EUCHNER EKS2 Electronic Key System Instruction Manual

Contents

EUCHNER

EUCHNER- EKS2- Electronic- Key -System

1. About this document

Scope
These operating instructions apply to all EKS2-C-USB-M-I1S1-B1-… from version V1.0.0. These operating instructions, the supplementary documents and any enclosed data sheet form the complete user information for your device.

Target group
Design engineers and installation planners for safety devices on machines as well as setup and servicing staff possessing the following expertise:

- specialist knowledge in handling safety components
- knowledge about the applicable EMC regulations
- knowledge about the applicable regulations on operational safety and accident prevention

Key to symbols

Symbol/depiction	Meaning
DANGER WARNING CAUTION	Safety precautions **Danger** of death or severe injuries **Warning** about possible injuries **Caution** slight injuries possible
NOTICE **Important!**	**Notice** about possible device damage **Important** information
Tip	Useful information

Supplementary documents
The overall documentation for this device consists of the following documents:

Document title (document number)	Contents
Operating instructions (2546099)	(this document)
Documentation (HTML)	.NET library documentation
Assembly instructions (2551025)	Assembly instructions
Description of testdmgmori.py	Use of the *pyeks* library

Important!
Always read all documents to gain a complete overview of safe installation, setup and use of the device.

Correct use

The device is used in combination with a touch panel or softkeys as part of a higher-level overall system for selection of operating mode. Before the device is used, a risk assessment must be performed on the machine, e.g. in accordance with the following standards:

- EN ISO 13849-1
- EN ISO 12100
- IEC 62061

Correct use includes observing the relevant requirements for installation and operation, particularly based on the

following standards:

- EN ISO 13849-1
- EN 60204-1

The device may be operated only with suitable smartcards and the EUCHNER connection components. On the use of unsuitable smartcards or other connection components, EUCHNER provides no warranty for safe function.

Important!

- The user is responsible for the proper integration of the device into a safe overall system. For this purpose, the overall system must be validated, e.g. in accordance with EN ISO 13849-2.
- Use only components that are permissible in accordance with the table below.

Component	Order number	Euchner ID no.	Description
Reader EKS2-…	3784024	166521	Reader
	3875478	166173	
	3875479 3860313	166174 166175	Smartcard for selecting an operating mode
Smartcard	3875480	166176	
	3875481	166177	Smartcard for selecting an operating mode and th e Service mode
	3796652	166178	Smartcard for selecting an operating mode and th e device configuration
.NET library	2546104	2546104	EKS class library
testdmgmori.py			Use of the *pyeks* library

Description of the safety function

Devices from the series EKS2-… feature the following safety function: Safe switching and monitoring of the selected operating mode (subsystem of the safety function selection of operating mode according to EN ISO 13849-1)

