay must comply with the following requirements:

- Detection of short-circuits and earth faults. A short-circuit can be detected in the safety path in the circuit described due to the fact that both the positive path and earth path of the safety relay are switched. In this case, the safety relay deactivates its safety outputs.

- Simultaneity monitoring: The safety relay must detect whether the safety inputs are switched practically simultaneously. If this is not the case, the safety outputs are not switched and the relay switches to fault state. A renewed start is possible only after the enabling switch has been released and then operated again.

The switching contact LA1/LA2 is closed after placement of the Electronic-Key. The EKS FSA is coupled with a control system. After placement of the Electronic-Key, the control system checks whether the Electronic-Key is authorized for work in the selected operating mode. If this is not the case, the operating mode cannot be set. If access rights are available, the control system gives the instruction to the switching contact A100.0 to close.
The switching contact LA1/LA2, in series with a switching contact on the enabling switch, is connected to the first input on the safety relay. The switching contact A100.0 is connected to the second input in series with the second switching contact on the enabling switch. The result is that these inputs on the safety relay are enabled only if

- the EKS-FSA (switching contact LA1/LA2) and
- the control system (switching contact A100.0) issue the related enabling signal and
- the enabling switch is actuated.

The output contacts on the safety relay are enabled only after actuation of the enabling switch.

The safety relay is de-energized without a time delay (stop category 0) and the machine movement is stopped if

- the Electronic-Key is removed or
- the enabling switch is released or
- the machine control system cancels the enable state (contact A100.0 is opened).

**Note:** The control system output A100.0 is allowed to be set only if

- the related Electronic-Key is in place and
- a suitable operating mode is selected.

---

### Information!

The control system output A100.0 is allowed to be set only if

- the related Electronic-Key is in place and
- a suitable operating mode is selected.

---

#### 6.4.1.2 Feedback loop

The safety relay can be started only with the feedback loop closed. A welded contactor contact in the enable path will thus be detected when a start request is made and a start is then prevented. The power contactor must have positively driven contacts.

#### 6.4.1.3 Start

The safety relay is started after enabling by the EKS FSA and by the control system, and after operation of the enabling switch.
6.4.1.4 Circuit diagram

Figure 5: Circuit diagram with enabling switch
6.4.2 Connection example without enabling switch

Note:
The related control system output is set only if the corresponding Electronic-Key is in place and a suitable operating mode is selected.

![Diagram of Connection example without enabling switch]

6.4.2.1 Description of the application example without enabling switch

The danger area on a machine is secured with a fence. To make set-up work on the machine possible with the safety door open, an EKS FSA system is integrated in conjunction with a control system and a safety relay. The safety relay must comply with the following requirements:

- Detection of short-circuits and earth faults. A short-circuit can be detected in the safety path in the circuit described due to the fact that both the positive path and earth path of the safety relay are switched. In this case, the safety relay deactivates its safety outputs.

- Simultaneity monitoring: The safety relay must detect whether the safety inputs are switched practically simultaneously. If this is not the case, the safety outputs are not switched and the relay switches to fault state. A renewed start is possible only after the Electronic-Key has been put in place again.

- Start button monitoring: The safety relay must detect when the start button is welded or jammed at the latest at the next start. If this is the case, the safety outputs are not switched and the relay switches to fault state. This prevents accidental starting of the system.

The switching contact LA1/LA2 is closed after placement of the Electronic-Key. The EKS FSA is coupled with a control system. After placement of the Electronic-Key, the control system checks whether the Electronic-Key is authorized for work in the selected operating mode. If this is not the case, the operating mode cannot be set. If access rights are available, the control system gives the instruction to the switching contact A100.0 to close.

The switching contact LA1/LA2 of the EKS FSA is connected to the first input on the safety relay. The switching contact A100.0 on the control system is connected to the second input on the safety relay. The control contact A100.0 and the switching contact LA1/LA2 are monitored for simultaneity.
The safety relay is de-energized without a time delay (stop category 0) and the machine movement is stopped if:
- the Electronic-Key is removed or
- the machine control system cancels the enable state (switching contact A100.0 is opened).

**Information!**
The switching contact A100.0 is allowed to be set only if:
- the related Electronic-Key is in place and
- a suitable operating mode is selected.

