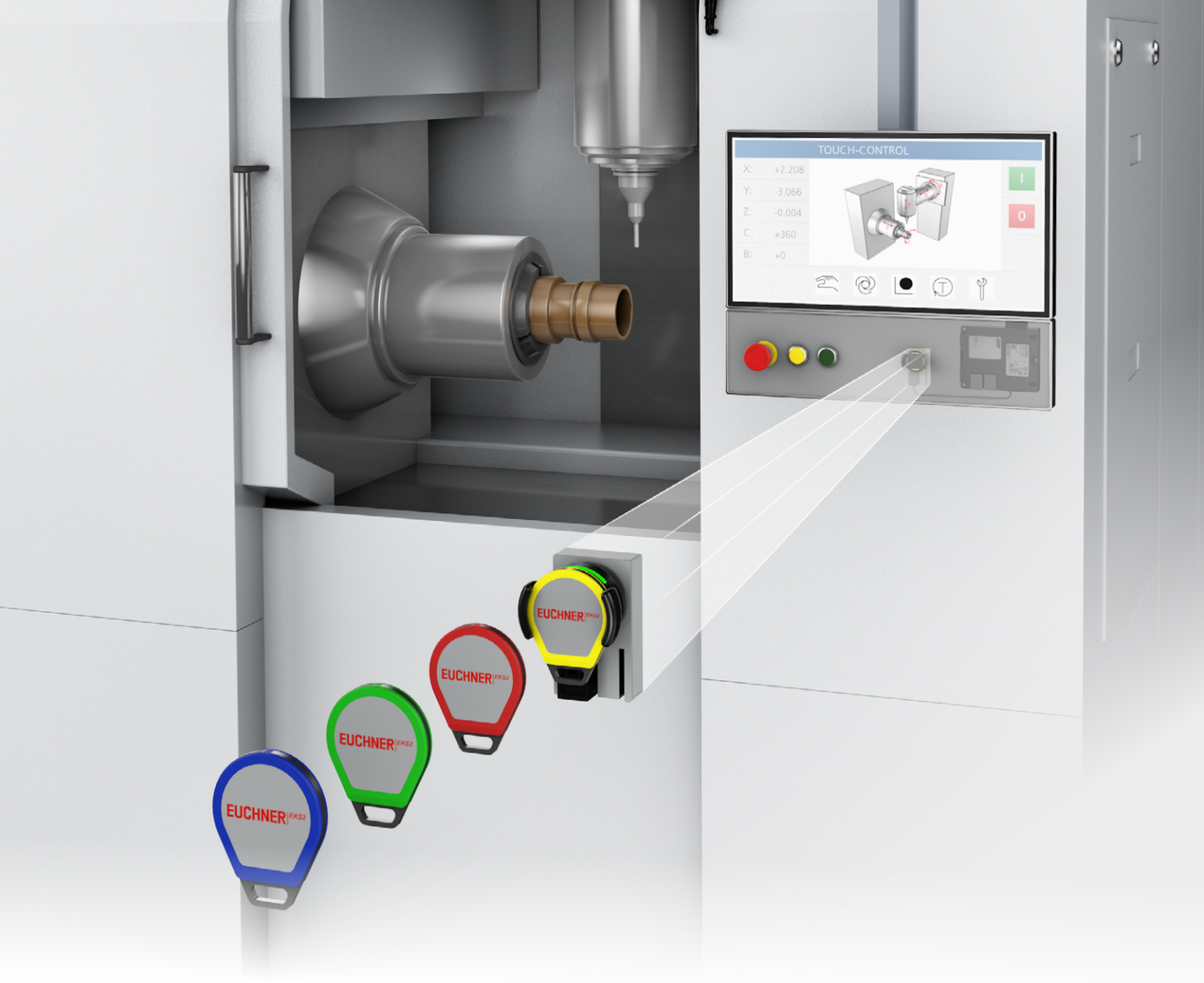


INNOVATIVE SAFETY ENGINEERING EN

THE SAFE CHOICE – SELECTION OF OPERATING MODE WITH THE ELECTRONIC-KEY-SYSTEM

EUCHNER
More than safety.

TAMPERERS NEVER WIN!

Without suitable operating modes, safety guards (e.g. safety doors) on many machines and installations still must be tampered with by bypassing for maintenance and servicing work. Providing selection of safe operating mode allows the operator to select the required operating mode (e.g. setup mode) and activate the suitable safeguard (e.g. enabling switch). An Electronic-Key-System is ideal for implementing convenient selection of safe operating mode in full compliance with laws.

