IO Input/Output Interface Module for LV Circuit Breakers

User Guide

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The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

Table of Contents

Safety Information

Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result** in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

About the Book

At a Glance

Document Scope

This guide describes the IO input/output interface module (IO module) for low-voltage (LV) circuit breakers and its functionalities. It helps to set the predefined applications and provides characteristics, wiring diagrams, and installation to set up the IO module.

Validity Note

This guide is valid for the IO module for use with Masterpact NT/NW, Compact NS, and Compact NSX circuit breakers.

The technical characteristics of the devices described in this document also appear online. To access this information online:

Step	Action
1	Go to the Schneider Electric home page *www.schneider-electric.com*.
2	In the **Search** box type the reference of a product or the name of a product range. ● Do not include blank spaces in the model number/product range. ● To get information on grouping similar modules, use asterisks (*).
3	If you entered a reference, go to the **Product Datasheets** search results and click on the reference that interests you. If you entered the name of a product range, go to the **Product Ranges** search results and click on the product range that interests you.
4	If more than one reference appears in the **Products** search results, click on the reference that interests you.
5	Depending on the size of your screen, you may need to scroll down to see the data sheet.
6	To save or print a data sheet as a .pdf file, click **Download XXX product datasheet**.

The characteristics that are presented in this manual should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the manual and online information, use the online information as your reference.

Related Documents

Title of Documentation	Reference Number
IO Input/Output Interface Module for LV Circuit Breaker - Instruction Sheet	HRB49217
ULP System - User Guide	TRV99100 (FR) TRV99101 (EN) TRV99102 (ES)
FDM121 Display for LV Circuit Breaker - User Guide	DOCA0088EN DOCA0088FR DOCA0088ES DOCA0088ZH
IFE Ethernet Interface for LV Circuit Breaker - User Guide	DOCA0084EN DOCA0084FR DOCA0084ES DOCA0084ZH
Compact NSX AC Circuit Breakers - User Guide	LV434100 (FR) LV434101 (EN) LV434102 (ES)
Compact NSX Micrologic 5/6 Trip Units - User Guide	LV434103 (FR) LV434104 (EN) LV434105 (ES)

Title of Documentation	Reference Number
Compact NSX Modbus Communication Guide	DOCA0091EN DOCA0091FR DOCA0091ES DOCA0091ZH
Masterpact NT Circuit Breakers and Switch-Disconnector - User Guide	GHD12555AA (FR) GHD12556AA (EN)
Masterpact NW Circuit Breakers and Switch-Disconnector - User Guide	GHD12557AA (FR) GHD12558AA (EN)
Compact NS 630b-1600 User Guide	51201639AA (FR) 51201640AA (EN)
Micrologic A and E Trip Units - User Guide	04443723AA (FR) 04443724AA (EN)
Micrologic P Trip Units - User Guide	04443725AA (FR) 04443726AA (EN)
Micrologic H Trip Units - User Guide	04443727AA (FR) 04443728AA (EN)
Masterpact NT/NW and Compact NS Modbus Communication Guide	DOCA0054EN DOCA0054FR DOCA0054ES DOCA0054ZH

You can download these technical publications and other technical information from our website at www.schneider-electric.com.

Chapter 1
IO Module Presentation

What Is in This Chapter?

This chapter contains the following topics:

Introduction

Description

The IO module for LV circuit breakers is part of an ULP system with built-in functionalities and applications.

The IO module is a component of the ULP system and is compliant with the ULP system specifications.

The ranges of LV circuit breakers compatible with the IO module are:
- Masterpact NW circuit breaker
- Masterpact NT circuit breaker
- Compact NS 1600b-3200 circuit breaker
- Compact NS 630b-1600 circuit breaker
- Compact NSX circuit breaker

IO Module Resources

The IO module resources are:
- Six digital inputs that are self powered for either NO or NC dry contact or pulse counter.
- Three digital outputs that are bistable relays (5 A maximum).
- One analog input for Pt100 temperature sensor.

Intelligent Modular Unit

A modular unit is a mechanical and electrical assembly containing one or more products to perform a function in a switchboard (incoming protection, motor command, and control). The modular units are installed in the switchboard.

The circuit breaker with its internal communicating components (Micrologic and so on) and external ULP modules (FDM121 display unit, IO module, and so on) connected to one IFM or IFE communication interface is called an intelligent modular unit (IMU).