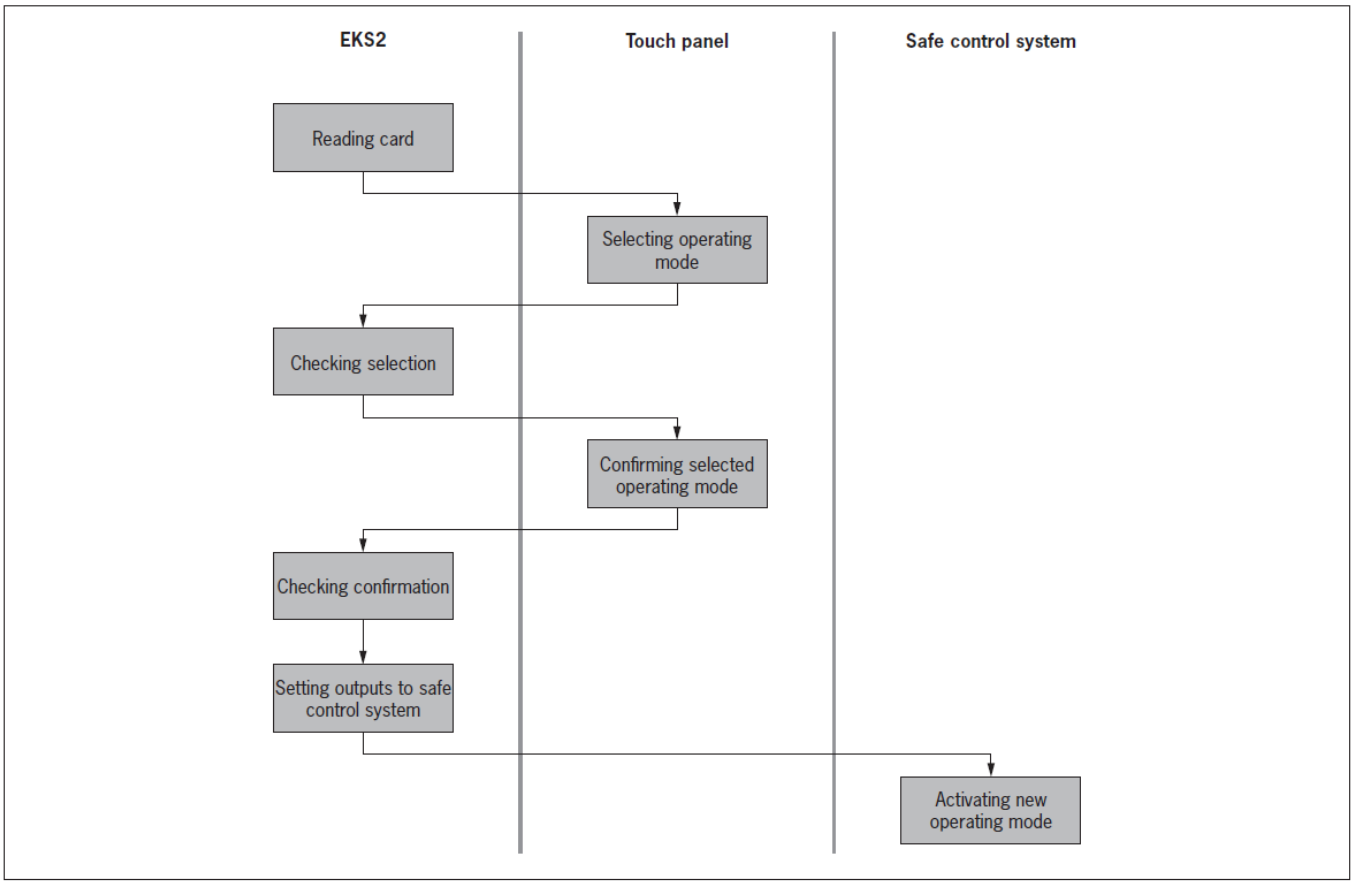
- Safety function:
  - Safe selection of an operating mode using a touch panel
  - Safe detection of a change of operating mode
- Safety characteristics: category, Performance Level, PFHD (see chapter 13. Technical data on page 14).

Selection of operating mode
As a subsystem, the device fulfills the subfunctions of an operating mode selector that controls the machine's safety functions required for the selected operating mode. A failure or malfunction of selection of operating mode can lead to the safety functions of the selected operating mode not being activated in the machine. A system for selection of operating mode can be subdivided into the following subfunctions according to EN ISO 16090-1, for

example:

- Access system
- Selection system
- Activation system

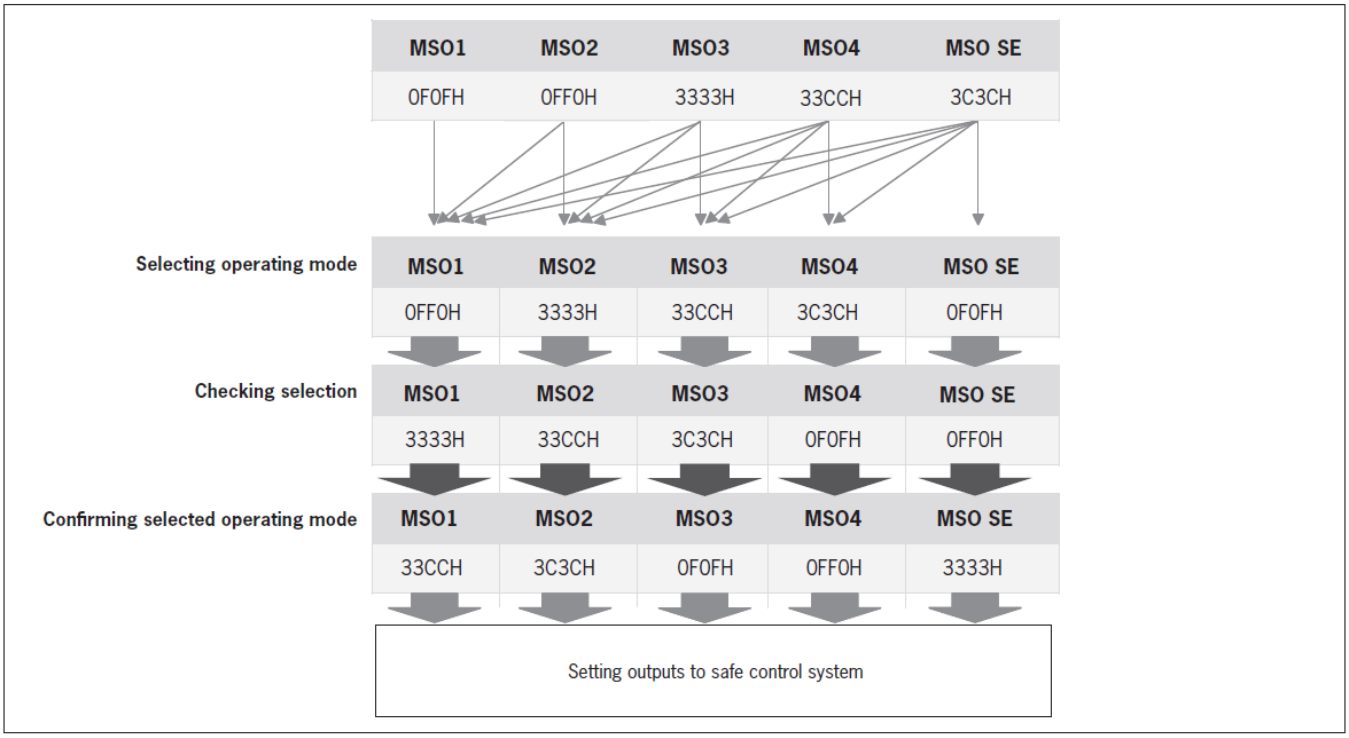
Incorrect behavior or an error in the selection system subfunction can lead to the safety function of the overall selection of operating mode system failing. The device fulfills the access system subfunction and, in combination with a touch panel, the selection system subfunction. The safety function is ensured by a two-stage interaction between the device and the touch panel. This involves prompting confirmation of the selection in a new, additional dialog.



Two-stage interaction between EKS2 and touch panel

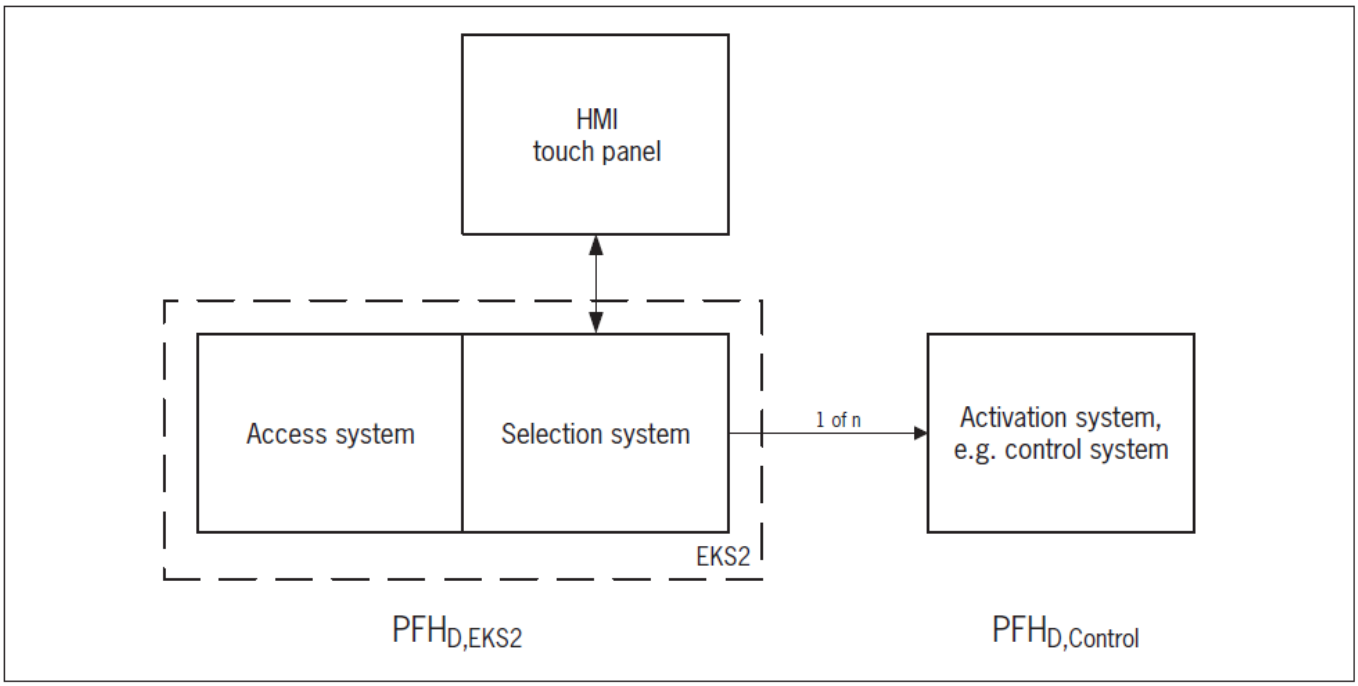
Operating Instructions Electronic-Key-System EKS2