REQUIREMENTS FROM LAWS AND STANDARDS IN MACHINE CONSTRUCTION

In order to use selection of safe operating mode in compliance with laws and standards, the following requirements must be met:

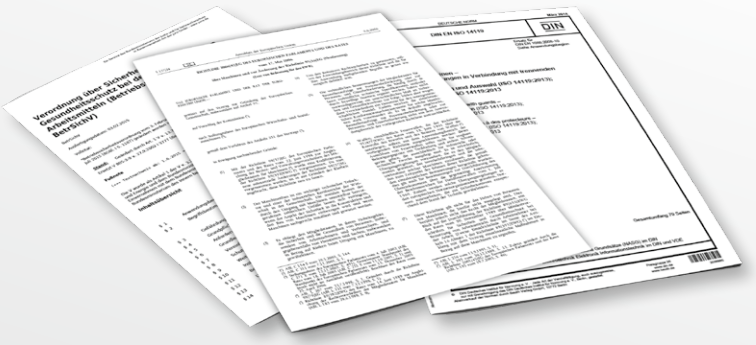
- **Access to use an operating mode selector must be restricted to certain categories of people**
  The Machinery Regulation requires the use of dangerous machine functions to be restricted to certain categories of people. The operating mode selector must be lockable for this reason. A password or a key-operated rotary switch is only marginally suitable. Passwords could be disclosed to others or keys could be left inserted.

- **Selection of safe operating mode must fulfill a Performance Level**
  Many standards now require selection of safe operating mode to fulfill at least PL c according to EN ISO 13849-1. C-standards can also require a higher Performance Level for certain functions. The operating mode selector therefore must always achieve a high safety standard together with the safe evaluation.

- **Suitable safety guards must be available for all work required on a machine**
  In accordance with the risk assessment, an appropriate safety guard must be used for all work required on a machine. Special servicing work also requires the best possible protection for the personnel. Even in this case, bypassing safety guards is impermissible. Not just the Machinery Regulation but also the Occupational Health and Safety requirements must be fulfilled by both the machine manufacturer and the user in this case.

SAFE OPERATING MODE Mode of operation MO	SYMBOL / MEANING
MO 0	Manual mode
MO 1	Automatic mode
MO 2	Setup mode
MO 3	Automatic mode with manual intervention
MO 4	Not used
MO 5 (MO SE)	Service mode

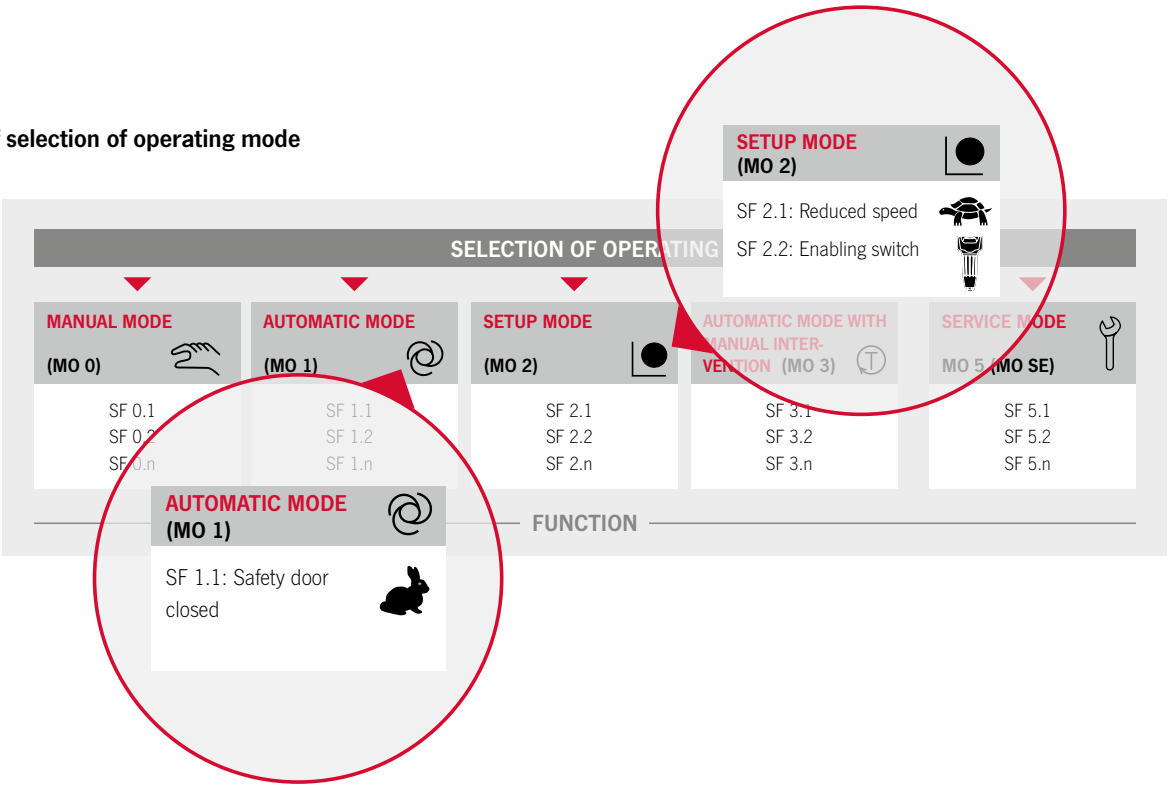
Example for operating modes from EN ISO 16090 (safety of milling machines)



HOW SAFE DOES SELECTION OF OPERATING MODE HAVE TO BE?

