

SIEMENS

SICAM BC

DO-5212/PCCO55

System Element Manual

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Peripheral Element DO-5212/PCCO55

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**Note**

Please observe Notes and Warnings for your own safety in the Preface.

Disclaimer of Liability

Although we have carefully checked the contents of this publication for conformity with the hardware and software described, we cannot guarantee complete conformity since errors cannot be excluded. The information provided in this manual is checked at regular intervals and any corrections that might become necessary are included in the next releases. Any suggestions for improvement are welcome.

Subject to change without prior notice.

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Preface

This document is applicable to the following product(s):

- SICAM BC
- DO-5212/PCCO55 (as of version BC5-212–A respectively 6MF10130FC120AA0CC)

Purpose of this manual

This manual describes the functioning of the system element DO-5212/PCCO55 (**P**reprocessing and **C**hecked **C**ommand **O**utput) and essentially contains

- Functional descriptions
- Technical specifications
- Descriptions of interfaces to the process and other system elements
- Possible configurations

Target Group

The document you are reading right now is addressed to users, who are in charge of the following engineering tasks:

- Conceptual activities, as for example design and configuration
- Creation of the assembly technical documentation using the designated engineering tools
- System parameterization and system diagnostic, using the designated engineering tools
- Technical system maintenance

Placement into the Information Landscape

Document	Item no.
SICAM BC System Manual	DC5-014-2
SICAM RTUs Common Functions Peripheral Elements according to IEC 60870-5-101/104	DC0-011-2

Notes on Safety

This manual does not constitute a complete catalog of all safety measures required for operating the equipment (module, device) in question because special operating conditions might require additional measures. However, it does contain notes that must be adhered to for your own personal safety and to avoid damage to property. These notes are highlighted with a warning triangle and different keywords indicating different degrees of danger.



Danger

means that death, serious bodily injury or considerable property damage **will** occur, if the appropriate precautionary measures are not carried out.



Warning

means that death, serious bodily injury or considerable property damage **can** occur, if the appropriate precautionary measures are not carried out.

Caution

means that minor bodily injury or property damage could occur, if the appropriate precautionary measures are not carried out.



Note

is important information about the product, the handling of the product or the respective part of the documentation, to which special attention is to be given.



Qualified Personnel

Commissioning and operation of the equipment (module, device) described in this manual must be performed by qualified personnel only. As used in the safety notes contained in this manual, qualified personnel are those persons who are authorized to commission, release, ground, and tag devices, systems, and electrical circuits in accordance with safety standards.

Use as Prescribed

The equipment (device, module) must not be used for any other purposes than those described in the Catalog and the Technical Description. If it is used together with third-party devices and components, these must be recommended or approved by Siemens.

Correct and safe operation of the product requires adequate transportation, storage, installation, and mounting as well as appropriate use and maintenance.

During operation of electrical equipment, it is unavoidable that certain parts of this equipment will carry dangerous voltages. Severe injury or damage to property can occur if the appropriate measures are not taken:

- Before making any connections at all, ground the equipment at the PE terminal.
 - Hazardous voltages can be present on all switching components connected to the power supply.
 - Even after the supply voltage has been disconnected, hazardous voltages can still be present in the equipment (capacitor storage).
 - Equipment with current transformer circuits must not be operated while open.
 - The limit values indicated in the manual or the operating instructions must not be exceeded; that also applies to testing and commissioning.
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1 Introduction

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1.1 Application

The peripheral element DO-5212/PCCO55 is used in automation units of the system SICAM BC. It is deployed in the field of telecontrol and automation. The peripheral element is used for checked output of pulse commands.