Predefined Applications

Predefined applications add new functions to the IMU:
- Selection by the application rotary switch on the IO module, defining the application with a predefined input/output assignment and wiring diagram.
- No additional setting by the customer is required.

The resources not assigned to the predefined application are available for additional user-defined applications.

List of Predefined Applications

Application Rotary Switch Position	Predefined Application	Description
1	Cradle management *(see page 30)*	Monitors the position of the circuit breaker in the cradle.
2	Circuit breaker operation *(see page 34)*	Controls the opening and closing of the circuit breaker by using the control mode (local or remote) and the inhibit close order.
3	Cradle management and Energy Reduction Maintenance Setting (ERMS) *(see page 39)*	Monitors the position of the circuit breaker in the cradle and monitors the position of inputs and controls the ERMS mode of the circuit breaker.
4	Light and load control *(see page 42)*	Controls the light and load application.
5–8	Spare	–
9	Custom *(see page 45)*	Performs the user-defined applications with the IO module.

User-Defined Applications

User-defined applications are processed by the IO module in addition to the predefined applications selected.

The user-defined applications are available depending on:
- the predefined applications selected.
- the IO module resources (inputs and outputs) not used by the application.

The resources required by user-defined applications are assigned using the customer engineering tool *(see page 17)*.

List of User-Defined Applications

The following table provides the list of user-defined applications available according to the predefined applications selected with the application rotary switch on the IO module.

Function	User-Defined Applications	Predefined Application Selected									
		1	2	3	4	5	6	7	8	9 (IO1)	9 (IO2)
Protection	Energy Reduction Maintenance Settings (ERMS) *(see page 48)*	X	–	X	X	–	–	–	–	–	–
Control	Enable/inhibit close order *(see page 50)*	X	–	X	X	–	–	–	–	X	–
	User-defined output *(see page 51)*	X	X	X	X	–	–	–	–	X	X
Energy Management	Energy counter reset *(see page 53)*	X	–	X	X	–	–	–	–	X	X
	User-defined pulse counters *(see page 54)*	X	–	X	X	–	–	–	–	X	X
Monitoring	Cradle management *(see page 56)*	X	–	X	–	–	–	–	–	–	X
	Drawer management *(see page 57)*	–	–	–	–	–	–	–	–	X	X
	Cooling system *(see page 59)*	X	–	X	X	–	–	–	–	X	X
	Predefined input acquisition *(see page 63)*	X	–	X	X	–	–	–	–	X	X
	User-defined input acquisition *(see page 64)*	X	–	X	X	–	–	–	–	X	X
	Input indicator *(see page 65)*	X	X	X	X	–	–	–	–	X	X
	Threshold overrun of input counter indicator *(see page 66)*	X	X	X	X	–	–	–	–	X	X
	Breaker status indicator *(see page 67)*	X	X	X	X	–	–	–	–	X	X
	Maintenance indicator *(see page 68)*	X	X	X	X	–	–	–	–	X	X
	Trip indicator *(see page 69)*	X	X	X	X	–	–	–	–	X	X
	Pre-alarm indicator *(see page 71)*	X	X	X	X	–	–	–	–	X	X
	User-defined alarm indicator *(see page 72)*	X	X	X	X	–	–	–	–	X	X
	X = user-defined application available – = user-defined application not available										

Remote Controller

A remote controller is a device able to communicate with an IMU using either the IFM Modbus-SL interface for an LV circuit breaker or the IFE Ethernet interface for an LV circuit breaker.

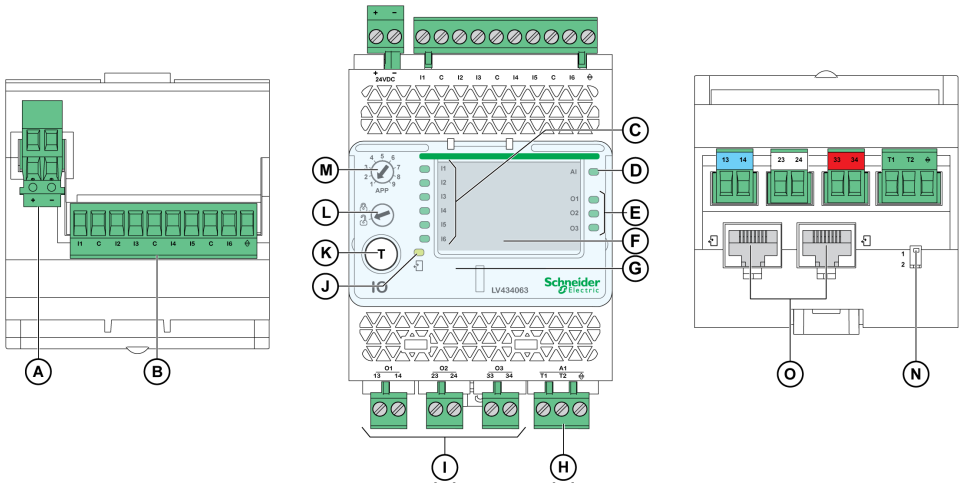
Example: FDM128 display unit for 8 LV devices, supervisor, PLC, BMS, SCADA system, and so on.

