

SIEMENS

SICAM BC

DI-5198 • DI-5199

System Element Manual

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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

Purpose of this manual

This manual describes the function and the manner of working of the peripheral elements DI-5198 and DI-5199 and essentially contains

- Functional descriptions
- Technical specifications
- Interface descriptions to 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 in 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 elements DI-5198 and DI-5199 are used in automation units of the system SICAM BC. It is deployed in the field of telecontrol and automation. The peripheral elements are used for the acquisition of binary inputs.

System element type	Peripheral element
consists of	Submodule DI-5198 or DI-5199
can be used in	SICAM BC
Engineering	SICAM TOOLBOX II with OPM II

1.2 Overview

Submodule for the CP-5014/CPCX55 master control element, as a peripheral element for

- Acquisition and processing according to IEC 60870-5-101/104
 - up to 14 single-point information units, or
 - up to 7 double-point information units, or
 - up to 14 integrated totals via count pulses, or
 - a combination thereof
- Acquisition and processing according to IEC 60870-5-101/104 of
 - up to 2 binary information units

With the following features:

- 14 binary inputs, in 3 groups of 2, 4 or 8 inputs each
 - of which one input can be used for power monitoring (optional)
 - galvanical insulation by optocouplers
 - each group has a common return
 - signal voltage
 - DI-5198: 48-60 VDC
 - DI-5199: 110/220 VDC
 - filter-equipped inputs circuits
 - 1ms resolution for time-tagging of events
- 2 2-pole relay outputs
 - in one group with one common return
 - signal voltage 24 to 220 VDC, 230 VAC

1.3 Architecture

1.3.1 Mechanics

Submodule, installed on CP-5014.

System Element	Hardware	Firmware
Peripheral Element DI-5198	DI-5198	Peripheral functions of CPCX55
Peripheral Element DI-5199	DI-5199	Peripheral functions of CPCX55

1.3.2 Ax 1703 Peripheral Bus

A peripheral element whose hardware consists of submodules - integrated in or installed on a basic system element - has no connection to the physical Ax 1703 peripheral bus.

The firmware connects the peripheral element to the Ax 1703 peripheral bus as a virtual bus device with a predefined bus address (PBA).

2 Peripheral Element DI-5198 • DI-5199

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2.1 Features and Functions

The Acquisition Functions in Detail

- **Single-point information**
 - Acquisition with a resolution of 1ms ^t
 - Update every 10 ms ^a
(or with the same cycle as the open-/closed-loop control function in the basic system element, depending on which cycle is larger)
 - Revision ^{ta}
 - Power monitoring ^{ta} (SE)
 - Inversion ^{ta}
 - Firmware filter ^t
 - Bounce suppression ^t
 - Determination of the cause of transmission ^t
 - Spontaneous transmission of changes ^t
 - Periodical transmission ^a

- **Double-point information**
 - Acquisition with a resolution of 1ms ^t
 - Update every 10 ms ^a
(or with the same cycle as the open-/closed-loop control function in the basic system element, depending on which cycle is larger)
 - Revision ^{ta}
 - Power monitoring ^{ta} (SE)
 - Inversion ^{ta}
 - Firmware filter ^t
 - Bounce suppression ^t
 - Monitoring intermediate and faulty positions ^t
 - Reporting switching operations in progress ^t
 - Breaker tripping detection ^t
 - Auto-reclose ^t
 - Determination of the cause of transmission ^t
 - Spontaneous transmission of changes ^t
 - Periodical transmission ^a

^t **Telecontrol**
the function affects process information which is **spontaneously** transmitted

^{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

^a **Automation**
the function affects process information which is **periodically** transmitted

- **Integrated totals via count pulses** (via binary inputs of the module) ^{t1}
 - Acquisition by firmware with a maximum count frequency of 20 Hz
 - Revision
 - Power monitoring (SE)
 - Inversion
 - Pulse counter
 - Counter value formation
 - Count pulse evaluation
 - Set counter
 - Formation of counts (integrated totals)
 - Counter request
 - Interval control
 - Freezed absolute value
 - Freezed relative value
 - Not power-fail safe
 - Spontaneous transmission

The Output Functions in Detail

- **Binary information output**
 - Selectable behavior on communication failure ^{ta}
(deactivation or retention)
 - Deactivation on module failure ^{ta}
 - Selective activation check
 - Spontaneous transmission ^t or
 - Periodical transmission ^a



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*, functions marked with ^(SE) are described in detail in the system element manual.