Each operating mode (MO) has one or more safety functions (SF) intended to protect the operator while working. In automatic mode, for example, a closed safety door prevents operators from being endangered by the running machine. In “setup” mode, the operator works with the safety door open. The safety function is no longer “safety door closed” in this case, but instead the use of an enabling device in combination with reduced speed, for example.

Example of selection of operating mode

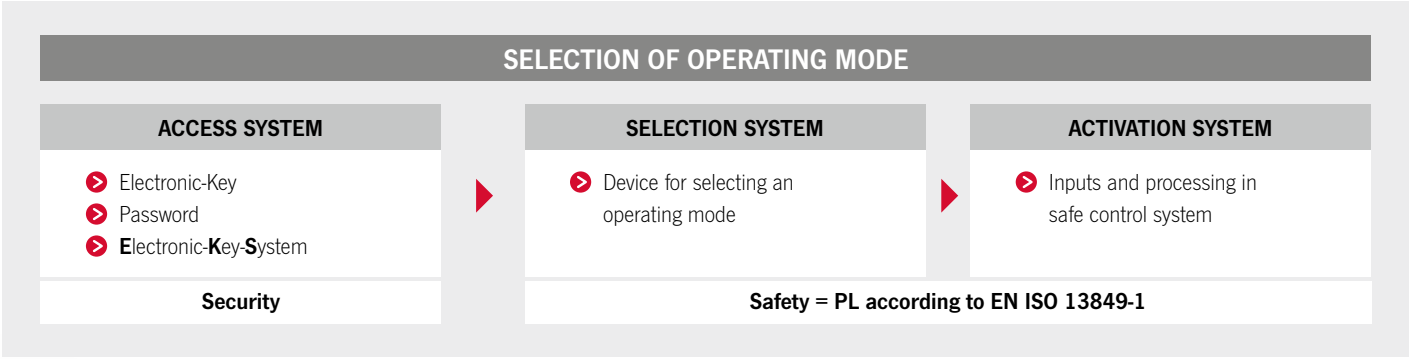


Changing the operating mode switches from one safety system to another one. Improper switchover can endanger the operator, so selection of safe operating mode must fulfill a Performance Level according to EN ISO 13849-1 corresponding to the risk assessment of the machine/installation.

EVALUATION OF THE PERFORMANCE LEVEL PL OF SELECTION OF OPERATING MODE

Assessment of the safety engineering of an operating mode selector according to EN ISO 13849-1 was defined in various standardization committees, and the procedure was defined. Selection of operating mode was subdivided into three systems:

- **Access system**
- **Selection system**
- **Activation system**



The access system does not have to be implemented according to EN ISO 13849-1. It is not possible to determine a PL for the monitoring of an authorization. By contrast, the selection system and the safe control system of a machine must fulfill the required PL.

ELECTRONIC-KEY-SYSTEM

The Electronic-Key-System EKS consists of a read station and at least one Electronic-Key. The Electronic-Key contains a writable memory. Three different systems are available: the EKS with data interface, the EKS *Light* and the EKS2.

EKS with data interface

The EKS with data interface features an Electronic-Key with freely programmable memory. With this EKS, applications such as access to control systems/operating parameters and entry of an expiry date, etc., can be implemented in addition to selection of operating mode. The Electronic-Key data are transmitted from the read station to the control system via the data interface (e.g. PROFINET, PROFIBUS, USB, Ethernet TCP/IP).

EKS Light

The EKS *Light* has five outputs, and the Electronic-Key is evaluated directly in the device. As the evaluation is integrated, the EKS *Light* can perform only a single function such as controlling access to selection of operating mode. The outputs are connected directly to the control system or, if necessary, also to the safety control.

EKS with data interface and EKS *Light* are available in compact (left) and modular (right) designs

EKS2

The new generation of products is a logical development of the successful EKS system and has many advantages in terms of digital access control and the selection of a operating mode. Templates with predefined functions and data fields have kept to a minimum the programming work needed to integrate the system. Current requirements, including security factors, for example, have been taken into consideration right from the start. The system consists of a read unit and an evaluation unit. PROFINET is used for data communication with the control system, e.g. to select an operating mode. The selected operating mode is transferred to the safety PLC via 1-of-n safety outputs.

EKS PRODUCTS MAKE SELECTION OF OPERATING MODE EVEN SAFER

The Electronic-Key-System offers additional options for improving selection of operating mode and making it safer.