System element type	Peripheral element
consists of	a module DO-5212 with firmware PCCO55
can be used in	SICAM BC
Engineering	SICAM TOOLBOX II with OPM II

1.2 Overview

Peripheral element for checked command output:

- Processing and output according to IEC 60870-5-101/104
 - 14 pulse commands, 1-pole, 4 fused circuits
 - 14 pulse commands, 2-pole, 4 fused circuits
 - 10 pulse commands, 1½-pole, 4 fused circuits
 - direct control of 4 motors (ON/OFF) with field coil, with 4 fused circuits
 - mixture of 1-pole and 2-pole command output, with 4 fused circuits
 - mixture of 1½-pole command output and direct motor control, with 4 fused circuits
 - mixing 1-pole or 2-pole command output with 1½-pole command output or direct motor control is not supported

With the following features:

- 10+4+2 binary outputs in groups with partly common return
 - each output galvanically insulated by monostable relays
 - current limitation by electronic means
 - switching voltage: 24...220 VDC
 - switched current: 10 A continuous current, 30 A for 0.5 s

1.3 Architecture

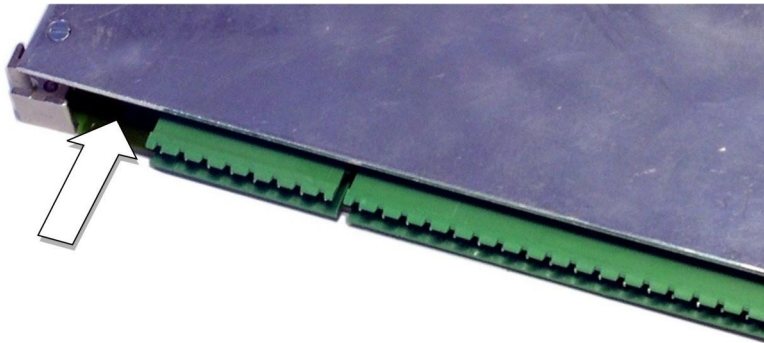
1.3.1 Mechanics

Module in double-euro format for equipping in a mounting rack.

1.3.2 Ax 1703 Peripheral Bus

The peripheral element is coupled to the basic system element via the Ax 1703 peripheral bus. The address of the peripheral element at the Ax 1703 peripheral bus is already specified during the assembly of the SICAM BC system.

This address can be changed afterwards also by a configuration change with the SICAM TOOLBOX II. This address is then to be set by means of the PBA switch (↑) on the peripheral element.



2 Peripheral Element DO-5212/PCCO55

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2.1 Features and Functions

The Output Functions in Detail

- **Pulse Commands (CC)** ^{t1}
 - Checked output of pulse commands
 - Single, double and regulating step commands
 - Command output with continuity check (CC1)
 - Idle check
 - Selective activation check
 - Continuity check of the external command circuit
 - Basic application functions and procedures according to IEC 60870-5-101/104
 - Synchronization
 - Switching sequences
 - Revision
 - Retry suppression
 - Periodical control circuit check
 - Command locking
 - Control location check
 - Command prolongation
 - Return information monitoring
 - 1-out-of-n check
 - Parameter-settable command output time
 - Monitoring of command output sequence to prevent incorrect outputs
 - Activation of command contactors with, or without, series-break contacts (current flow check)
 - Spontaneous transmission



Note

The above mentioned functions are described in detail in the document *SICAM RTUs Common Functions Peripheral Elements according to IEC 60870-5-101/104*.

In the following section, features and functions and - if present - deviating and additional information to this document is listed.

^{t1} **Telecontrol**

the function delivers (acquisition) **spontaneously** transmitted process information or is controlled by such information (output); partly, periodically transmitted information is also created/required

2.1.1 Deviating and Additional Information

2.1.1.1 Pulse Commands

Functions and Features	Deviation / Remark
Number 1-pole	14
Number 1½-pole	10
Number 2-pole	14
Number circuitry with motor	4
Mixture 1- , 1½- , 2-pole	Mixture of 1-pole and 2-pole commands possible
Command type	Single command Double command Regulating step command
Command output (OC)	no
Command output with internal checks (IC1)	no
Command output with continuity check (CC1)	yes
Command output with resistance check (RC1)	no
Prepare command output	
Formal check	
Retry suppression	
Direct command	
Select and execute command	
Initiate command output	
1-out-of-n check	
System element overlapping 1-out-of-n check	
Control location check	
Command interlocking	
Synchronization	
Revision	
Monitor pulse duration	
Command output time	Parameter-settable Dependent on process
Return information monitoring	
Command prolongation	
Idle check	yes
Selective activation check	yes
Continuity check	yes
Resistance check	no
Current flow check	no
Earth fault check	no
Interference voltage monitoring	no