2.2 Details regarding Selected Functions

2.2.1 Power Monitoring

The sensor voltage of the binary inputs of all groups can be monitored for failure. For this the binary input IN D21 must be used, whereby the number of inputs, available for acquisition of binary information and integrated totals, is reduced. IN D21 is to be connected to the fused sensor voltage. A sensor voltage failure is detected when IN D21 is de-energized.

Only those inputs are affected by the consequences of the power monitoring which are selected, on a per input basis, by using parameter "MSP_Monitoring".

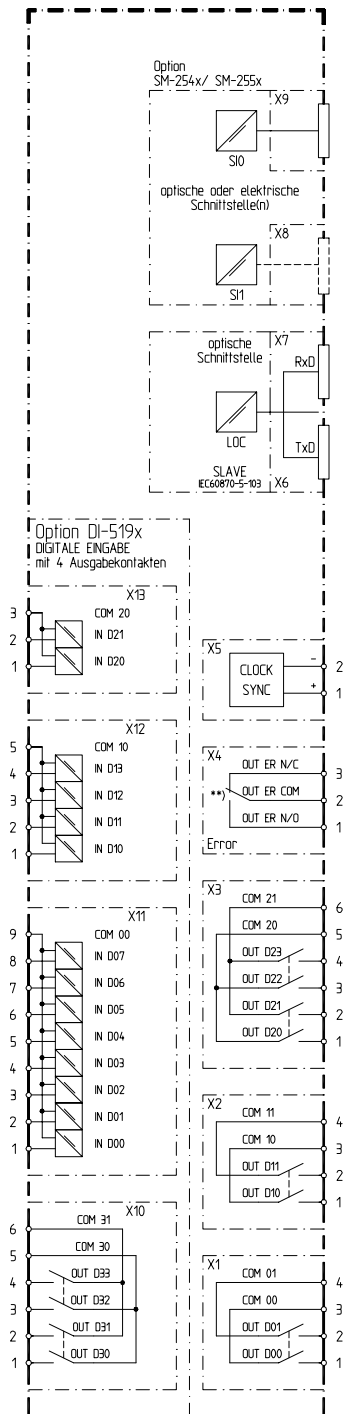
Sensor voltage failure means, that

- the states of affected inputs are frozen
- a periodical information "Voltage failure" is set in the process image of the open- and closed-loop control function
- a diagnostic information of the class "external" is set
- in case of *single-point information and double-point information*
 - the spontaneous information objects of affected inputs with states before the sensor voltage failure and the quality identifier "invalid" are transmitted
- in case of *integrated totals via count pulses*
 - affected counter values are flagged "invalid"
 - with the subsequent triggers for freezing, affected counts to be transmitted are flagged "invalid".