Personalization of each Electronic-Key

Electronic-Keys can be assigned to specific people. Responsibility is thereby visibly transferred to the Electronic-Key holder, effectively preventing Electronic-Keys from being passed along or left inserted.

Effective Electronic-Key management

Unlike passwords or conventional keys, Electronic-Keys cannot be easily copied. With the Electronic-Key-Systems, you always retain an overview of your group of users. If an Electronic-Key should be lost, it can be blocked. This keeps you in control of the Electronic-Keys.

Access management through individual storage of authorizations

On many installations, there are particularly dangerous tasks that can be performed only with open safety doors and, in some cases, only at full speed. Persons must be specially trained to perform these tasks. The EKS with data interface and the EKS2 offer the option of storing verification of training on the Electronic-Key. The dangerous work can then be performed only with valid verification.

SELECTING THE RIGHT SYSTEM FOR YOUR APPLICATION	EKS WITH DATA INTERFACE	EKS *LIGHT*	EKS2
Selection of operating mode with pushbuttons	●	●	●
Selection of operating mode with touch panel or softkeys	–	–	●
Assignment of several operating modes per operator (e.g. differentiation by machine groups)	●	○	●
High copy protection level of the Electronic-Keys	○	○	●
Additional functions (access control to parameters, of persons, of other installations, etc.)	●	–	●
Traceability of access operations	○	–	●

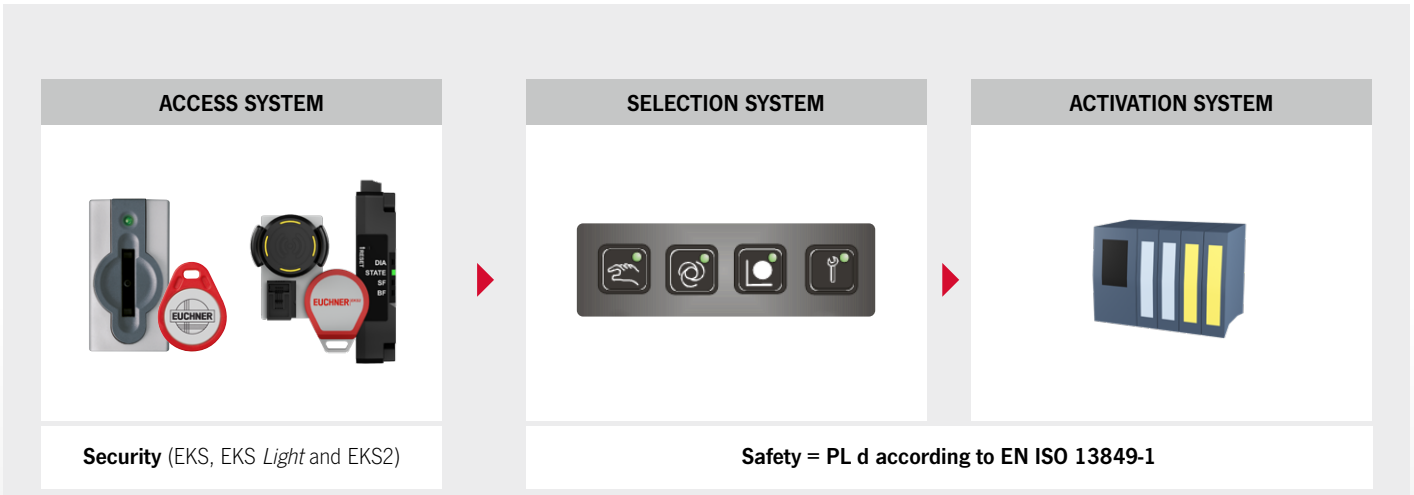
● = highly suitable ○ = suitable – = unsuitable

SELECTION OF OPERATING MODE WITH PUSHBUTTONS UP TO PL d

Operating panels have been used on machines and installations for many years and have proven their worth in everyday work. If an additional operating mode, such as service mode, is to be added to these machines, it is usually expedient to implement selection of operating mode with pushbuttons.

Technical implementation is particularly simple in this case. The Electronic-Key-System is used exclusively as an access system to ensure a certain group of users as required by the Machinery Regulation. The pushbuttons are enabled based on the authorization stored on the Electronic-Key. For example, these pushbuttons flash corresponding to the content of the Electronic-Key. This feature can be implemented using the standard PLC, as access to selection of operating mode does not need to fulfill a PL.

Pushbuttons are used to achieve a PL for the selection and activation of an operating mode. The signals are read into the safe control system and the selected operating mode signaled, e.g. by the continuous illumination of the pushbutton, while at the same time the machine changes to the new operating mode.