Modbus registers and commands related to the ULP modules including the IO module are described in separate guides:

- For Compact NSX circuit breakers, refer to *Compact NSX Modbus Communication Guide.*
- For Masterpact NT/NW and Compact NS circuit breakers, refer to the *Masterpact NT/NW and Compact NS Modbus Communication Guide.*

Hardware Description

Description



A 24 Vdc power supply terminal block
B Digital input terminal block: six inputs, three commons, and one shield
C Six input status LEDs
D Analog input status LED
E Three output status LEDs
F I/O identification labels
G Sealable transparent cover
H Analog input terminal block
I Digital output terminal block
J ULP status LED
K Test/reset button (accessible with cover closed)
L Setting locking pad
M Application rotary switch: 1 to 9
N Switch for IO module addressing (IO module 1 or IO module 2)
O Two RJ45 ULP ports

Mounting

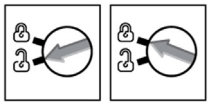
The IO module mounts on a DIN rail.

Application Rotary Switch

The application rotary switch enables the selection of a predefined application. It has nine positions and each position is assigned to a predefined application. The factory-set position of the switch is predefined as application 1.

Setting Locking Pad

The setting locking pad on the front panel of the IO module enables the setting of the IO module by the customer engineering tool *(see page 17)*.



- If the arrow points to the open padlock (factory setting), loading of the configuration file from the customer engineering tool is allowed.
- If the arrow points to the closed padlock, loading of the configuration file from the customer engineering tool is not allowed.

Test/Reset Button

The test/reset button has three functions, according to how long the button is pressed.

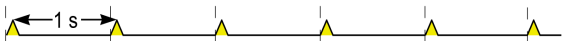
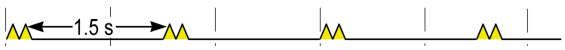
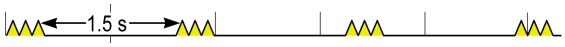
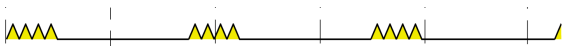
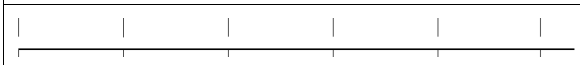
Time Range	Function
0.25–1s	Reset the alarms in manual reset mode
1–5 s	Test the ULP modules connected in the IMU
5–15 s	Validate the application selected through the application rotary switch.

Analog Input Status LED

LED Indication	Status Description
Steady OFF	Open circuit or no signal
Blinking LED 1 s ON, 1 s OFF	Short circuit
Steady Green	Analog input signal activity

ULP LED Status

The ULP LED describes the mode of the ULP module.

ULP LED	Mode	Action
	Nominal	None
	Conflict	Remove modules with duplicate function
	Degraded	Replace IO module at the next maintenance operation
	Test	None
	Non-critical firmware discrepancy	Upgrade firmware at the next maintenance operation with the customer engineering tool
	Non-critical hardware discrepancy	Replace IO module at the next maintenance operation
	Configuration discrepancy	Install missing features
	Critical firmware discrepancy	Upgrade firmware with the customer engineering tool
	Critical hardware discrepancy	Replace IO module
	Stop	Replace IO module
	Power OFF	Check power supply

For more information, refer to Troubleshooting *(see page 74)*.