The data structure of selection of operating mode is hierarchically structured for the individual authorization levels, and it changes values accordingly in the individual polling levels.



Data structure of selection of operating mode

To fulfill the safety function of the overall selection of operating mode system, a suitable activation system must be connected to the safe outputs of the device. A suitable activation system is a safe control system that can process 1-of-n signals, for example. The failure probability of the overall system's safety function can therefore be calculated as follows: PFHD,tot. = PFHD,EKS2 + PFHD,Control



Exclusion of liability and warranty

Liability or warranty is ruled out in case of:

- Incorrect use
- Failure to comply with the operating instructions and the safety regulations therein
- Failure to perform the required check for correct function

- Changes to the device

General safety precautions

Safe operating mode selectors fulfill personnel protection functions. Incorrect installation of the subsystem or tampering can lead to fatal injuries to personnel. Observe the following safety regulations to prevent failure of the personnel protection function:

- Visually inspect all components for damage prior to mounting and connection. Do not use damaged components; file a complaint with the manufacturer instead.
- Do not modify or replace plugs or cables.
- Check the safe function of the device as a subsystem, particularly:
  - each time after initial setup
  - each time after replacing the device
  - each time after correcting an error
  - in accordance with the machine's maintenance schedul

Function

The device is part of a higher-level overall system for selection of operating mode on safe control systems. The device consists of a reader and various smartcards. Authorizations for selecting various operating modes are stored on the smartcards. After being read in the reader, the smartcard is checked for validity based on specific parameters. If the smartcard is rec-ognized as valid, the operating modes available for selection can be displayed on the machine's touch panel. The selected operating mode is transmitted via the device's safety outputs FO1A to FO1F to the safe control system of the machine acting as the activation system. The safe control system must be capable of processing 1-of-n signals. Each 1-of-n state maps an operating mode MO (Mode of Operation):

	FO1A	**FO1B**	**FO1C**	**FO1D**	**FO1E**	**FO1F**
MO1	1	0	0	0	0	0
MO2	0	1	0	0	0	0
MO3	0	0	1	0	0	0
MO4	0	0	0	1	0	0
MO Service	0	0	0	0	1	0
Safe state 1) 2)	0	0	0	0	0	0
Safe state 1) 2)	Two or more outputs: 1					

1. Operating mode change: state duration from 2 to max. 60 ms; safe state: state duration longer than 60 ms.
2. The subsystem EKS2 is in the safe state. An error must be reported to the control system.

The LED illumination of the card holder indicates the status and error messages (see chapter 12. Status and fault displays on page 11).

Smartcards

Various smartcards are available for the device. They differ regarding the type and scope of authorization for selection of operating mode MO.