Functions and Features	Deviation / Remark
Activation of command contactors with and without self interruption (Current flow check or Continuity check)	yes
Error handling	
Abortion	
Abortion with additional information	
Abortion with diagnosis	
Abortion with blockade	
Confirmation of the command output fault	
Monitoring of the command output sequence (phase counter check)	
Periodical control circuit check	
Switching sequence	
Command output for Auto-Reclose Function	

The position of the both keylock switches on the panel is provided for the system element.

If the keylock switch is in position LOC, exclusively commands from the local operation are accepted. These are that commands, those source address concurs with the parameterized control location of the display.

In the position LOC can be set via the second keylock switch, whether the command output shall be locked or unlocked:

- Position „locked“: the function command interlocking is activated
- Position „unlocked“: the function command interlocking is deactivated

If the keylock switch is in position REMOTE, the check of the source address happens like described in the document *SICAM RTUs Common Functions Peripheral Elements according to IEC 60870-5-101/104, chapter “Pulse Commands”, section “Functions Independent of the Hardware of the System Element”, “Initiate Command Output Procedure”, “Control Location Check”*.

If the keylock switch is in position TEST, the command output is switched in Revision or in the local operation. The selection takes place once for the entire system element with an arbitrary pulse command(parameter `key_operated_sw_test`).

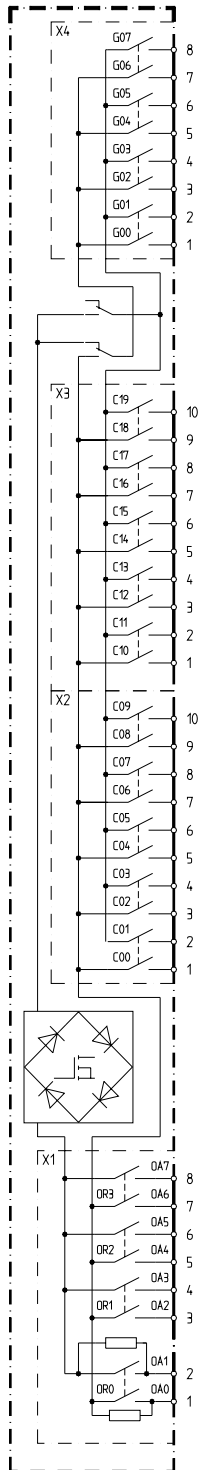
2.1.1.2 Assignment Binary Information to Pulse Command

Functions and Features	Deviation / Remark
Procedure sequence for the command transmission	
Binary information acquisition and pulse command output on the same peripheral element	no
Binary information acquisition and pulse command output on different peripheral elements	only with ACP RTUs platform
Possible peripheral elements with fixed assignment	no fixed assignment possible