Switch for IO Module Addressing (IO Module 1 or IO Module 2)

When two IO modules are connected in the same ULP network used in one IMU, the two IO modules are differentiated by the position of the DIP switch located on the bottom of the IO module:

Switch Postition	Description
	DIP switch on position 1 for IO module 1 (factory setting)
	DIP switch on position 2 for IO module 2

For more information, refer to Application with two IO modules *(see page 26)*.

Predefined Applications

Introduction

Changing the application rotary switch position does not change the application. After changing the application, the wiring must be checked or changed according to the application.

⚠ WARNING
DISCREPANCY BETWEEN IO MODULE WIRING AND APPLICATION
DO NOT change the position of the application rotary switch during the operation.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Predefined Application Selection Procedure

Step	Action	LED Status
1	Rotate the application rotary switch. **NOTE:** Even though the application rotary switch is rotated, the selected predefined application is still the same.	Input and output LEDs blink: 1 s ON, 1 s OFF.
2	Press the test/reset button for 5 to 15 s. The predefined application corresponding to the application rotary switch is selected.	Input and output LEDs stop blinking. The LEDs indicate the status of the inputs and outputs.
3	Check the IO module wiring for the new application.	-

Customer Engineering Tool

Ecoreach

Ecoreach is a software application that helps to manage a project as part of testing, site commissioning and maintenance phases of the project life cycle. It enables to prepare the settings of the devices offline (without connecting to the device), save the project in cloud as reference, and configure the devices when connected with the devices. Also it offers value added features like discover communicating devices, organize devices in switchboard, manage a hierarchical structure of the electrical installation, perform communication test, generate reports, upgrade firmware, and so on.

The Ecoreach software enables the configuration of the following devices, modules, accessories:

Device Ranges	Modules	Accessories
• Masterpact NT/NW circuit breakers • Compact NS circuit breakers	• Micrologic trip units • Communication interface modules: BCM, CCM, BCM ULP IFM, IFE • ULP modules: IO module, FDM121 display unit (1)	M2C and M6C output modules
Compact NSX circuit breaker	• Micrologic trip units • Communication interface modules: BSCM, IFM, IFE • ULP modules: IO module, FDM121 display unit (1)	SDTAM and SDx output modules
Acti 9 Smartlink	Acti 9 Smartlink Ethernet and Acti 9 Smartlink Modbus	–
(1) For FDM121 display unit, only the firmware and language download are supported.		

For more information, refer to the *Ecoreach Online Help*.

Ecoreach Software Features

Ecoreach software allows you to perform the following actions:

- Create projects by device discovery and selection from the Schneider Electric catalogs
- Monitor protection status and IO status
- Read information such as, alarms, measurements, parameters
- Download and upload configuration or settings for single or multiple devices
- Perform control actions in a secured way
- Generate and print device settings report and communication test report
- Manage multiple devices with electrical and communication hierarchy model
- Manage artifacts (project and device documents)
- Check consistency in settings between devices in a communication network
- Compare configuration settings between the project and device (online)
- Download latest firmware and upgrade devices
- Provide a safe repository of projects in Ecoreach cloud and sharing of projects with other users

Legacy Software

The Ecoreach software replaces the following legacy software:

- Compact NSX RSU (Remote Setting Utility): Compact NSX configuration software.
- Masterpact RSU (Remote Setting Utility): Masterpact and Compact NS configuration software.
- RCU (Remote Control Utility): A SCADA software for:
  - Compact NSX circuit breakers
  - Compact NS circuit breakers
  - Masterpact NT/NW circuit breakers
  - Power meters

The legacy software is available at *www.schneider-electric.com*.

Digital Inputs

Definition

An IO module has six digital inputs. The digital inputs assigned to a predefined application are pre-configured and cannot be modified.

The remaining available inputs can be configured separately using the customer engineering tool *(see page 17)*.

Digital Input Types

There are two types of digital inputs:
- normal digital inputs, used to record the state of a normally open or normally closed external contact.
- pulse digital inputs, used to count pulses delivered by a metering device.

Each digital input can be configured using the customer engineering tool.

Normal Digital Input Parameters

The following parameters can be set with the customer engineering tool. The input signal type must be set to normal.

Description	Setting Range	Factory Settings
Input signal type	• 0 (Normal digital input) • 1 (Pulse digital input)	Normal
Input contact type	• NO (Normally open contact) • NC (Normally closed contact)	NO
Counter threshold	1–4294967294	5000

Digital Input Contact Type

The contact type of the normal digital inputs available for user-defined applications can be configured using the customer engineering tool *(see page 17)* as:

- normally open contact (NO)
- normally close contact (NC)

Normal Digital Input Counters

A counter is linked to each normal digital input. The counter is incremented on each rising edge of the linked input.