If pushbuttons are used for selection of operating mode, the question arises as to whether the manufacturer provides the B_{10d} value required for determining a PL. This is usually not the case. However, Table D.2 in IFA Report 02/2017, which is available via the German Social Accident Insurance Association (DGUV), specifies that 1,000,000 cycles can be assumed as the B_{10d} value for position switches and pushbuttons if the electrical load is < 10% of the maximum load. All required values are thus available, and a PL can be determined.

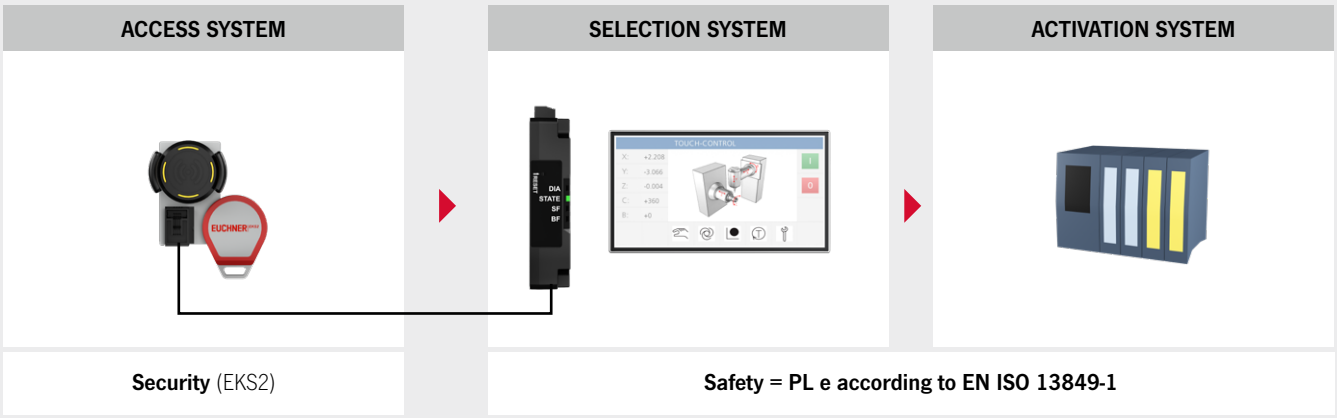
SELECTION OF OPERATING MODE WITH TOUCH PANEL UP TO PL e

Modern touch panels are increasingly being used on machines and installations. They are simple and intuitive to use, which makes the everyday work of operators easier and more efficient. A range of different functions can also be integrated and customized to meet individual requirements. Therefore, the next logical step is to select the operating mode of a machine only via the touchscreen. This will eliminate the need for additional mechanical control elements.

This was previously not possible due to the lack of suitable systems.

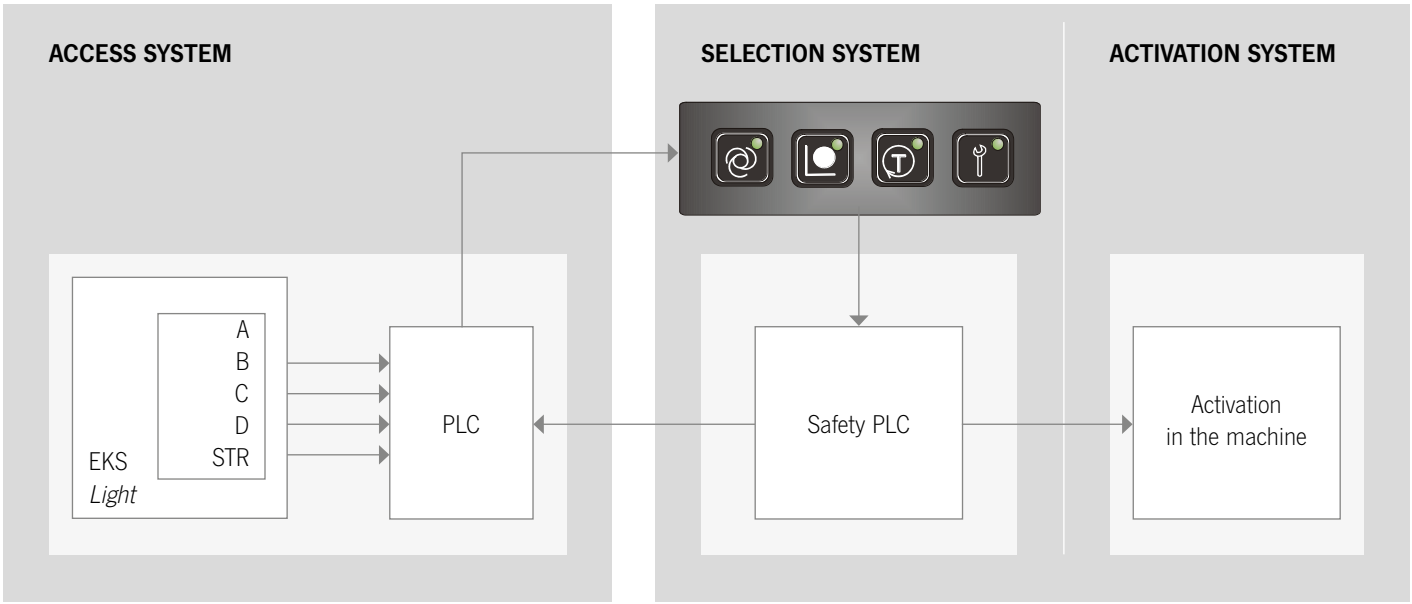
This has now changed. With the EKS2, it was for the first time possible to develop a system permitting selection of operating mode on a touch panel without additional mechanical control elements. With this method, the touchscreen fulfills all requirements from the risk assessment for a Performance Level (PL_r).