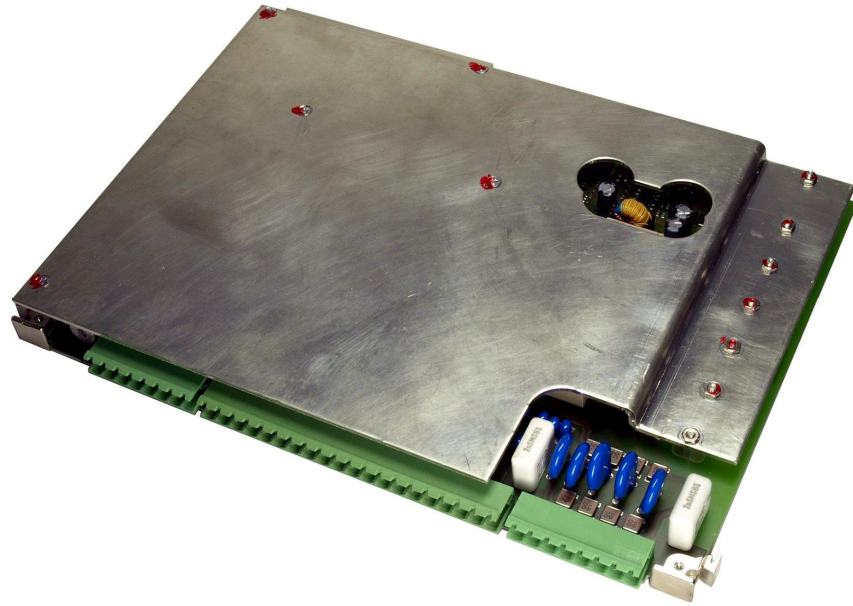
2.2 Engineering

For diagnosis, testing, parameter setting or documentation, the system element is supported by the engineering tools of SICAM TOOLBOX II. OPM II is required.

2.3 Block Diagram



2.4 View



2.5 Technical Data

Processor and Memory	
Processor	Xilinx Spartan 6 (XC6SLX45) mit Soft-IPcore
Clock pulse	16 MHz
Program memory	SPI-Flash 16 MBytes HW config 64 kBytes Program memory 192 kBytes FPGA factory image 1.572864 MBytes FPGA user image 1.572864 MBytes
Main memory	RAM 512 kBytes Program memory in operation 192 kBytes Main memory in operation 64 kBytes
Parameter memory	EEPROM 2048 Bytes (AT24C16A)
Binary Outputs	
10 command outputs 4 group-/command outputs 4 pulse outputs (relay) (X1, X2, X3, X4)	<ul style="list-style-type: none"> The outputs form - as can be seen in the external circuits examples - groups with partly common return The outputs are galvanically insulated from logic circuits and ground by monostable relays, and current-limited electronically
Maximum output current	<ul style="list-style-type: none"> 10 A 4 min >10 A 500 ms 30...40 A 10 µs (short circuit current)
Maximum switching voltage	220 VDC + 10%
Switching cycles	5×10^7
Switched current	<ul style="list-style-type: none"> min. 5 mA max. 30 A
Nominal switched current and nominal power	<ul style="list-style-type: none"> 240 W / 10 A @ 24 VDC 480 W / 10 A @ 48 VDC 600 W / 10 A @ 60 VDC 1100 W / 10 A @ 110 VDC 2200 W / 10 A @ 220 VDC
Output Circuits	$\leq 220 \text{ VDC} + 10\%$ The circuits are operated by means of an external voltage.
Power supply	
Operating voltage	5 VDC \pm 5% Power consumption: approx. 1.25 W idle approx. 2.0 W during command output The voltage is picked off at the bus of mounting rack
Mechanics and Connectors	
Ax 1703 peripheral bus	Transmission rate 16Mbps
Peripheral connector (X1...X4, front side)	Removable screw terminals Phoenix Contact MSTBT 2.5/x-ST-5,08 <ul style="list-style-type: none"> 10 command outputs X2+X3 10-pin each 4 group outputs X4 8-pin 8 pulse outputs X1 8-pin
Dimensions	Double-euro format 233.4 x 160 mm, 4WU
Weight	Approx. 970 g

2.5.1 Line Parameters

The line parameters (R_K , L_K , C_K) have up to a cable length of 100 m only a low affect against transient effects that are generated by the load.

$$t_C = 5 \cdot \frac{L_K}{R_K}$$

t_C ...transient effect time on the line without load

L_L ...Induktivity of the line [H]

R_L ...ohmic resistance of the line [Ω]

Example:

Cable type	R_K	L_K	C_K	t_C
Cu flexible wire 2x 0.5 length 100 m	6,0 Ω ^{*)}	2,8 mH	8,8 nF	0,002 s

^{*)} 2x 100 m

2.5.2 Transient Effects on the Line with External Load

The test times are determined by means of transient effects, provoked by the resistance and inductivity of the line and the external load.

$$5 \cdot \frac{L_L}{R_L} + t_K + t_C < t_D \quad t_K = 0,003s \quad t_D = 0,015s$$

t_C ...transient effect time on the line without load

t_D ...time between activation of the internal relay and evaluation of the current flow

t_K ...time between activation of the internal relay and closing of ist contact

L_L ...Induktivity of the external load [H]