The digital input counters have the following properties:
- The counters are saved in non-volatile memory to prevent data loss in case of power loss.
- The counters can be preset to any value from 0 to 4294967294 using:
  - the customer engineering tool
  - or the FDM121 display unit
- The counter stops counting after reaching 4294967294.
- A threshold is associated to each counter. The counter threshold can be of any value ranging from 1 to 4294967294. The factory setting is 5000.
- An alarm is generated when a counter reaches the threshold.
- A digital output can be assigned to any threshold overrun on input counter.

Digital Input Forcing

For maintenance reasons, it is possible to force the state of the digital inputs.This action can be performed only with an FDM121 display unit.

Digital Input Events

The following events are generated by the digital inputs. For more information on IO module events, refer to Events and Alarms *(see page 24)*.

Code IO1	Code IO2	Description	Type	Priority	Reset
1555 (0x0613)	1811 (0X0713)	Input 1 rising edge (NO contact) or falling edge (NC contact)	Event	NA	NA
1556 (0x0614)	1812 (0X0714)	Input 2 rising edge (NO contact) or falling edge (NC contact)	Event	NA	NA
1557 (0x0615)	1813 (0X0715)	Input 3 rising edge (NO contact) or falling edge (NC contact)	Event	NA	NA
1558 (0x0616)	1814 (0X0716)	Input 4 rising edge (NO contact) or falling edge (NC contact)	Event	NA	NA
1559 (0x0617)	1815 (0X0717)	Input 5 rising edge (NO contact) or falling edge (NC contact)	Event	NA	NA
1560 (0x0618)	1816 (0X0718)	Input 6 rising edge (NO contact) or falling edge (NC contact)	Event	NA	NA
1561 (0x0619)	1817 (0X0719)	Threshold overrun on input 1 counter	Alarm	Medium	Manual or remote
1562 (0x061A)	1818 (0X071A)	Threshold overrun on input 2 counter	Alarm	Medium	Manual or remote
1563 (0x061B)	1819 (0X071B)	Threshold overrun on input 3 counter	Alarm	Medium	Manual or remote
1564 (0x061C)	1820 (0X071C)	Threshold overrun on input 4 counter	Alarm	Medium	Manual or remote
1565 (0x061D)	1821 (0X071D)	Threshold overrun on input 5 counter	Alarm	Medium	Manual or remote
1566 (0x061E)	1822 (0X071E)	Threshold overrun on input 6 counter	Alarm	Medium	Manual or remote
1570 (0x0622)	1826 (0X0722)	Input 1 not forced / forced change	Event	NA	NA
1571 (0x0623)	1827 (0X0723)	Input 2 not forced / forced change	Event	NA	NA
1572 (0x0624)	1828 (0X0724)	Input 3 not forced / forced change	Event	NA	NA
1573 (0x0625)	1829 (0X0725)	Input 4 not forced / forced change	Event	NA	NA
1574 (0x0626)	1830 (0X0726)	Input 5 not forced / forced change	Event	NA	NA
1575 (0x0627)	1831 (0X0726)	Input 6 not forced / forced change	Event	NA	NA

Pulse Input

The maximum number of allowed user-defined pulse inputs are six, with one or two IO modules. All the inputs can be configured as a pulse input using the customer engineering tool *(see page 17)*. Also, the pulse rate, pulse polarity, and the pulse unit can be configured using the customer engineering tool. A pulse counter is activated when the corresponding digital input of IO module 1 or IO module 2 is configured as a pulse input.

For example, if I2 on IO module 1 is set as a pulse input, I2 on IO module 2 cannot be set as a pulse input. If I3 on IO module 2 is set as a pulse input, I3 on IO module 1 cannot be set as a pulse input.

The minimum pulse width is 40 ms.

Pulse Digital Input Parameters

The following parameters can be set with the customer engineering tool. The input signal type must be set to pulse.

Description	Setting Range	Factory Settings
Input signal type	• Normal • Pulse	Normal
Pulse polarity	• Low to high (rising edge of the pulse) • High to low (falling edge of the pulse)	Low to high
Pulse unit	• Active energy: Wh • Reactive energy: VARh • Apparent energy: VAh • Volume: cubic-meter	Wh

Description	Setting Range	Factory Settings
Pulse weight	0 to 16777215	1

The pulse weight must be calculated according to the characteristics of the pulses delivered by the meter.

