EUCHNER

Application

Connection of CET.-AP-... to BECKHOFF EP1957

EN

From V1.5.0

Contents

1. About this document

1.1. Version

Version	Date	Change/addition	Chapter
01-02/21	2/4/2021	Prepared	All

1.2. Scope

This document describes the connection of the CET.-AP-... to the BECKHOFF digital combi module EP1957-0022.

1.3. Target group

Design engineers and installation planners for safety systems on machines, as well as setup and servicing staff possessing special expertise in handling safety components as well as expertise in the installation, setup, programming and diagnostics of programmable logic controllers (PLCs) and bus systems.

1.4. Supplementary documents

The overall documentation for this application consists of the following documents:

Document title (document number)	Contents	
Operating instructions (2122242)	Operating Instructions Transponder-Coded Safety Switch with Guard Locking CET.-AP-... (Unicode/Multicode)	
Safety information (2525460)	Information sheet with important safety information	
Possibly enclosed data sheets	Item-specific information about deviations or additions	

1.5. Notice

This application is based on the operating instructions for the CET.-AP-... and the operating instructions for the digital combi module EP1957-0022. Please refer to the operating instructions for technical details and other information.

Tip: More information and downloads for the aforementioned EUCHNER products can be found at www.euchner.com. Simply enter the order number in the search box.

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2. Components/modules used

2.1. EUCHNER

Description	Order number / item number
Safety switches with guard locking and guard lock monitoring with transponder technology	111346 / CET3-AP-CRA-AH-50X-SI-111346
	121367 / CET3-AP-CRA-AH-50X-SI-C2290-121367
	114073 / CET3-AP-CRA-AH-50F-SI-114073
	157408 / CET3-AP-CRA-AH-50F-SI-C2312-157408
	112082 / CET4-AP-CRA-AH-50X-SI-112082

Tip: More information and downloads for the aforementioned EUCHNER products can be found at www.euchner.com. Simply enter the order number in the search box.

2.2. Others

Description	Order number / item number
BECKHOFF CX2030-0155	CX2030-0155
BECKHOFF TwinSAFE Logic	EL6910
BECKHOFF digital combi module, TwinSAFE Logic, 24 V DC, 8 safe inputs, 4 safe outputs	EP1957-0022

2.3. Software

Description	Version
TwinCAT 3	3.1.4024.10

3. Functional description

3.1. CET3-AP-...

The CET3-AP-... is an interlocking device with guard locking according to EN ISO 14119. The safety outputs are switched off when guard locking is released (monitoring of the locking element).

The spring-operated guard locking functions in accordance with the closed-circuit current principle. If the voltage is interrupted at the solenoid, the guard locking remains active and the guard cannot be opened directly.

Guard locking according to EN ISO 14119 actuated by spring force and released by power-ON (closed-circuit current principle)	
Safety function	Guard locking for personnel protection acc. to EN ISO 14119
Reliability values according to EN ISO 13849	Category 4, PL e

In this example, the two safe outputs (OA and OB) of the CET3-AP-... are connected to a safe input of the EP1957-0022.

3.2. CET4-AP-...

The CET4-AP-... is an interlocking device with guard locking according to EN ISO 14119. The safety outputs are switched off when guard locking is released (monitoring of the locking element).

The guard locking released by spring force operates in accordance with the open-circuit current principle. If the voltage is interrupted at the solenoid, the guard locking is deactivated and the guard can be opened directly.

Guard locking according to EN ISO 14119 actuated by power-ON and released by spring force (open-circuit current principle)	
Safety function	Guard locking for personnel protection acc. to EN ISO 14119
Reliability values according to EN ISO 13849	Category 4, PL e

In this example, the two safe outputs (OA and OB) of the CET4-AP-... are connected to a safe input of the EP1957-0022.

4. Safety assessment

The CET.-AP-... features complete monitoring for faults in the safety-relevant parts and in the connected cables (short circuit monitoring by means of pulsed signals on the outputs OA and OB). Due to the device's own pulsing, switching off or not connecting the clock signals from the control system's safe inputs does not lead to a reduction in the PL.

The example achieves PL e according to EN ISO 13849-1 for position monitoring of the locking element of the guard locking device.

	**Important!** A safety assessment for control of guard locking is not part of this example and must be supplemented for the respective machine by the design engineer in accordance with the risk assessment.