The EKS2 is not a safety component as defined in the Machinery Regulation. Use for selection of operating mode in combination with a touchscreen is confirmed by TÜV. The only prerequisite is taking into account the communication procedure described in the operating instructions between the EKS2, PLC and touch panel and evaluation of the resulting 1-of-n safety outputs in the safety PLC. The method also allows so-called softkeys to be used instead of a touchscreen, also up to PL e.



The PL calculation is more difficult if a touchscreen is to be used as the selection system, because a touchscreen does not represent a safe selection system and there are no available values for the PL calculation. The EKS2 from EUCHNER now permits selection of operating mode via a touchscreen to be implemented up to PL e.

SELECTION OF OPERATING MODE WITH PUSHBUTTONS AND EKS *LIGHT*

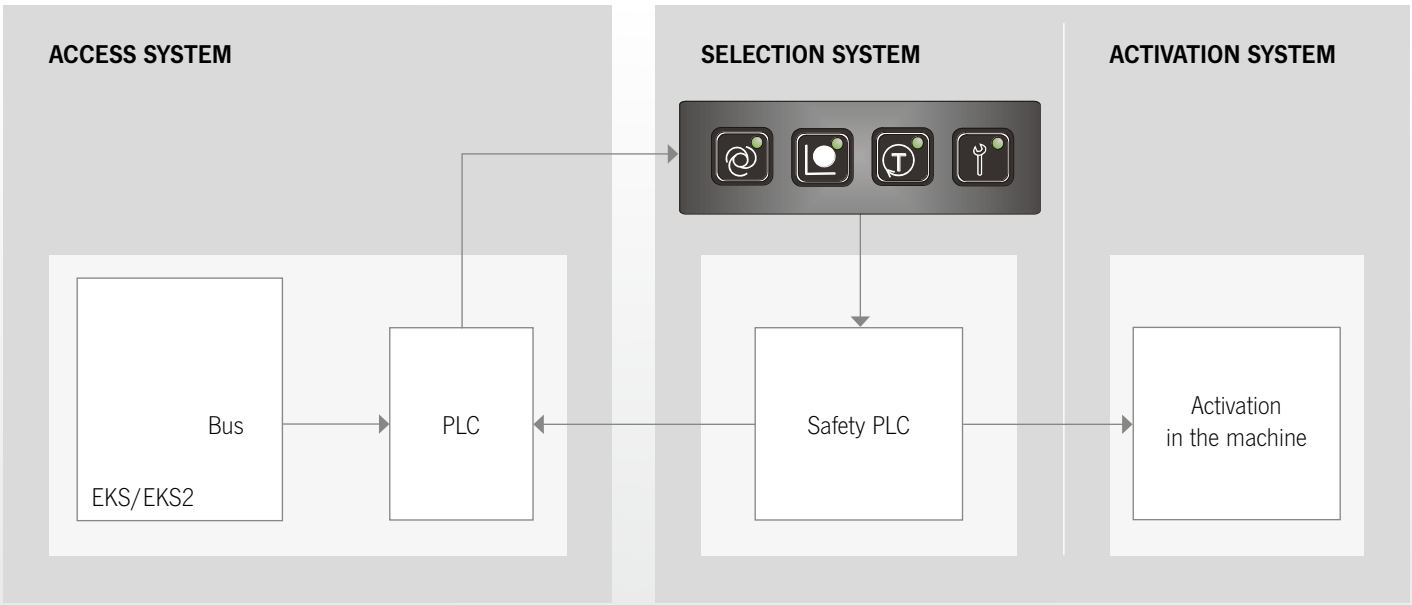


Implementation requires:

- EKS *Light*
- Safe control system
- Standard PLC or NC control system
- Illuminated pushbuttons
- EUCHNER application AP000225