Examples:

- If each pulse delivered by an active energy meter corresponds to 10 KWh, and the pulse unit is set to Wh, the pulse weight must be set to 10,000 (Wh).
- If each pulse delivered by a volume meter corresponds to 125 liters, and the pulse unit is set to m^3, the pulse weight must be set to 0.125 (m^3).
- If each pulse delivered by a volume meter corresponds to 1 gallon, and the pulse unit is set to m^3, the pulse weight must be set to 0.003785 (m^3).

Digital Outputs

Definition

An IO module has three digital outputs (bistable relay). The digital outputs assigned to a predefined application are pre-configured and cannot be modified.

The other available outputs can be configured separately using the customer engineering tool *(see page 17)*.

Digital Output Contact Type

The outputs used in the user-defined application can be configured as NO or NC contacts.

- Normally open contact (NO)
- normally closed contact (NC)

Digital Output Forcing

For maintenance reasons, it is possible to force the state of the digital outputs. This action can be performed only with FDM121 display unit.

Output Operating Mode

The operating mode of the digital outputs is assigned by the customer engineering tool, and can be set to:

- Non-latching operating mode (factory setting)
- Latching operating mode
- Time-delayed operating mode

Operating Mode	Alarm Status	Output Status
Non-latching	Activated	Activated
	Deactivated	Deactivated
Latching	Activated	Activated
	Deactivated	Activate as long as the output has not been acknowledged.
Time delayed non-latching	Activated	Activated for the time set with the customer engineering tool
	Deactivated	Deactivated immediately after time delay set by using customer engineering tool is over

NOTE:

- If the output contact type is configured as NO (normally open),
  - the status is activated when the output state is HIGH.
  - the status is deactivated when the output state is LOW.
- If the output contact type is configured as NC (normally close),
  - the status is activated when the output state is LOW.
  - the status is deactivated when the output state is HIGH.

Digital Output Counters

A counter is linked to each normal digital output. The counter is incremented for each change in the output.

The digital output counters have the following properties:

- The counters are saved in non-volatile memory to prevent data loss in case of power loss.
- The counter can be preset to any value from 0 to 4294967294.
  NOTE: When the counter reaches the maximum value, it is possible to reset the counter using the IO module counter reset command.
- The counter stops counting after reaching 4294967294.
- A threshold is associated to each counter. A threshold can be set to any value from 1 to 429467294. The factory setting is 5000.
- An alarm is generated when a counter reaches the threshold.

Digital Output Events

The following events are generated by the digital outputs. For more information on IO module events, refer to Events and Alarms *(see page 24)*.

Code IO1	Code IO2	Description	Type	Priority	Reset
1552 (0X0610)	1808 (0X0710)	Output 1 rising edge (NO contact) or falling edge (NC contact)	Event	NA	NA
1553 (0X0611)	1809 (0X0711)	Output 2 rising edge (NO contact) or falling edge (NC contact)	Event	NA	NA
1554 (0X0612)	1810 (0X0712)	Output 3 rising edge (NO contact) or falling edge (NC contact)	Event	NA	NA
1567 (0X061F)	1823 (0X071F)	Threshold overrun on output 1 counter	Alarm	Medium	Manual or remote
1568 (0X0620)	1824 (0X0720)	Threshold overrun on output 2 counter	Alarm	Medium	Manual or remote
1569 (0X0621)	1825 (0X0721)	Threshold overrun on output 3 counter	Alarm	Medium	Manual or remote
1576 (0X0628)	1832 (0X0728)	Output 1 not forced / forced change	Event	NA	NA
1577 (0X0629)	1833 (0X0729)	Output 2 not forced / forced change	Event	NA	NA
1578 (0X062A)	1834 (0X072A)	Output 3 not forced / forced change	Event	NA	NA

Fallback Positions

The digital bistable relay output is configured to a predefined fallback position after the detection of a specific operating event.

The different fallback positions are:
- OFF: the relay output turns OFF
- ON: the relay output turns ON
- Freeze: the relay output stays in the same position

The fallback position of each digital output is configured using the customer engineering tool.