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5. Overview of the connections

Pin	Designation	Function	Use in this example
X1.1	U_B	Electronics operating voltage, 24 V DC	Connection to sensor power supply 24 V DC
X1.2	OA	Safety output, channel A	Connection to fail-safe inputs EP1957: input 1(In1). Switching off at least one of the outputs must lead to the shutdown of the machine or installation via the connected control system. Important: The actual shutdown of the energy causing a hazard in a machine is not shown in the example and must be added.
X1.3	0 V U_B	Electronics operating voltage, 0 V DC	Connection to sensor power supply 0 V DC
X1.4	OB	Safety output, channel B	Connection to fail-safe inputs EP1957: input 2(In2). Switching off at least one of the outputs must lead to the shutdown of the machine or installation via the connected control system. Important: The actual shutdown of the energy causing a hazard in a machine is not shown in the example and must be added.
X1.5	-	n.c.	-
X2.1	-	n.c.	-
X2.2	-	n.c.	-
X2.3	0 V U_{CM}	Solenoid operating voltage, 0 V DC	Connection to fail-safe outputs EP1957: output 1 (GND Up).
X2.4	U_{CM}	Operating voltage of guard locking solenoid, 24 V DC	Connection to fail-safe outputs EP1957: output 1(Out1). Important: According to EN ISO 14119, it must be ensured that the hazard posed by a machine is no longer present before the guard locking can be opened.
X2.5	-	n.c.	-