R_L ...ohmic resistance of the external load [Ω]

Examples:

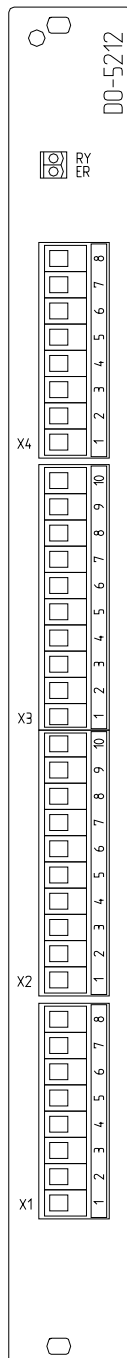
Relais	R_L	L_L	$5 \cdot L_L / R_L + t_K + t_C$	usable
Schrack MT (RM) relay 220 VDC	38000 Ω	53 H	0,012	yes
AEG LS-5K-4 220 VDC	8700 Ω	72,7 H	0,047	no
Schrack MT (RM) relay 110 VDC	9800 Ω	12,2 H	0,011	yes
Schrack MT (RM) relay 60 VDC	2700 Ω	3,6 H	0,012	yes
Schrack MT (RM) relay 48 VDC	2100 Ω	2,8 H	0,012	yes
Schrack MT (RM) relay 24 VDC	466 Ω	0,62 H	0,012	yes

2.5.3 Resistance of the External Load

Dependent on the battery voltage, values result for the maximum load resistances that must not be exceeded.

Voltage	Load resistance max.
24 V	1k2 Ω
48 V	5k9 Ω
60 V	9k7 Ω
110 V	18k2 Ω
220 V	39k8 Ω

2.6 Front Panel

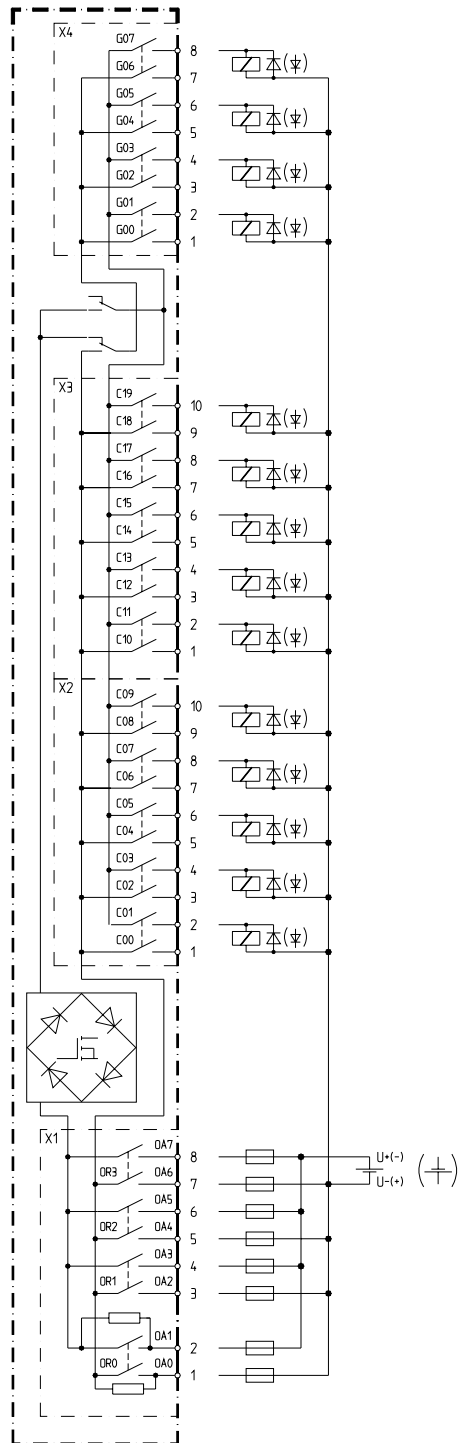


Meaning of the display elements:

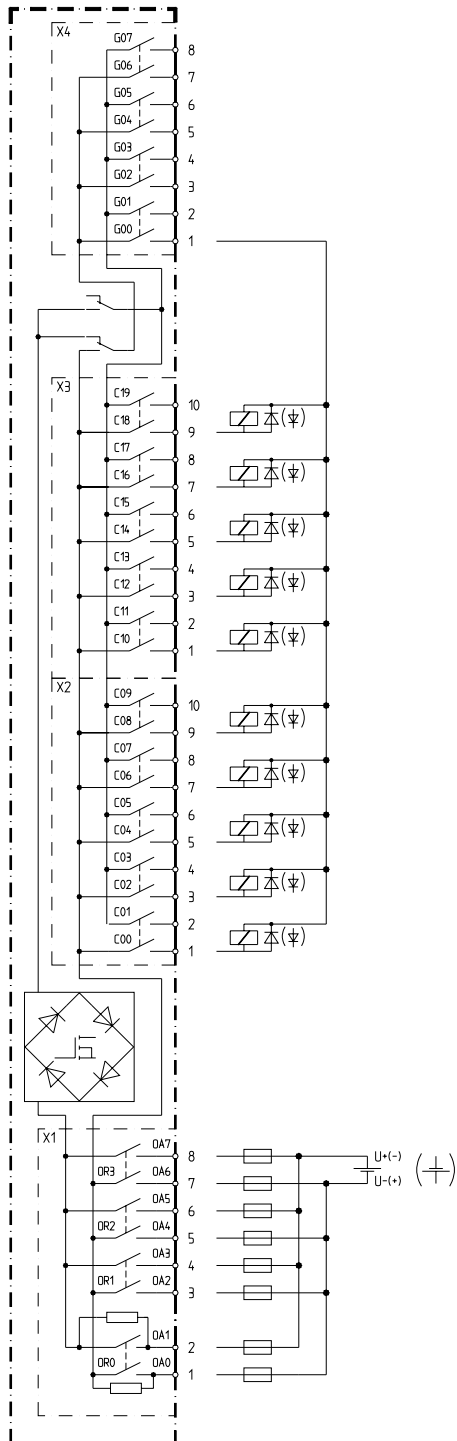
RY Module ready for operation
ER Error

2.8 External Circuit Elements

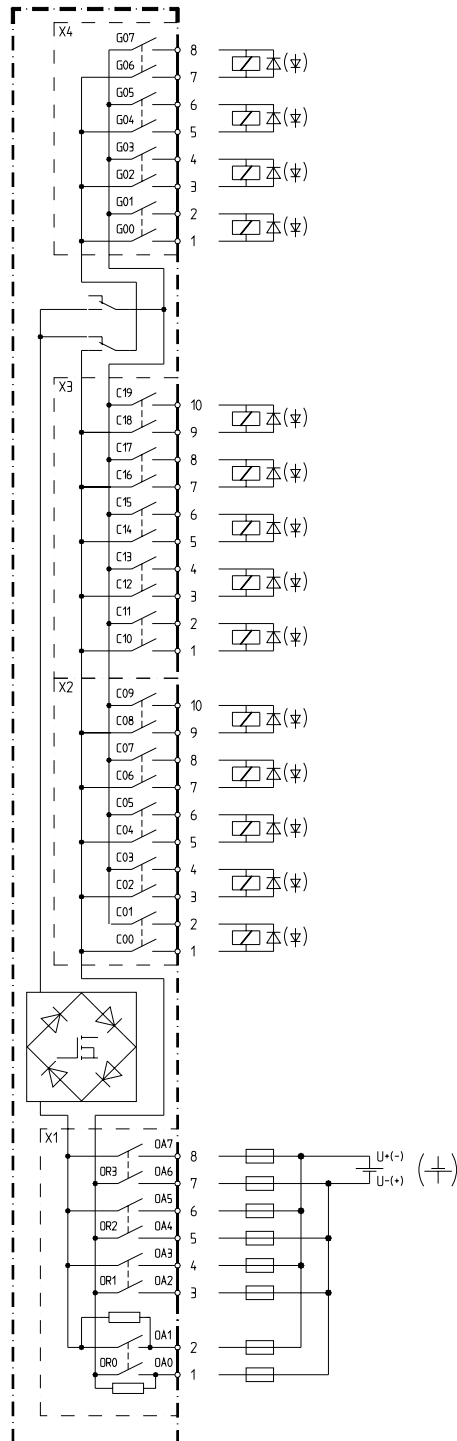
2.8.1 14x 1-pole Commands with 4 Fused Circuits