### 6.4.2.2 Feedback loop

The safety relay can be started only with the feedback loop closed. A welded contactor contact in the enable path will thus be detected when a start request is made and a start is then prevented. The power contactor must have positively driven contacts.

### 6.4.2.3 Start

The safety relay start is given after enabling by the EKS FSA and by the control system, and after operation of the start button.
6.4.2.4 Circuit diagram

Figure 7: Circuit diagram without enabling switch
7 Setup

Information!
You will require the corresponding GSD file in GSDML format to integrate the EKS in a PROFINET system environment:

- GSDML-Vx.x-Euchner-EKS_109539-YYYYMMDD.xml
- GSDML -Vx.x-EUCHNER-EKS_PN_modular_126145-YYYYMMDD.xml

The GSD file is available for download on the Internet at www.EUCHNER.de or free of charge on request. The archive of the GSD file also includes the image file for depicting the device in the configuration software.

Prior to setup, the GSD file must be imported into the configuration software for the control system (see control system manual).

A separate switch or a crossover cable may be required for the PROFINET connection.

Perform setup in the following sequence:

1. Configure EKS with the aid of the GSD file.
2. Set the DIP switches of the device (see section 4.7).
3. Check that mounting and electrical connection are correct (see section 5 and section 6).
4. After the power supply is plugged in, the LED on the front of the compact Electronic-Key adapter respectively the SF and BF LEDs on the interface adapter are initially illuminated in red. Once the connection has been established, the LED on the front of the compact Electronic-Key adapter respectively the ON LED on the interface adapter are illuminated in green and signal readiness for operation.
5. Place the Electronic-Key in the Electronic-Key adapter. The LED on the front of the compact Electronic-Key adapter or the ACTIVE LED on the interface adapter changes to yellow.
6. Important: for the version EKS FSA, all safety functions must also be thoroughly tested.

7.1 Requirements
You need the following hardware/software to integrate the EKS read/write station into the PROFINET network:

- Current GSD file for the configuration
- Configuration software (e.g. SIMATIC STEP 7)
- PROFINET CPU (e.g. Siemens CPU315)
7.2 Configuration settings

This section describes the possible settings for the modules EKS read and EKS write. In section 7.3 Connecting the EKS to a PROFINET CPU it is shown, step-by-step, how the device is configured in the configuration software for the control system.

**Information!**

On the use of automatic name assignment in the control system based on the topology, the preset DCP name >>EKS-PN<< in the device must be deleted first. This action can be undertaken, e.g. by means of the web interface or the SIMATIC STEP 7 software, using >>Reset to factory settings<<.

7.2.1 Modules available in the GSD file for reading data

The number of bytes transferred cyclically is defined by the selection of the module in the GSD file. A maximum of 124 bytes user data can be read from the Electronic-Key. The following modules can be selected:

<table>
<thead>
<tr>
<th>GSD file selection (data block size)</th>
<th>Electronic-Key user data Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control system input area</td>
<td></td>
</tr>
<tr>
<td>Read: 009 bytes</td>
<td>8 bytes</td>
</tr>
<tr>
<td>Read: 017 bytes</td>
<td>16 bytes</td>
</tr>
<tr>
<td>Read: 033 bytes</td>
<td>32 bytes</td>
</tr>
<tr>
<td>Read: 065 bytes</td>
<td>64 bytes</td>
</tr>
<tr>
<td>Read: 128 bytes</td>
<td>124 bytes</td>
</tr>
</tbody>
</table>

The module selected defines the length of the data block that is read from the Electronic-Key and cyclically transferred to the input area. A larger data block occupies more memory in the input area of the control system.

**Information!**
The modules 009 bytes to 065 bytes can be used on compact EKS Electronic-Key adapters from version 2.7.0 (August 2013) in combination with a GSD file from 2014 >>GSDML-V2.25-Euchner-EKS_109539-20140626.xml<< or >>GSDML-V2.3-Euchner-EKS_109539-20140626.xml<<. The module 128 bytes is selected by default. The module 128 bytes can be used with all EKS Electronic-Key adapters. Earlier versions of the GSD file can be used with all Electronic-Key adapters. All modules can always be used in the modular interface adapter.