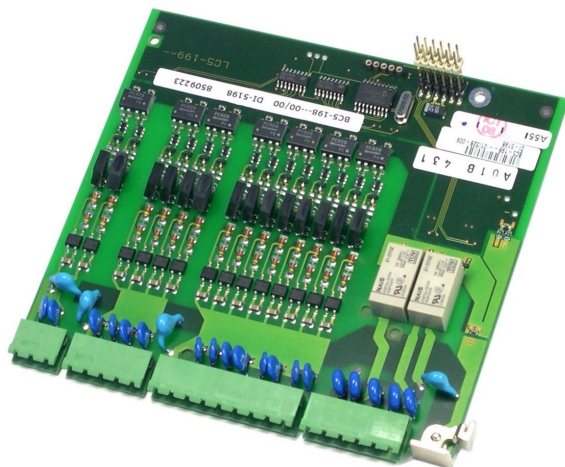
2.3 Engineering

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

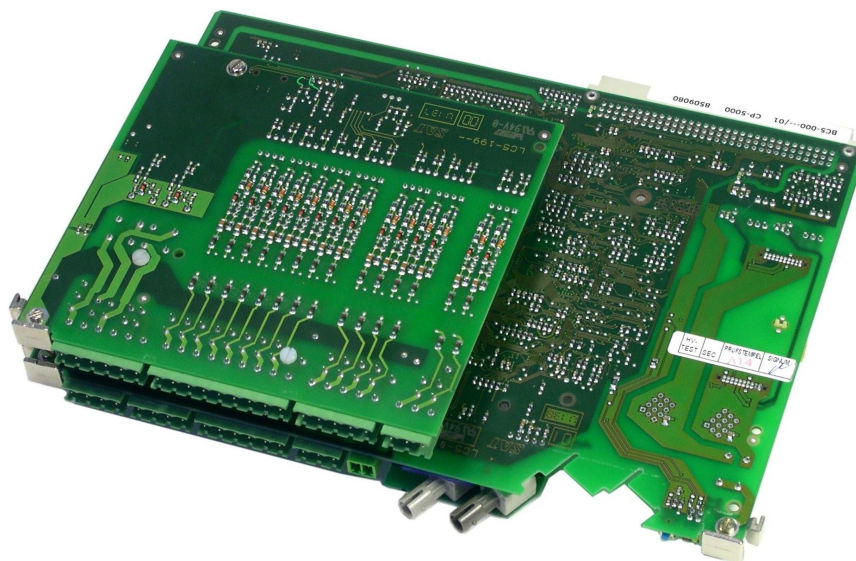
2.4 Block Diagram



2.5 View

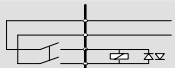



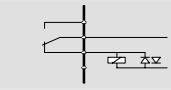
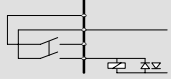
DI-519x (component side)

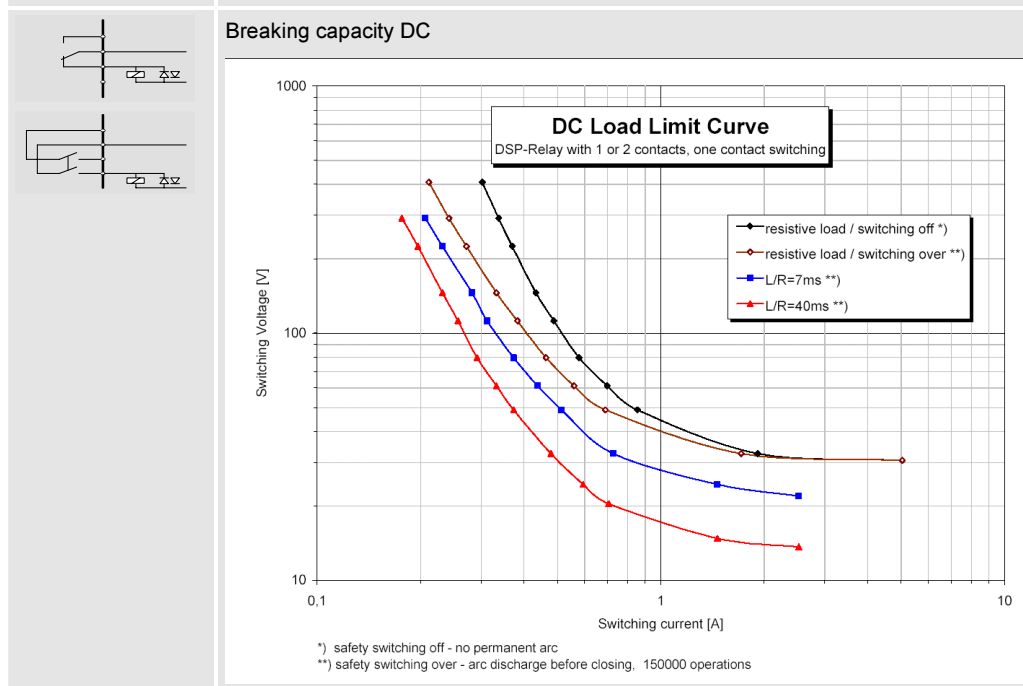
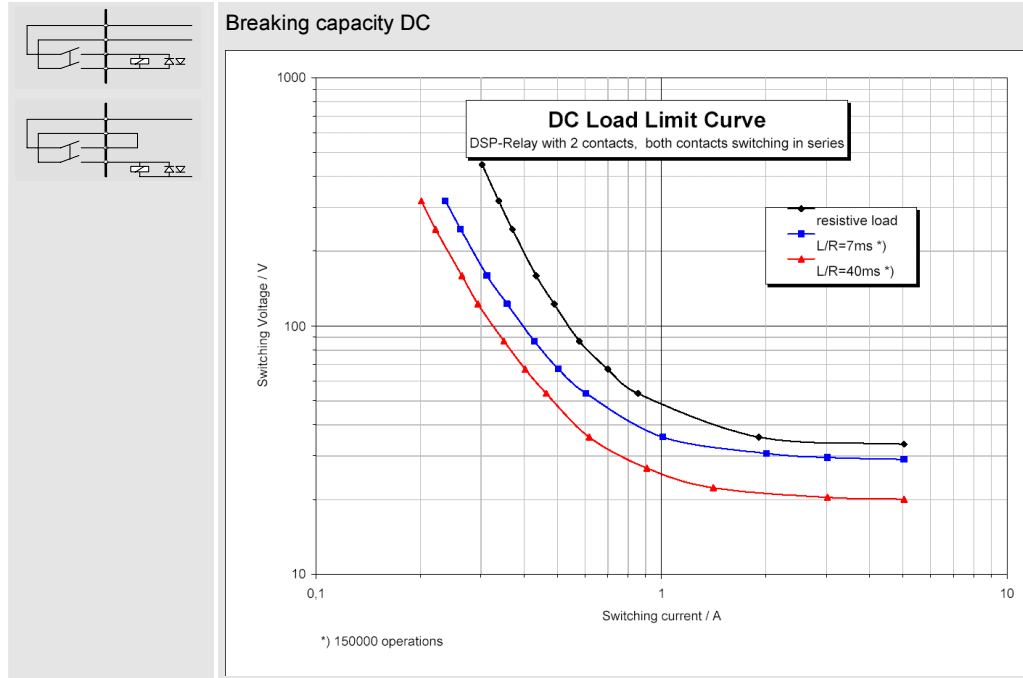