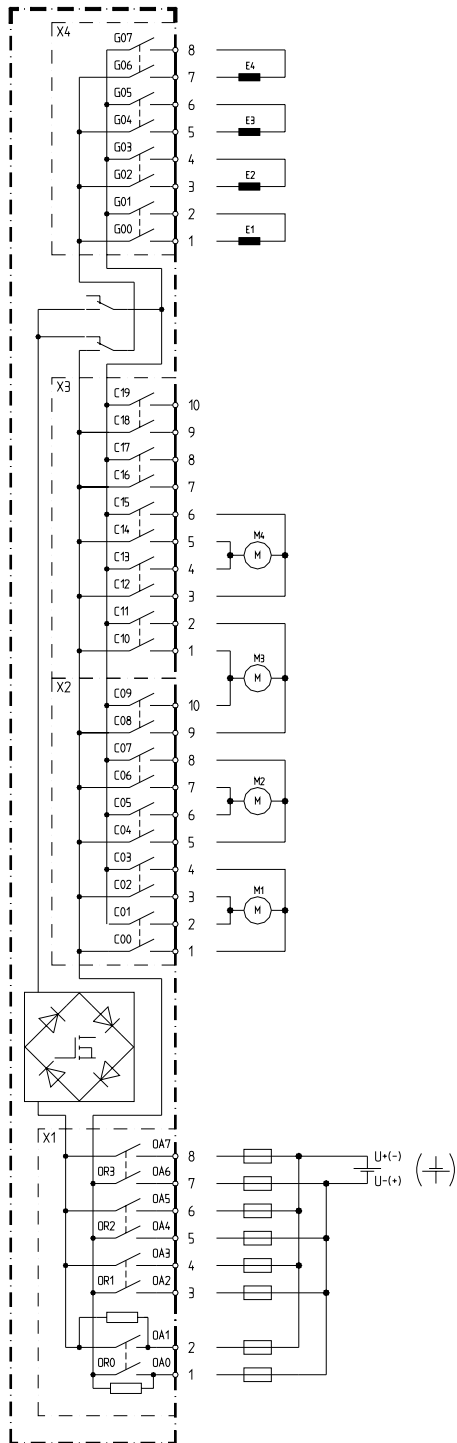
2.8.2 10x 1.5-pole Commands with 4 Fused Circuits



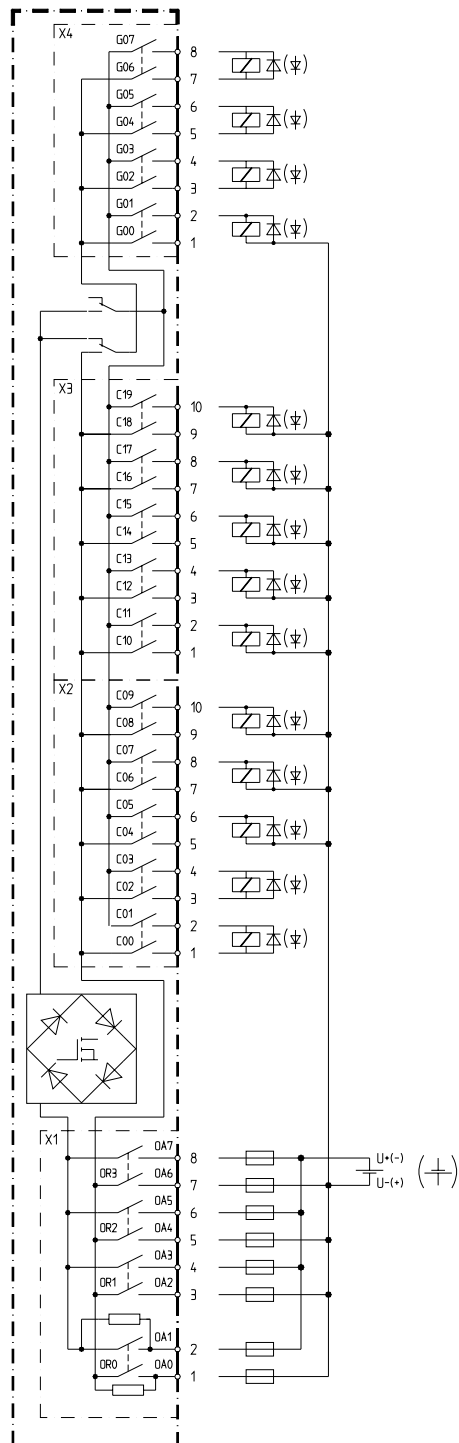
2.8.3 14x 2-pole Commands with 4 Fused Circuits