**Information!**

If a GSD file module is replaced during communication with the control system, the power supply of the modular interface adapter must then be disconnected and reconnected. The RESET button on the front can also be used to disconnect the power supply and restart the device.

7.2.2 Properties for the modules for reading data

A module EKS read reads alarms and Electronic-Key data and writes this information to the input area of the control system.

7.2.2.1 Parameter Alarm settings

Here it is defined how alarms that arise during reading are to be handled.

The following settings are possible:

- Activate diagnostics alarm
- Activate process alarm
- Deactivate alarms
7.2.2.2 Parameter Start address
Here you can select a start address from the permissible memory on the Electronic-Key. Possible values on reading are byte no. 0 to byte no. 116.

7.2.2.3 Parameter Number of bytes
Here you can set the number of bytes of user data to be read. This number of bytes to be read must lie in a valid memory on the Electronic-Key based on the start address. With a start address of byte no. 116, for example, the maximum number of bytes to be read is 8.

7.2.3 Modules available in the GSD file for writing data
The number of bytes transferred is defined by the selection of the module in the GSD file. A maximum of 116 bytes user data can be written to the Electronic-Key. The following modules can be selected:

<table>
<thead>
<tr>
<th>GSD file selection (data block size)</th>
<th>Electronic-Key user data Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control system output area</td>
<td></td>
</tr>
<tr>
<td>Write: 012 bytes</td>
<td>8 bytes</td>
</tr>
<tr>
<td>Write: 020 bytes</td>
<td>16 bytes</td>
</tr>
<tr>
<td>Write: 036 bytes</td>
<td>32 bytes</td>
</tr>
<tr>
<td>Write: 068 bytes</td>
<td>64 bytes</td>
</tr>
<tr>
<td>Write: 128 bytes</td>
<td>116 bytes</td>
</tr>
</tbody>
</table>

The module selected defines the length of the data block that is written to the Electronic-Key. A larger data block occupies more memory in the output area of the control system.

**Information!**
The modules 012 bytes to 068 bytes can be used on compact EKS Electronic-Key adapters from version 2.7.0 (August 2013) in combination with a GSD file from 2014 >>GSDML-V2.25-Euchner-EKS_109539-20140626.xml<< or >>GSDML-V2.3-Euchner-EKS_109539-20140626.xml<<. The module 128 bytes is selected by default. The module 128 bytes can be used with all EKS Electronic-Key adapters. Earlier versions of the GSD file can be used with all Electronic-Key adapters. All modules can always be used in the modular interface adapter.

**Information!**
If a GSD file module is replaced during communication with the control system, the power supply of the modular interface adapter must then be disconnected and reconnected. The RESET button on the front can also be used to disconnect the power supply and restart the device.

7.2.4 Properties for the modules for writing data
A module EKS write writes the data from the output area of the control system to the Electronic-Key.

7.2.4.1 Parameter Alarm settings
Here it is defined how alarms that arise during writing are to be handled.

The following settings are possible:

- Activate diagnostics alarm
- Activate process alarm
- Deactivate alarms
7.3 Connecting the EKS to a PROFINET CPU

Integration of the EKS PROFINET (compact version, order no. 106305) is described in the following based on the example of the SIMATIC STEP 7 software and a Siemens CPU 315F-2 PN/DP.

1. Create a new S7 project.
2. Open the hardware configuration and install the current EKS GSD file.
3. Select the EKS from the catalog and drag it to the PROFINET system.
4. Select required module from GSD file

5. In Interface, set a cycle time ≥ 128 ms.
6. Make the alarm settings in the module *EKS read*.

7. In the module *EKS read*, set the start address from which the data on the Electronic-Key are to be read.

8. In the module *EKS read*, set the number of bytes to be read.

9. In the module *EKS write*, set the required alarm mode.
10. Configure the required name for the EKS (default: EKS-PN)

11. If required, you can change the input address area in the control system for the module EKS read.

12. If required, you can change the output address area in the control system for the module EKS write.

13. Save and compile your configuration. Then load it into the CPU.

   ▶ You can create your modules for the S7 project as usual and load them into the CPU.
8 Operation in the PROFINET

8.1 Communication
This section primarily describes communication between the CPU and the read/write station (referred to as device in the following).