Table 1: Terminal assignment and contact description

6. Basic circuit diagram

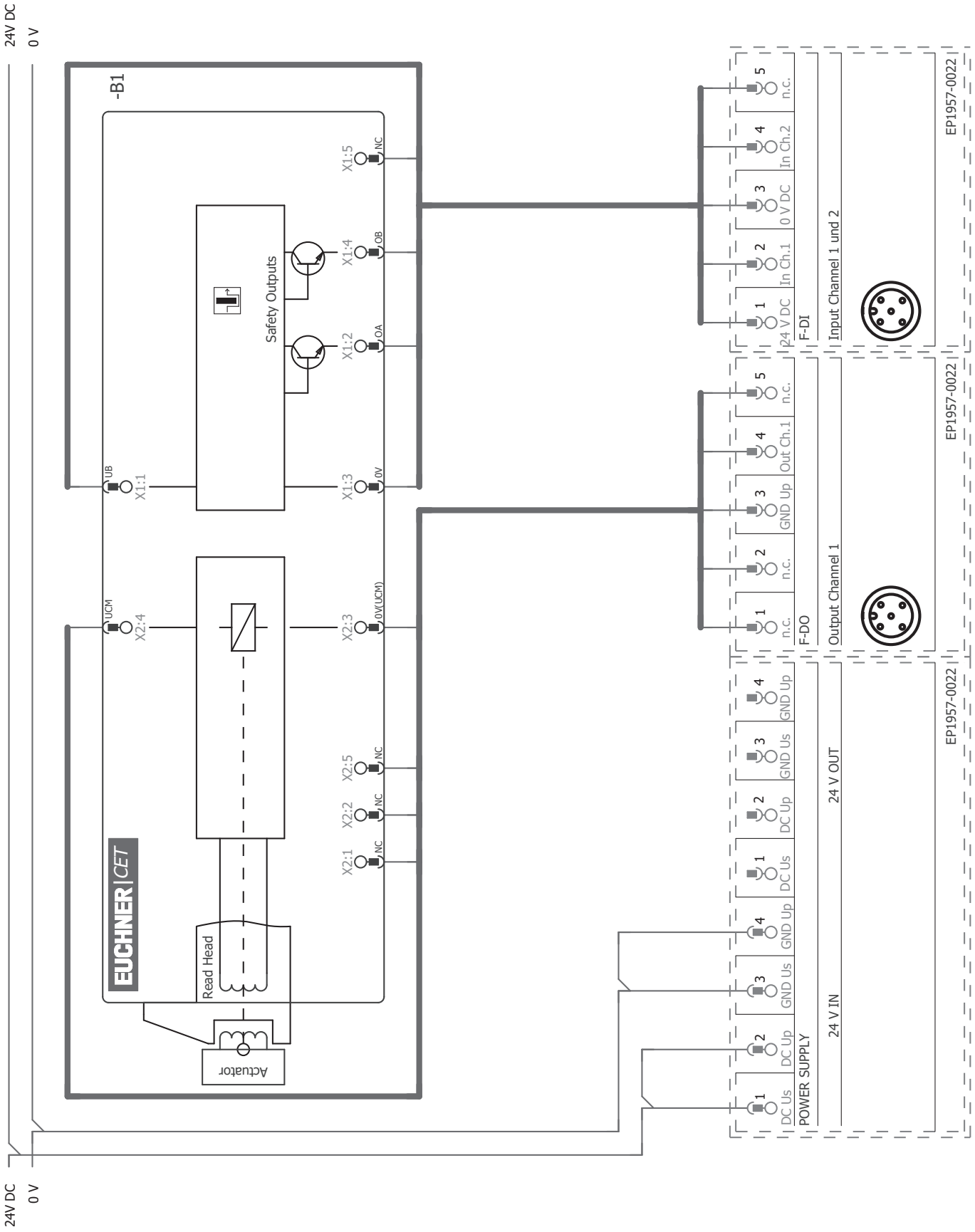

Figure 1: Basic circuit diagram

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7. Parameter assignment in the control system

Index	Name	Value	Unit
8000:0	**FSOUT Module 1 Settings Common**	**>7<**	
8000:01	ModuloDiagTestPulse	0x00(0)	
8000:02	MultiplierDiagTestPulse	0x01(1)	
8000:03	Standard Outputs active	FALSE(0)	
8000:04	Diag TestPulse active	TRUE(1)	
8000:07	Module Fault Link active	TRUE(1)	
8040:0	**FSIN Module 1 Settings Common**	**>12<**	
8040:01	ModuloDiagTestPulse	0x00(0)	
8040:02	MultiplierDiagTestPulse	0x01(1)	
8040:04	Diag TestPulse active	FALSE(0)	
8040:05	Module Fault Link active	TRUE(1)	
8040:0C	Input Power Mode	PowerMode A: Pin1(+) / Pin3(-) (10)	
8041:0	**FSIN Module 1 Settings Channel**	**>5<**	
8041:01	Channel1.InputFilterTime	0x000A(10)	x0.1 milliseconds
8041:02	Channel1.DiagTestPulseFilterTime	0x0002(2)	x0.1 milliseconds
8041:04	Channel2.InputFilterTime	0x000A(10)	x0.1 milliseconds
8041:05	Channel2.DiagTestPulseFilterTime	0X0002(2)	x0.1 milliseconds