Order number	Smartcard	Selectable operating modes
3875478	Mode 1 (MO1)	Automatic mode
3875479	Mode 2 (MO2)	Automatic mode Setup
3860313	Mode 3 (MO3)	Automatic mode Setup Automatic mode with manual intervention
3875480	Mode 4 (MO4)	Automatic mode Setup Automatic mode with manual intervention Automatic mode with manual intervention without enabling device
3875481	Mode Service (MO Service)	Automatic mode Setup Automatic mode with manual intervention Automatic mode with manual intervention without enabling device Service mode
3796652	Mode Master (MO1)	Automatic mode

Mounting

Assembly instructions are included with the device and form part of these operating instructions. Observe the following points during mounting:

- Install the reader on the side of the touch panel. If the reader is installed on the upper or lower frame of the touch panel, make sure that:
  - no dust or dirt particles can enter the card holder from above.
  - vibrations cannot cause the smart card to fall out of the reader.
- Ensure adequate ventilation for the device to maintain the ambient temperature (see 13. Technical data on page 14).
- Maintain a distance of at least 2.5 mm from metal surfaces.
- Fasten screws with a tightening torque of 1 ± 0.15 Nm.

Electrical connection

General notes

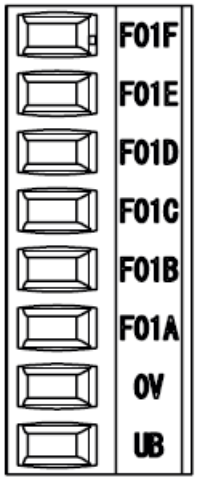
	WARNING
	Loss of the safety function due to incorrect electrical connection.
	► Ensure that at least four of the safety outputs FO1A to FO1F can be evaluated by a safe control system at all times.
	► Ensure that the safe control system can process 1-of-n signals.
	► Lay the connecting cables with protection to prevent short circuits.
	► Do not lay connecting cables in the immediate vicinity of sources of interference.

	CAUTION
	Risk of damage to equipment or malfunctions as a result of incorrect electrical connection.
	► Ensure that all circuits connected to the device comply with the regulations for low voltages with safe electrical isolation (SELV/PELV).
	► Ensure that power devices, which are a powerful source of interference, are installed in a separate location away from the input and output circuits for signal processing. The cables of the safety circuits must be installed as far away as possible from the cables of the power circuits.
	► Ensure that, to avoid EMC interference, the physical environmental and operating conditions at the installation site of the device comply with the requirements according to the standard EN 60204-1:2016, section 4.4.2 (EMC).
	► Pay attention to any interference fields from devices such as frequency converters or induction heating systems. Observe the EMC notes in the manuals from the respective manufacturer.

Notes about

	Important!
	► This device is intended to be used with a Class 2 power source in accordance with UL1310. As an alternative an LV/C (Limited Voltage/Current) power source with the following properties can be used: This device shall be used with a suitable isolating source in conjunction with a fuse in accordance with UL248. The fuse shall be rated max. 3.3 A and be installed in the max. 30 V DC power supply to the device in order to limit the available current to comply with the UL requirements. Please note possibly lower connection ratings for your device (refer to the technical data).
	► For use and application as per the requirements of 1) a connecting cable listed under the UL category code CYJV/7 must be used.
	1) Note on the scope of the UL approval: the devices have been tested as per the requirements of UL508 and CSA/ C22.2 no. 14 (protection against electric shock and fire).

Terminal assignment Connection terminal



F01F	-
F01E	MO Service
F01D	MO4
F01C	MO3
F01B	MO2
F01A	MO1
0V	Ground 0 V
UB	Operating voltage 24 V DC

USB interface
The device is connected to the touch panel using the permanently mounted USB cable.

Setup

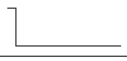
	Important!
	When programming the evaluation in the safe control system, ensure that, when the operating mode is selected, exactly one output is set at the safety outputs FO1A to FO1F for transmission to the safe control system via 1-of-n evaluation. This means:
	► If more than one output or no output is set, there is an error in the device or in the cable installa- tion. The safe control system must be capable of reacting to such errors in accordance with the machine's risk assessment.
	► When the device is reset, the setting of an output can be delayed by up to 5 s. Operating mode MO1 is selected automatically after the reset.

Operation

	Important!
	If the smartcard is removed from the reader in operating mode MO4 or Service mode, the selected operating mode will be retained for up to 15 s: ► If the same smartcard is re-inserted into the reader within 15 s, the corresponding operating mode will be regarded as still being selected. ► If no smartcard is inserted into the reader within the 15 s, the device will automatically switch to operating mode MO1. ► If a different smartcard is inserted into the reader within the 15 s, the device will immediately switch to operating mode MO1.

Status and fault displays

The card holder's LED illumination indicates the individual status and error messages. Detailed error messages can be output on the touch panel.