The communication between the control system and the device is either cyclic (write/read processes to and from the Electronic-Key) or acyclic (diagnostic messages).

8.2 EKS alarms
Depending on the setting in the configuration, the EKS can send
- Diagnostics alarms
- Process alarms
- No alarms
to the control system (see section 7.2 Configuration settings).

Process alarms are written to a data area in the control system. The alarms have the following structure:

[byte word with alarm no.];[byte with alarm information]

**Example**
During an attempt to read the serial number of the Electronic-Key, byte no. 116 is entered as the start address and 20 bytes as the number of bytes to be read. However, in this case the maximum possible number of bytes is 8.

Description: Error during read access. Max. number of bytes allowed incorrect.
Depiction in the related data area in the control system: 0100;08

<table>
<thead>
<tr>
<th>Alarm no.</th>
<th>Alarm information</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0100&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Returns the max. number of bytes that are allowed to be read.</td>
<td>Read process aborted. Max. number of bytes allowed exceeded.</td>
</tr>
<tr>
<td>0101&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Returns the max. number of bytes that are allowed to be written.</td>
<td>Write process aborted. Max. number of bytes allowed exceeded.</td>
</tr>
<tr>
<td>0102&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Returns the number of bytes that has been entered incorrectly.</td>
<td>Write process aborted. Number of bytes is not a multiple of the block size 4.</td>
</tr>
<tr>
<td>0103&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Returns the start address that has been entered incorrectly.</td>
<td>Write process aborted. Start address is not a multiple of the block size 4.</td>
</tr>
<tr>
<td>0104&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Not used</td>
<td>Electronic-Key not in the operating distance.</td>
</tr>
<tr>
<td>0105&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Not used</td>
<td>General Electronic-Key communication error (renewed write or read necessary).</td>
</tr>
<tr>
<td>0106&lt;sub&gt;hex&lt;/sub&gt;</td>
<td>Not used</td>
<td>Write attempt despite enabled write protection. Deactivate write protection and re-start device.</td>
</tr>
</tbody>
</table>
8.3  Read/write operation

In read or write operation, following successful configuration, a transfer message is continually transferred to the input area or from the output area of the control system during each I/O cycle.

The number of bytes transferred cyclically is defined by the selection of the module in the GSD file.

**Information!**

On the Electronic-Key read/write with 116 bytes freely programmable, the memory is organized in 4-byte blocks. This means the start address must be given for writing in the range byte number 0 to byte number 112, always in 4-byte steps (byte number 0, 4, 8 ... 112). Also a multiple of 4-byte sized blocks must always be written (4, 8, 12 ... 116 bytes).

However, during reading it is possible to access the memory byte-by-byte without the above-mentioned restriction for writing.

The Electronic-Key read/write also contains a unique 8-byte serial number. This number is written by laser during the Electronic-Key production process and is hereby stored absolutely indestructibly. The serial number can therefore not be changed. The serial number is used for secure distinction of every single Electronic-Key. It is necessary that all 8 bytes are completely evaluated for secure distinction. The serial number is appended to the freely programmable memory. The serial number can be read by entering the start address byte number 116 and the number of bytes 8.

8.3.1  Input area (read process)

**Information!**

If a specific start address is not defined, the user data are cyclically transferred to the input area of the control system starting from byte no. 0 on the Electronic-Key. The number of bytes with user data transferred cyclically from the Electronic-Key depends on the setting in the configuration software for the control system (see section 7.2.2.2 Parameter Start address and 7.2.2.3 Parameter Number of bytes).