PL d

SELECTION OF OPERATING MODE WITH PUSHBUTTONS AND EKS WITH DATA INTERFACE OR EKS2

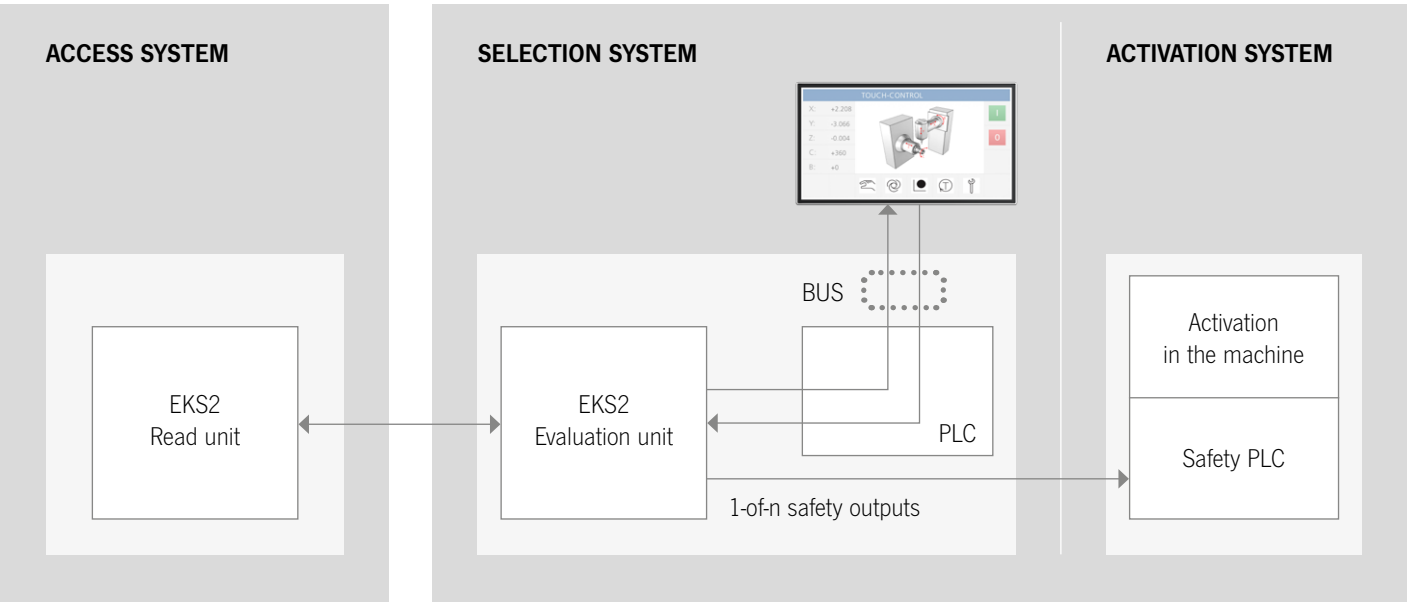


Implementation requires:

- EKS with data interface or EKS2
- Safe control system
- Standard PLC or NC control system
- Illuminated pushbuttons
- E.g. EUCHNER application AP000234

PL d

SELECTION OF OPERATING MODE WITH TOUCH PANEL AND EKS2



Implementation requires:

- EKS2
- Safe control system
- Standard PLC or NC control system
- Touchscreen
- EUCHNER application AP000273

PL e

FOR ORIENTATION PURPOSES, YOU CAN FIND THE MOST IMPORTANT "POINTS" FOR SELECTION OF OPERATING MODE IN THE FORM OF A CHECKLIST

	Yes	No
Is it possible to set up the machine without tampering with safety systems, thereby complying with all Occupational Health and Safety requirements?		
Can your customer perform all servicing work on the machine without bypassing safety guards?		
Is your customer sufficiently trained to perform all work on the machine without major hazard and can thereby comply with all Occupational Health and Safety requirements?		
Can organizational verification of the necessary training for hazardous work be maintained?		
Has the requirement in the Machinery Regulation that foreseeable misuse of the machine must be prevented been fulfilled?		
Has the requirement in the Machinery Regulation that only trained specialists are to be allowed access to selection of operating mode been fulfilled?		
Is access to selection of operating mode protected against copying and unauthorized passing along?		
Does selection of operating mode fulfill the PL_r from the risk assessment?		

FURTHER INFORMATION

For detailed information about the various systems and the accessories, please refer to the product catalogs or visit our homepage at **www.euchner.com**

Product information

Detailed product information about our systems and the suitable software for convenient Electronic-Key admnistration can be found at:
https://www.euchner.de/en-us/products/transponder-coded-key-systems/

Applications

The complete applications can be found in the download area at:
https://www.euchner.de/en-us/service/downloads/applications/

Catalogs and flyers

Catalogs and flyers for the systems can be found at:
https://www.euchner.de/de-de/service/downloads/

www.euchner.com

YOUR BENEFITS WHEN USING AN ELECTRONIC-KEY-SYSTEM FOR SELECTION OF OPERATING MODE

- Consistent machine operating concept, including selection of operating mode
- Fulfills all requirements of the Machinery Regulation
- Safe working according to the Occupational Health and Safety requirements can be implemented