Table 2: Parameter assignment of inputs and outputs

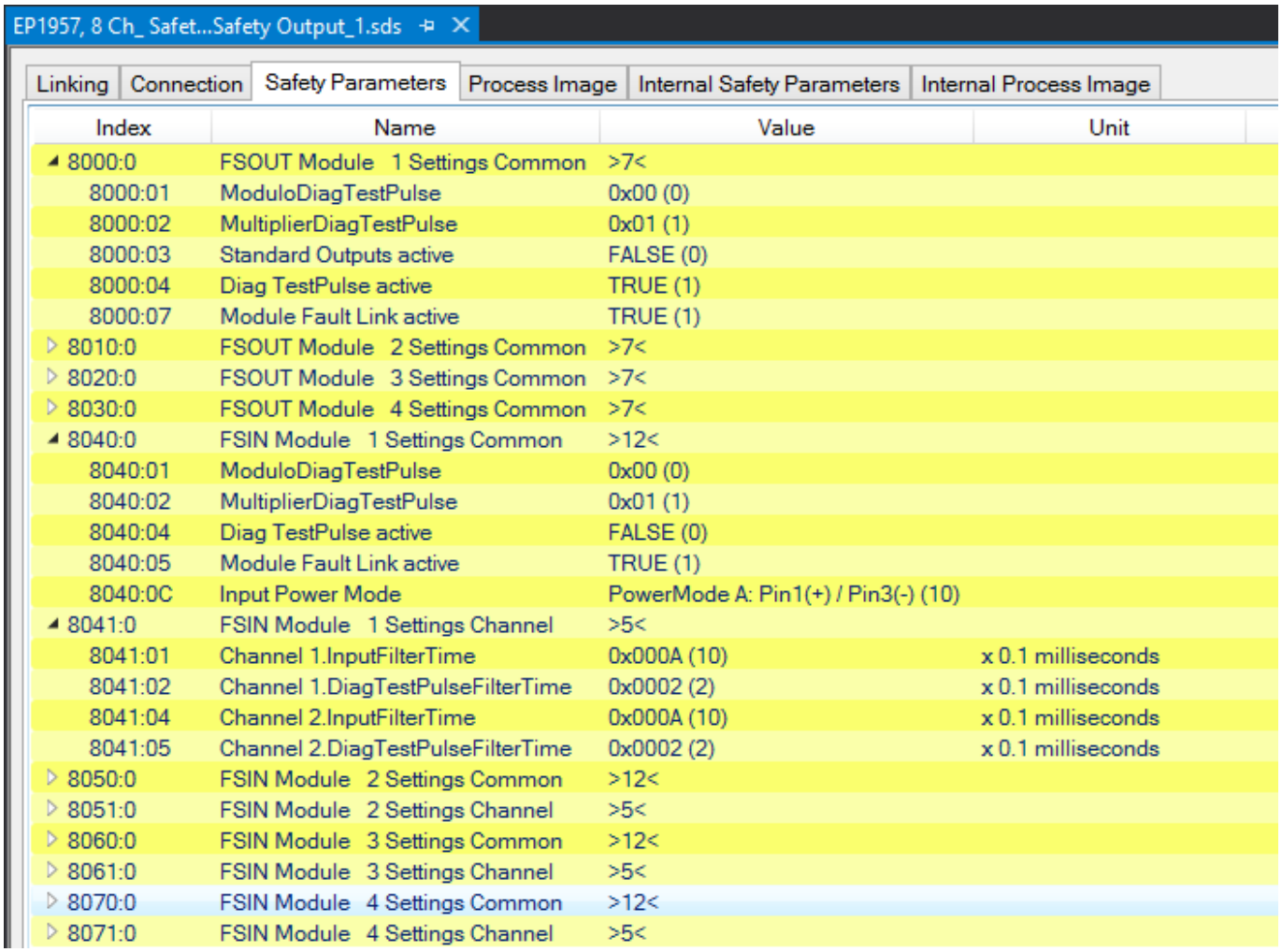

Figure 2: Parameter assignment of inputs and outputs

The other channel parameters must be parameterized in accordance with the application.

8. Important note – please observe carefully!

This document is intended for a design engineer who possesses the requisite knowledge in safety engineering and knows the applicable standards, e.g. through training for qualification as a safety engineer. Only with the appropriate qualification is it possible to integrate the example provided into a complete safety chain.

The example represents only part of a complete safety chain and does not fulfill any safety function on its own. In order to fulfill a safety function, the energy switch-off function for the danger zone and the software must also be considered in the safety evaluation, for example.

The applications provided are only examples for solving certain safety tasks for protecting safety doors. The examples cannot be comprehensive due to the application-dependent and individual protection goals within a machine/installation.

If questions concerning this example remain open, please contact us directly.

According to the Machinery Directive 2006/42/EC, the design engineer of a machine or installation has the obligation to perform a risk assessment and take measures to reduce the risk. While doing this, the engineer must comply with the applicable national and international safety standards. Standards generally represent the current state-of-the-art. Therefore, the design engineer should continuously inform himself about changes in the standards and adapt his considerations to them. Relevant standards for functional safety include EN ISO 13849 and EN 62061. This application must be regarded only as assistance for the considerations about safety measures.

The design engineer of a machine/installation has the obligation to assess the safety technology himself. The examples must not be used for an assessment, because only a small excerpt of a complete safety function was considered in terms of safety engineering here.

In order to be able to use the safety switch applications correctly on safety doors, it is indispensable to observe the standards EN ISO 13849-1, EN ISO 14119 and all relevant C-standards for the respective machine type. Under no circumstances does this document replace the engineer's own risk assessment, and it cannot serve as the basis for a fault assessment.

In particular in relation to a fault exclusion, it must be noted that a fault can be excluded only by the machine's or installation's design engineer and this action requires justification. A general fault exclusion is not possible. More information about fault exclusion can be found in EN ISO 13849-2.

Changes to products or within assemblies from third-party suppliers used in this example can lead to the function no longer being ensured or the safety assessment having to be adapted. In any event, the information in the operating instructions on the part of EUCHNER, as well as on the part of third-party suppliers, must be used as the basis before this application is integrated into an overall safety function. If contradictions should arise between the operating instructions and this document, please contact us directly.

Use of brand names and company names

All brand names and company names stated are the property of the related manufacturer. They are used only for the clear identification of compatible peripheral devices and operating environments in relation to our products.

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