<table>
<thead>
<tr>
<th>Input area of the PROFINET CPU</th>
<th>Byte no.</th>
<th>Description</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>Status byte</td>
<td>(see below)</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Receive data</td>
<td>Max. 124 bytes user data from the Electronic-Key plus 3 bytes reserve. If fewer bytes of data were selected during configuration, these are filled with 0\text{hex}.</td>
</tr>
<tr>
<td></td>
<td>127</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The following status information is transferred in the status byte (byte no. 0, see above):

<table>
<thead>
<tr>
<th>Status byte</th>
<th>Description (active with bit = 1)</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Device ready for operation</td>
<td>After successful configuration the device signals that it is ready via bit no. 0. Readiness should be continuously monitored by the application.</td>
</tr>
<tr>
<td>1</td>
<td>Electronic-Key detected</td>
<td>The detection of a valid Electronic-Key is signaled using bit no. 1. Using this bit, the application can detect that new data is available.</td>
</tr>
<tr>
<td>2</td>
<td>Reserve</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Job finished</td>
<td>Bit no. 6 indicates that a write process has been successfully finished.</td>
</tr>
<tr>
<td>7</td>
<td>Job in progress</td>
<td>Bit no. 7 indicates that a write process is currently in progress.</td>
</tr>
</tbody>
</table>

**Information!**

It is imperative all reserve bits are set to 0.
8.3.2 Output area (write process)

Information!
When this command is used, the Electronic-Key must be in the Electronic-Key adapter, and must be removed from within the operating distance only after the reply message has been received.

As the serial number of the Electronic-Key cannot be written, the start address for the data to be written is limited to byte no. 0 to byte no. 112.

Information!
It is imperative all reserve bits are set to 0.

<table>
<thead>
<tr>
<th>Byte no.</th>
<th>Description</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Command byte</td>
<td>(see below)</td>
</tr>
<tr>
<td>1</td>
<td>Start address</td>
<td>Defines first byte in the memory of the Electronic-Key that is written on setting bit no. 0 in the command byte. Start address of user data: Byte no. 0, 4, 8 … 112.</td>
</tr>
<tr>
<td>2</td>
<td>Number of bytes</td>
<td>Defines the number of bytes in the memory of the Electronic-Key that are written on setting bit no. 0 in the command byte. Number of bytes of user data: 4, 8, 12 … 116 bytes.</td>
</tr>
<tr>
<td>3</td>
<td>Not used</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Transmit data</td>
<td>If bit no. 0 in the command byte is set to 1, the content of these bytes is written to the Electronic-Key starting from the start address defined.</td>
</tr>
<tr>
<td>119</td>
<td>Not used</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>Not used</td>
<td></td>
</tr>
<tr>
<td>127</td>
<td>Not used</td>
<td></td>
</tr>
</tbody>
</table>

In the command byte it is defined whether data are written to the Electronic-Key.

<table>
<thead>
<tr>
<th>Bit no.</th>
<th>Description (active with bit = 1)</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Write Electronic-Key</td>
<td>After this bit is set, the content of &quot;Transmit data&quot; is written to the Electronic-Key in place, starting at the &quot;Start address&quot; and with the length &quot;Number of bytes&quot;. On the completion of the write process, bit no. 6 in the status byte in the input area of the CPU is set. Bit no. 0 in the command byte in the output area of the CPU must then be set to 0 so that a new write process can be started.</td>
</tr>
<tr>
<td>1</td>
<td>Reserve</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Reserve</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Reserve</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Reserve</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Reserve</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Reserve</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Reserve</td>
<td></td>
</tr>
</tbody>
</table>
9 Analysis and assignment of DCP name via web interface

As an alternative to communication via PROFINET, it is possible to communicate with the EKS read/write station from a PC with the aid of web browser via TCP/IP. The feature can be used, e.g., for analysis, to read data from the memory in the Electronic-Key and to display them in the browser. The DCP name of the device can also be set via the web browser (see also DIP switch settings in section 4.7.3).

This process is described in detail in the following sections.

9.1 Network settings for a configuration PC with Windows®

Information!
- It is assumed that you connect the PC to the EKS read/write station as shown in the following example.
- For connection, you need a (Cat 5) patch cable with crossed cables (crossover).
- You must first modify the network settings on the PC so that the web interface can be opened.
- Enter IP address for the PC from 192.168.1.2 to 192.168.1.254.
- Enter subnet mask for the PC as 255.255.255.0

Figure 8: Configuration PC connection
Adapting network settings

1. Select **Network Connections** in your operating system.

2. Right-click **Local Area Connection** and then click **Properties**.

3. Check whether **Internet Protocol (TCP/IP)** is listed. If the entry **Internet Protocol (TCP/IP)** is present, continue with Step 6.