DO-519x installed on CP-5014 (solder side)

2.6 Technical Specifications

Binary Inputs		
14 binary inputs (X11, X12, X13)	<ul style="list-style-type: none"> Groups of 2, 4, or 8 inputs (each group has its own connector) Each group is galvanically insulated from other groups and from logic circuits Each group has a common return of selectable polarity Cleaning of signal transmitter contacts when switching under voltage 	
Filter time	Approx. 3 ms	
Nominal voltages	DI-5198 48/60 VDC DI-5199 110/220 VDC	
Operating points	DI-5198 ≤ 22 V "logic 0" ≥ 36 V "logic 1" DI-5199 ≤ 55 V "logic 0" ≥ 82 V "logic 1"	
Dynamic suppression of noise caused by cable capacitance of typically ...	DI-5198 typ. 220 nF (at nominal voltage) DI-5199 typ. 100 nF (at nominal voltage)	
Rated current	DI-5198 at 48 V: 2.5 mA (dyn. 10...100 mA) at 60V: 2.6 mA (dyn. 10...100 mA) DI-5199 at 110 V: 1.3 mA (dyn. 10...100 mA) at 220V: 1.7 mA (dyn. 10...100 mA)	
Input circuits	DI-5198 36...78 VDC DI-5199 82.5...250 VDC The circuits are operated by means of an external voltage.	
Binary Outputs		
2 information outputs (relay) (X10)	<ul style="list-style-type: none"> The outputs are of 2-pole make The outputs have a common return The outputs are galvanically insulated from logic circuits and ground by monostable relays 	
Maximum output current	5 A AC or DC permanent	
Maximum short-time current	<ul style="list-style-type: none"> 20 A for 0.5 s 30 A for 0.2 s 	
Maximum switching voltage	250 V AC or DC	
Minimum number of switching cycles	<ul style="list-style-type: none"> 10^5 AC 250 V (≤ 5 A) @ $\cos \varphi = 1$ $5 \cdot 10^4$ AC 250 V (≤ 5 A) @ $\cos \varphi = 0,4$ $1.5 \cdot 10^5$ DC according to DC Load Limit Curve 	
Minimum switching capacity	1 mW	
Electric strength with open contacts	1.0 kV AC or DC for 1 min	
Output circuits	≤ 250 V AC or DC The circuits are operated by means of an external voltage.	
	Maximum switching capacity AC	250 V 1250 VA (≤ 5 A) @ $\cos \varphi \geq 0.4$
	Maximum switching-on capacity DC	24...33 V ≤ 30 A @ L/R ≤ 40 ms 33...250 V ≤ 1000 W @ L/R ≤ 40 ms