... with pushbuttons

- Can be fitted into existing control panels
- Fulfills PL d according to EN ISO 13849-1
- Simple implementation with all systems

... with touch panel

- No additional pushbuttons next to the touchscreen required
- Fulfills PL e according to EN ISO 13849-1
- Simple implementation with EKS2

YOUR BENEFITS WHEN USING THE ELECTRONIC-KEY-SYSTEMS

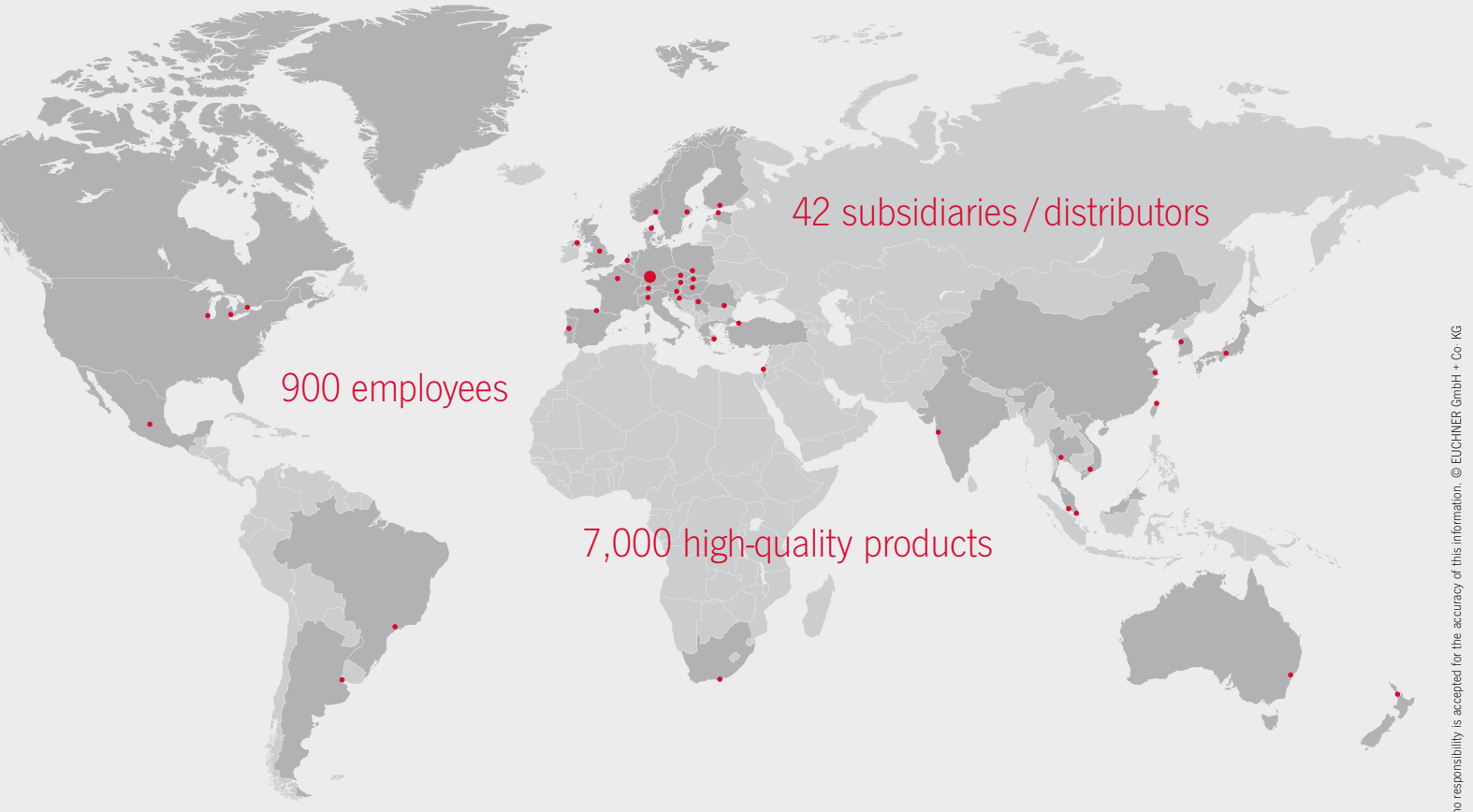
... EKS with data interface and EKS2

- Additional access controls can be programmed, e.g. access to control systems or operating parameters
- Simple integration into existing bus structures
- Training measures can be stored on the Electronic-Key
- A validity expiry date can be stored
- Lost Electronic-Keys can be blocked
- Access operations are clearly traceable
- Electronic-Key data can be protected against tampering

... EKS *Light*

- No bus system required
- Simple wiring to the control system
- Electronic-Key evaluation takes place in the EKS *Light*

A CLOSE WORKING RELATIONSHIP – LITERALLY!



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