4. Click **Install**. The **Select network component type** dialog box opens. Click **Protocol** and then click the **Add** button. The **Select network protocol** dialog box opens.

5. In the **Select network protocol** dialog box, select the entry **Microsoft TCP/IP** and click **OK**. You may need the installation CD for Windows® to set this up.

6. In the **Local Area Connection Properties** dialog box, double-click the entry **Internet Protocol TCP/IP**. The **Internet Protocol (TCP/IP) Properties** dialog box opens.
7. In order to ensure that the EKS read/write station and the configuration computer are in the same network, you must assign your configuration PC an IP address in the same subnet mask as the read/write station. On delivery, the default IP of the device is 192.168.1.1 and the subnet mask is 255.255.255.0. As a consequence you can allocate to the configuration PC, e.g. any IP address between 192.168.1.2 and 192.168.1.254. In this example, the configuration PC is assigned the IP address 192.168.1.2.

8. Click the **OK** button to confirm your entries.

The EKS read/write station can now be configured via the integrated web interface as described in section 9.2.
9.2 Configuring the read/write station via the web interface

The device can be configured with a web browser.

If you want to operate the device with a self-defined DCP name, you can configure the device using a PC. A PROFINET control system is not required during this process. This is the fastest method, particularly if several devices have to be configured. The configuration PC must meet the following requirements:

- Network card (10Base-T or 100Base-TX)
- Web browser (e.g. Internet Explorer)
- If the configuration PC features a firewall, it may be necessary to enable the EKS read/write station as a trustworthy application. Refer to the firewall documentation for further information.

Launching the EKS web interface

Use of the web interface is described below based on the example of the modular EKS PROFINET.

Information!

The web interface may be different for the compact EKS PROFINET. With this web interface, a Java applet is used to display Electronic-Key data in the Information screen. This is no longer compatible with the runtime environment from Java 8. Consequently, no Electronic-Key data are displayed. The connection to the web interface is established anyway; the Configuration screen and setting of the DCP name continue to function.

You will find the DIP switch setting for activating the web interface in section 4.7.3.

1. Open a browser window and enter the default IP address (http://192.168.1.1/). If necessary, first reset the default IP address (see section 6.1.1.1).

The Information screen of the EKS web interface is now displayed.
2. Click **Configuration**.
   ▶ The **Configuration** screen of the EKS web interface is now displayed.

1. Enter the required DCP name.
2. Click the **Send** button.
   ▶ The following message is displayed: **The settings were saved, to apply settings please switch power off/on...**
3. Interrupt the power supply and connect the device again in order to adopt the settings.
   
   **Information!**
   
   With the modular interface adapter, the RESET button on the front can be used to disconnect the power supply and restart the device.
9.3 Reading Electronic-Key data using the web interface

You can use the web interface to view the status byte (see section 8.3.1) and the receive data from the memory of the Electronic-Key that is currently in the Electronic-Key adapter. The Electronic-Key data cannot be changed via the web interface. The value of the individual bytes is displayed in hexadecimal notation.

Receive data are displayed in addition to the status byte. In the example below, the number of bytes displayed corresponds to the factory setting respectively to the module for reading of 128 bytes (see section 7.2.1) in the GSD file. In the example below, the overall data block is structured as follows:

Status byte window:
- 1 byte from device

Receive data window:
- 116 bytes from the Electronic-Key, freely programmable
- 8 bytes from the Electronic-Key, serial number - see red frame in example below
- 3 bytes with value 00, filler data (reserve) - see green frame in example below

A data block with 124 bytes from the Electronic-Key in total is sent via PROFINET, for example, to the control system if the >>Read: 128 bytes<< module was selected and the start address >>0<< and the number of bytes >>124<< were parameterized during configuration. This is the factory setting.

Information!
In order to read the data of a newly placed Electronic-Key, it is necessary to use the >>Update (typically F5)<< function in the web browser.
10 Exclusion of liability

Liability coverage is void under the following circumstances:

► incorrect use
► non-compliance with safety regulations
► if mounting and electrical connection are carried out by unauthorized personnel
► if modifications are made

11 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 to be made only by the manufacturer.
► On version EKS FSA devices, the safety-related functions must be checked at regular intervals.

12 Guarantee

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