Key to symbols	○		LED not illuminated
			LED illuminated
	 5 Hz		LED flashes at 5 Hz
	 3 x		LED repeatedly flashes three times
			LEDs flash alternately

Smartcard status and fault displays

Status code	ENUM in .NET 'KeyStatus'	Status/error	Meaning	LED indicator		Troubleshooting
				yellow	green	
0x00	NoKey	Card not inserted or cannot be read.	The device is ready for operation. No card is inserted or card cannot be read.			Not an error
0x01	ValidKeyInsert	Card inserted. Card valid.	The inserted card was checked. The card is valid.			Not an error
0x02	KeyInvalid	Invalid authentication	The card is valid, but an authentication parameter does not match the pre-scribed values.			Use card with valid parameters
0x03	KeyLocked	Card blocked	The card can be read but is locked.			Use a valid card.
0x04	KeyExpired	Expired validity date of the card	The card can be read, but the validity date has expired.			Use a valid card or extend the validity date.
0x05	KeyUnknownData- Structure	Invalid data structure	The card can be read, but its data structure is invalid.			Card does not belong to this ma- chine. Use a valid card.
0x06	InvalidFileContent	File error	The file content is invalid and cannot be read. The file is not safe (security).			Card is faulty or does not belong to this machine. Use a valid card.
0x07	FileError	File error	At least one data record on the card is invalid and cannot be read. The file is not safe (security).			Card is faulty or does not belong to this machine. Use a valid card.
0x08	KeyTypeNotSup- ported	Invalid card type	The card can be read, but the card type is invalid.			Card does not belong to this ma- chine. Use a valid card.

0x09	KeyCommunication Error	Communication error	Disrupted communication with the touch panel. There may be an EMC fault.		6 x	1. Switch the device off. 2. Check the connecting cables to the touch panel and to the safe control system. 3. Restart the device. Contact the manufacturer if the problem persists.
100	NoKeyWithFallback Timeout	No card inserted, and fallback timeout is activated.	Only in .Net library: no card inserted. The device will switch to a different safe operating mode when the fallback timer elapses.			Insert a valid card with the appropri- ate authorization within the timeout period.
101	KeyUIDUnreadable	UID of the inserted card can- not be read.	Only in .Net library: the unique identifier (UID) of the card cannot be read.			Use a valid card.
102	KeyInMaximummMO NotDeterminable	Error when reading the highest permissible operating mode.	Only in .Net library: the highest permis- sible operating mode of the inserted card cannot be read.			Use a valid card.

EKS2 status and fault displays

Error code	**ENUM in .NET**	**Error**	**Meaning**	**State of safe- ty outputs**	**Reset**	**LED indicator**			**Troubleshooting**
						green	**red**	**yellow**	
–			The device starts. Communication not possible.	All off					
0x00			The device is in operation.	Depending on the selected operating mode		Depending on the card status (see **“12.1. Smartcard status and fault displays”**)			

0x 01	Enum(EKS Error) + Value(EKS Error Code)	Internal error	The device has an internal error.	At least two outputs on	Reset not possible				Replace the device.
0x 02	Enum(EKS Error) + Value(EKS Error Code)	Configuration error	Invalid configuration		Reset not possible	1 x			Restart the machine.

0x 10	Enum(EKS Error) + Value(EKS Error Code)	Invalid output state	The output state is invalid (1-to-n): • Several outputs are switched (short circuit). • Wrong output is switched. • The output can not be switched.	At least two outputs on	Select operating mode again or restart via .NET library	2 x			Internal error or connection error. Check connections.
0x 11	Enum(EKS Error) + Value(EKS Error Code)	Voltage is too high or too low.	Voltage monitoring at the outputs reports an error: • The output voltage is too high. • The output voltage is too low.		Select operating mode again or restart via .NET library	2 x			Check connections.

0x 20	Enum(EKS Error) + Value(EKS Error Code)	Supply voltage too high		All off	Select operating mode again or restart via .NET library	3 x			Check connections and power supply.
0x 21	Enum(EKS Error) + Value(EKS Error Code)	Supply voltage too low							
0x 22	Enum(EKS Error) + Value(EKS Error Code)	Temperature too high							Check ambient conditions.
0x 23	Enum(EKS Error) + Value(EKS Error Code)	Temperature too low		At least two outputs on					

0x 30	–	Communi cation tim eout	The polling time of 1 s was exceeded. .NET library does not s end an error code. Err or appears only in the transfer protocol.	Irrelev ant	Reset po ssible			6 x	No or invalid card inserted. Check connections.
						6 x			Card is valid. Check connec- tions.
–	?	Faulty co mmunicat ion	Only in .NET library: in correct USB connectio n or faulty cable.	Irrelev ant					Check connections.