	Maximum switching capacity AC	250 V	1250 VA (≤ 5 A)	@ $\cos \varphi = 1$
			1000 VA (≤ 4 A)	@ $\cos \varphi \geq 0.4$
	Maximum switching-on capacity DC	24...100 V	≤ 10 A	@ $L/R \leq 40$ ms
		100...250 V	≤ 1000 W	@ $L/R \leq 40$ ms



Connectors

Peripheral connector (X10...X13, front side)	Removable screw terminals PHOENIX CONTACT MSTBT 2,5/x-ST-5,08
• 2 outputs	X10 1x 6-pin
• 8 inputs	X11 1x 9-pin
• 4 inputs	X12 1x 5-pin
• 2 inputs	X13 1x 3-pin

2.7 I/O Assignment

The assignment of single-point information, double-point information and count pulses to the binary inputs (HW-Pin) is done according to the following schema:

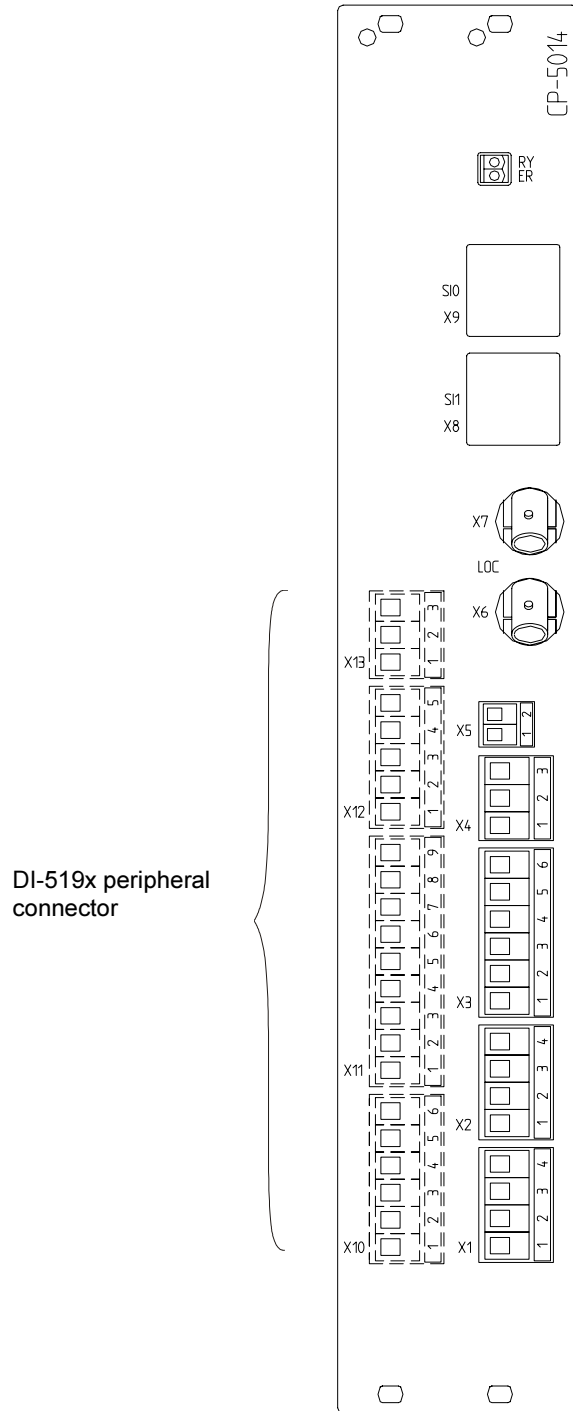
HW Pin	Single-Point Information	Double-Point Information	Integrated Total
IN D00	SI IN D00	DI IN D00/D01	counter IN D00
IN D01	SI IN D01		counter IN D01
IN D02	SI IN D02	DI IN D02/D03	counter IN D02
IN D03	SI IN D03		counter IN D03
IN D04	SI IN D04	DI IN D04/D05	counter IN D04
IN D05	SI IN D05		counter IN D05
IN D06	SI IN D06	DI IN D06/D07	counter IN D06
IN D07	SI IN D07		counter IN D07
IN D10	SI IN D10	DI IN D10/D11	counter IN D10
IN D11	SI IN D11		counter IN D11
IN D12	SI IN D12	DI IN D12/D13	counter IN D12
IN D13	SI IN D13		counter IN D13
IN D20	SI IN D20	DI IN D20/D21 ^{*)}	counter IN D20
IN D21	SI IN D21 ^{*)}		counter IN D21 ^{*)}