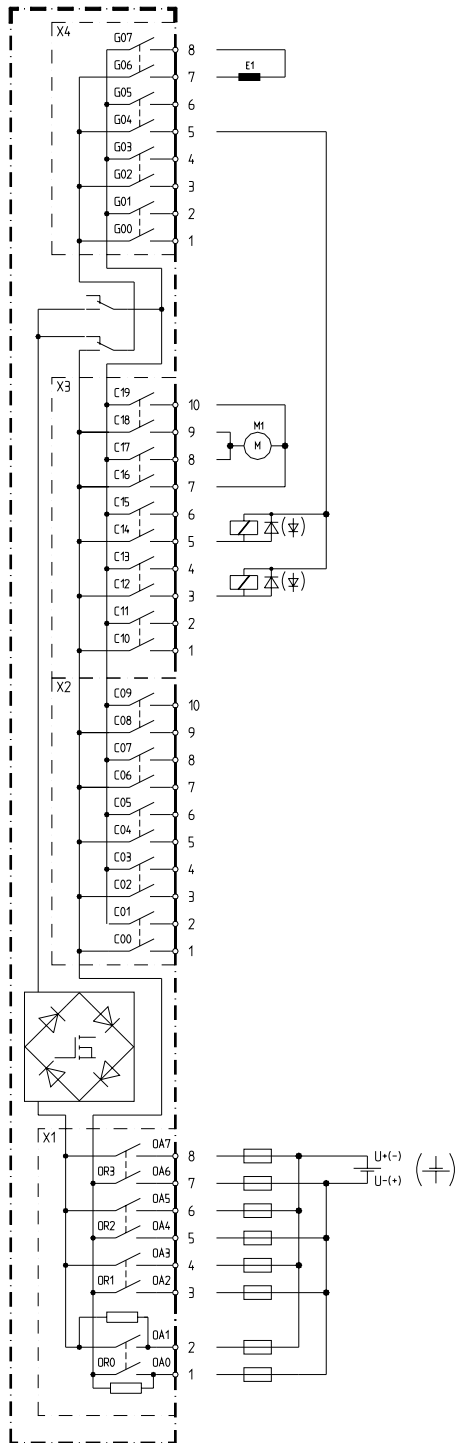
2.8.4 4x Direct Motor Control with 4 Fused Circuits



2.8.5 Mixture of 2-pole and 1-pole Command Output, with 4 Fused Circuits



2.8.6 Mixture of 1.5-pole Command Output and Direct Motor Control, with 4 Fused Circuits

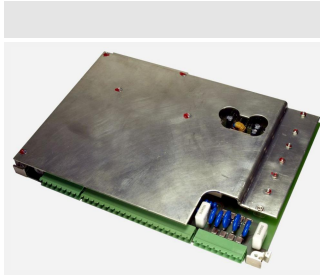


A Order Information

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A.1 System Element



Designation	Item Number/MLFB
DO-5212/PCCO55 Checked Command Output 24...220 VDC	BC5-212 6MF10130FC120AA0