0x 40	InvalidSele ctedMO In validConfir medMO	Invalid sel ection of operating mode	Invalid selection of ope rating mode: • The selected operating mode does n ot match the authorization. • The confirmed operating mode does n ot match the selected operating mode.	Irrelev ant	Reset po ssible	See “Normal ope ration”	

Firmware status display

LED indicator		**Meaning**
green	**red**	

See “Normal o peration”		Firmware data are sent to the device during normal operation.
	5 Hz	The firmware update is activated via a separate command.
		The firmware update was successful. Acknowledge flashing code by restart or separate command.

	The device has been reset to the factory settings. A restart is required.

Technical data

Technical data for EKS2

Parameter			Value		Unit
		min.	typ.	max.	
General					
Material		Polyamide PA66			
Installation orientation		On side			
Degree of protection	in the installed state	IP54 at front, IP20 in panel			
Safety class					
Degree of contamination					
Mechanical life					
Ambient temperature at UB = 24 V		-25	–	+55	°C
Storage temperature	Reader EKS	-45	–	+85	°C
	Smartcard	-45	–	+55	°C
Weight		Approx. 0.09			kg
Connection		Plug-in connection terminal, 8-pin, with screw terminal (tightening torque 0.2 … 0.25 Nm), conductor cross-section 0.05 … 1.5 mm²			
Interface to the PC		USB full speed			
Transfer protocol		USB 2.0			
Data transfer rate		12			Mbits
USB interface connection		Socket type A			
USB cable length		0.5			m
Output cable length		20			m
Operating voltage UB (reverse polarity protected, regulated, residual ripple < 5%)		24 ± 15% (SELV/PELV)			V DC
Current consumption		100			mA
Switching current		50			mA
The following applies to the approval acc. to UL		Operation only with UL class 2 power supply or equivalent measures			
Switching load acc. to UL		DC 24 V, class 2			
External fuse (operating voltage UB)		1.5	–	10	A
Rated impulse withstand voltage U_{imp}		–	–	± 1	kV
Rated conditional short-circuit current		200			A

Resilience to vibration		As per EN 60947-5-2			
EMC protection requirements		As per IEC 61000-6-2			
Safety outputs FO1A/FO1B		Semiconductor outputs, p-switching, short circuit-proof			
– Output voltage U_{FO1A}…U_{FO1F}					V DC
HIGH UFO1A… UFO1F		UB – 1.5	–	UB	
LOW UFO1A… UFO1F		0	–	1	
Switching current per safety output		1	–	50	mA
Utilization category acc. to EN 60947-5-2		DC-13 24V 150 mA Caution: outputs must be protected with a free-wheeling dio de in case of inductive loads			
Off-state current I_r 1)		0.5			mA
Reliability values acc. to EN ISO 13849-1					
Mission time		20			years
Monitoring of guard locking and the guard position					
Category		3			
Performance Level (PL)		d			
PFH_D		1.01 x 10-7/h			

Radio frequency approvals

- FCC ID: 2AJ58-14
- IC: 22052-14

FCC/IC-Requirements

This device complies with part 15 of the FCC Rules and with Industry Canada’s licence-exempt RSSs. Operation is subject to the following two conditions:

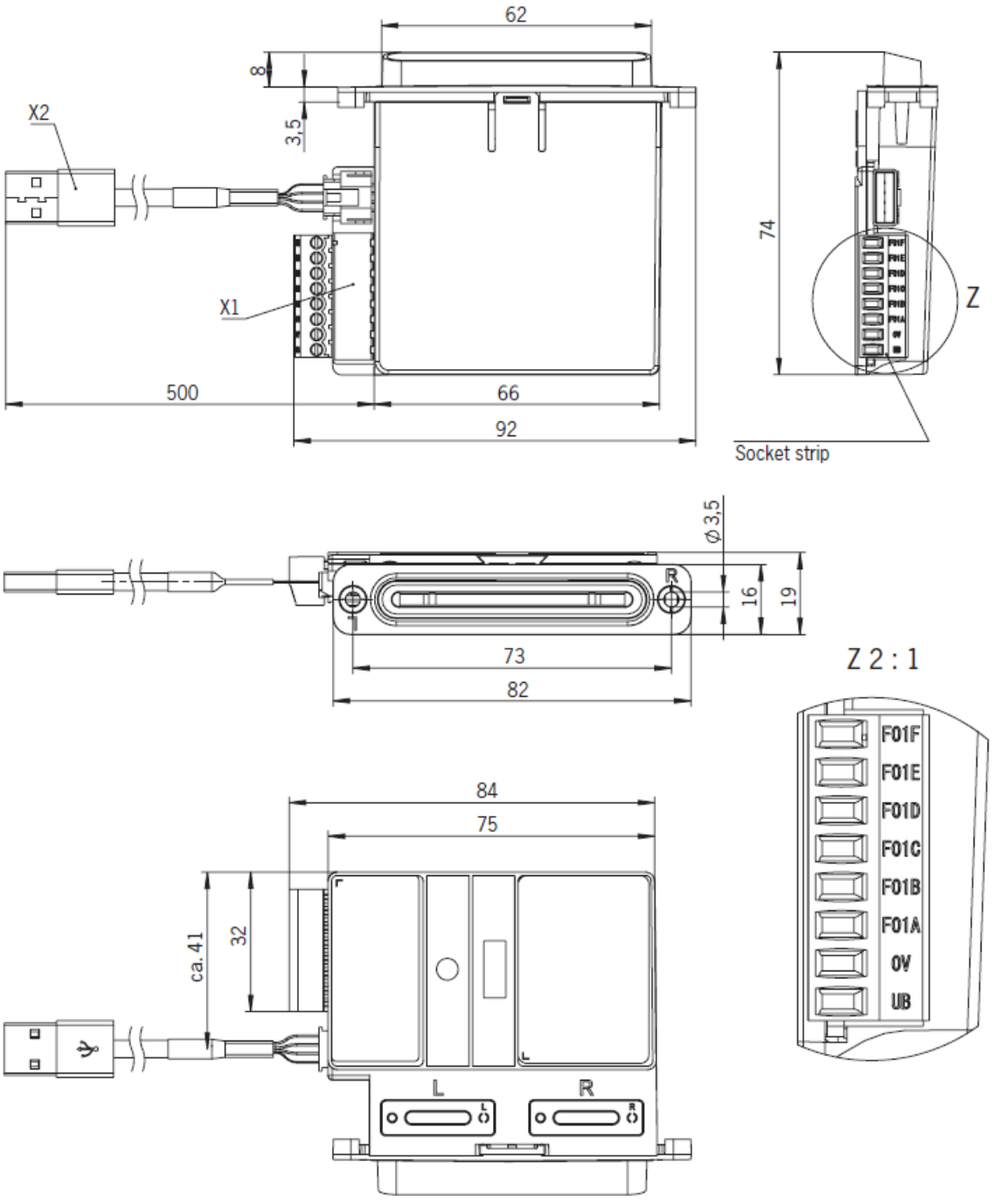
1. This device may not cause harmful interference, and
2. his device must accept any interference received, including interference that may cause undesired operation.

   Changes or modifications not expressly approved by the party responsible for compliance could void the user‘s authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and

can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Dimension drawing for EKS2…



Inspection and service

Regular inspection of the following is necessary to ensure trouble-free long-term operation:

- Ì Check the secure mounting of the devices and the connections

  Ì Check for contamination

No servicing is required. Repairs to the device are only allowed to be made by the manufacturer.

NOTICE

The year of manufacture can be seen in the lower right corner of the type label. The current version number in the format (V X.X.X) can also be found on the device.

Service

If servicing is required, please contact:

- EUCHNER GmbH + Co.
- KG Kohlhammerstraße 16
- 70771 Leinfelden-Echterdingen Germany

Service telephone:
+49 711 7597-500
E-mail:
support@euchner.de
Internet:
www.euchner.com

Documents / Resources

	EUCHNER EKS2 Electronic Key System [pdf] Instruction Manual 14, 2AJ58-14, 2AJ5814, EKS2 Electronic Key System, EKS2, Electronic Key System

References

- EUCHNER – More than safety.
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