^{*)} if IN D21 is used for power monitoring, these objects cannot be assigned

The assignment of the binary information outputs to the binary outputs is done according to the following schema:

HW Pin	Data Point
OUT D30	binary information output OUT D30/D31
OUT D31	
OUT D32	binary information output OUT D32/D33
OUT D33	

2.8 Front Panel CP-5014



2.9 Pin Assignment

Removeable screw terminals are used as peripheral connectors. They are assigned according to the following tables:

X13:

pin	signal
3	COM20
2	IN D21
1	IN D20

X12:

pin	signal
5	COM10
4	IN D13
3	IN D12
2	IN D11
1	IN D10

X11:

pin	signal
9	COM00
8	IN D07
7	IN D06
6	IN D05
5	IN D04
4	IN D03
3	IN D02
2	IN D01
1	IN D00

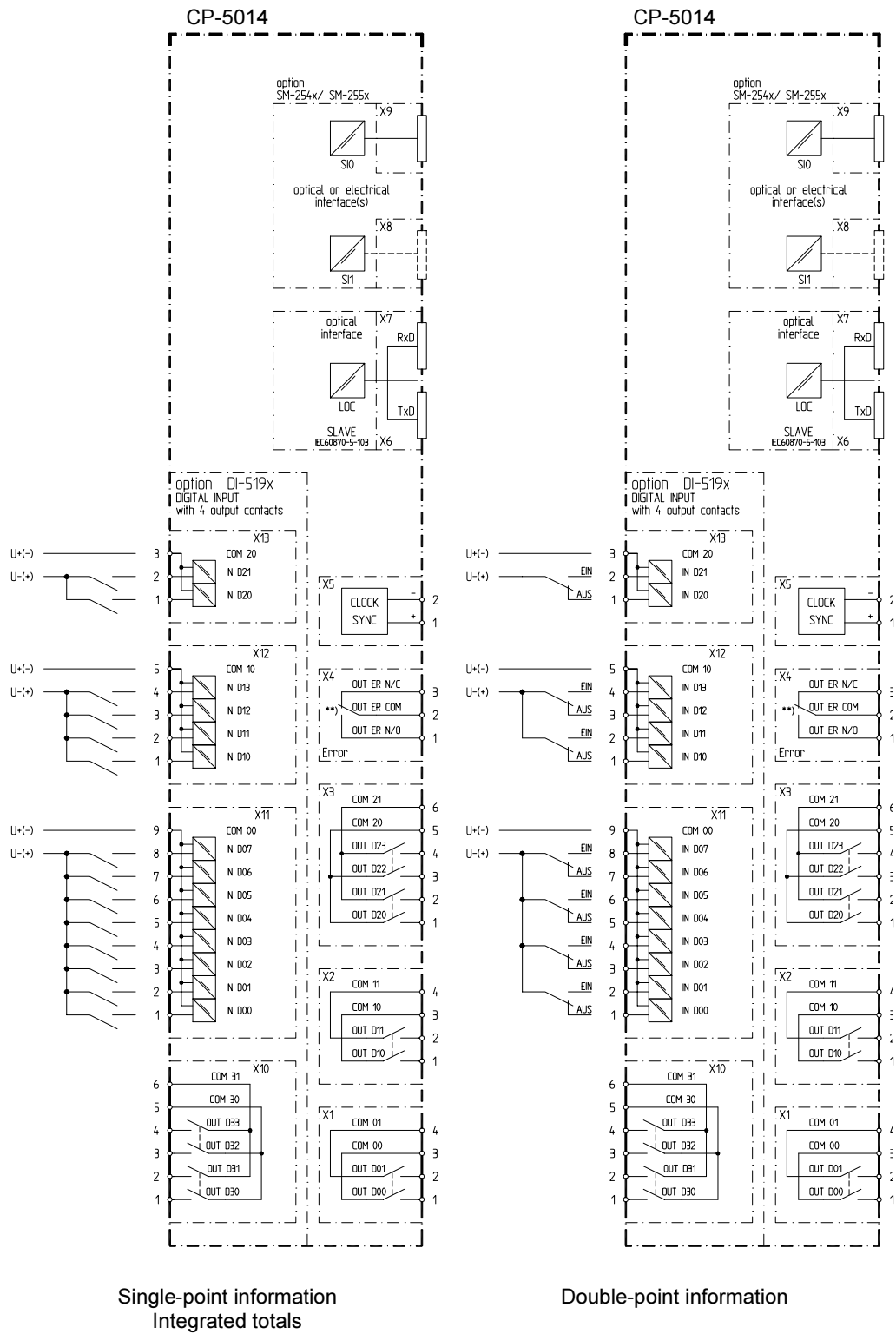
X10:

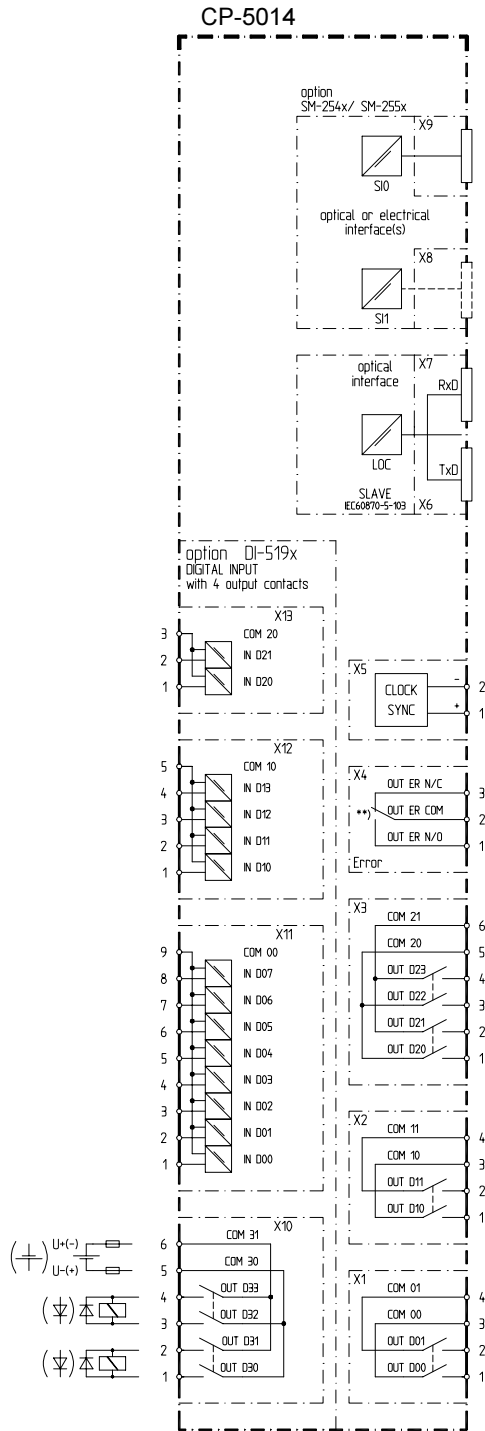
pin	signal
6	COM31
5	COM30
4	OUT D33
3	OUT D32
2	OUT D31
1	OUT D30

The abbreviations have the following meaning:

COMx0 ... COMx1 common contact of group x
 IN Dxy inputs y of group x
 OUT Dxy normally open contact, group x, outputs y

2.10 External Circuit Elements



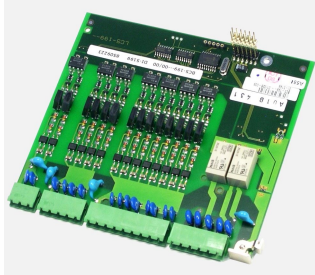
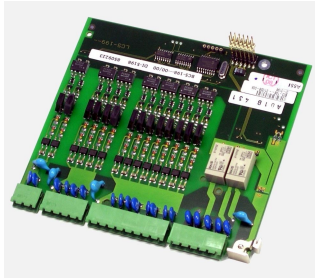


3 Order Information

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3.1 System Elements



Designation	Item Number/MLFB
DI-5198 Binary Input 16x 24...60 VDC, 1 ms	BC5-198 6MF10131FB080AA1
DI-5199 Binary Input 16x 110/220 VDC, 1 ms	BC5-199 6MF10133FB000AA1