The fallback position is initiated as soon as the IO module detects one of the specific operating events listed below:

- IO module watchdog
- ULP communication interruption
- 24 Vdc power loss
- Firmware upgrade

For the applications listed in the below table, the fallback position of the digital outputs assigned to the application cannot be modified.

Application	Fallback Position
ERMS	OFF
Breaker operation	OFF
Light control	Freeze
Load control	OFF
User-defined output	OFF

Analog Input

Definition

An IO module has one analog input. The analog input assigned to a predefined application is preconfigured and cannot be modified.

In user-defined application, the analog input can be assigned using the customer engineering tool *(see page 17)*.

Analog Input Type

The Pt100 sensor is the only analog input type, which is used to record and monitor the temperature inside the switchboard.

Pt100 Status

The IO module detects an open-circuit or short circuit condition of the analog input.

For more information, refer to Analog Input Status LED *(see page 14)*.

Detection Function	Pt100 Value	Accuracy
Open-circuit detection	>195 Ω	± 10%
Short-circuit detection	< 10 Ω	± 5%

Events and Alarms

Definitions

An event is digital data changing state or any incident detected by the IO module. Events are time stamped and logged in the IO module event history.

Event codes are displayed on the FDM121 display unit and are used to identify the type of event or alarm.

The IO module event history contains the last 100 time-stamped events.

It can be accessed from:
- FDM121 display unit.
- remote controller using the communication network.
  NOTE: The FDM121 displays only the last 20 time-stamped events of the IO module event history.

The event can be:
- system events, generated by the IO module.
- IO module events, generated by the digital inputs and outputs.
- functional events, generated by the application or functions performed by the IO module.

An alarm is a type of event that requires a specific attention from the user.

Alarm Reset Mode

Each alarm is latched and must be reset.

There are three reset modes:
- Auto reset mode: the alarm is reset automatically when the alarm condition disappears.
- Manual reset mode: the alarm is reset using the test/reset button for 0.25–1 second on the IO module.
- Remote reset mode: the alarm is reset by a remote controller using the communication network with the reset IO alarms command.

For Compact NSX circuit breakers, refer to *Compact NSX Modbus Communication Guide.*

For Masterpact NT/NW and Compact NS circuit breakers, refer to *Masterpact NT/NW and Compact NS Modbus Communication Guide.*

Alarm Priority Level

Each alarm is given a priority level:
- High priority
- Medium priority
- Low priority

The alarm priority level is predefined.

Alarm indication on the FDM121 display unit depends on the alarm priority level. For more information, refer to the *FDM121 Display for LV Circuit Breaker User Guide*.

System Events

List of System Events

The following events are generated by IO module 1 or IO module 2.

Code IO1	Code IO2	Description	Type	Priority	Reset
1537 (0x0601)	1793 (0x0701)	Watchdog reset	Event	N/A	N/A
1539 (0x0603)	1795 (0x0703)	IO module in STOP mode	Alarm	High	Manual or remote
1540 (0x0604)	1796 (0x0704)	IO module in ERROR mode	Alarm	Medium	Manual or remote
1541 (0x0605)	1797 (0x0705)	Application rotary switch position change	Event	N/A	N/A
1542 (0x0606)	1798 (0x0706)	Setting locking pad rotary switch position change	Event	N/A	N/A
1543 (0x0607)	1799 (0x0707)	Source address DIP switch position change	Event	N/A	N/A

Watchdog Reset

The watchdog reset is a firmware reset where the IO module restarts itself after detection of an IO module processing time-out.

IO Module in STOP Mode

The IO module in STOP mode alarm is generated when the IO module is out of service. Replace the IO module immediately.

IO Module in ERROR Mode

IO module in ERROR mode alarm is generated when the IO module detects that the EEPROM memory is corrupted. Replace the IO module at the next maintenance operation.

Application Rotary Switch Position Change

The application rotary switch is located on the front face of the IO module. Each time the position of the application rotary switch is changed from one application to another application, an event is generated.

Setting Locking Pad Rotary Switch Position Change

The setting locking pad is located on the front face of the IO module. Each time the position of the setting locking pad is changed, an event is generated.

Source Address DIP Switch Position Change

The source address DIP switch is located on the bottom of the IO module. Each time the position of the DIP switch is changed, an event is generated.

Application with Two IO Modules

Definition

A second IO module can be connected to the IMU when additional IO module resources are required to perform user-defined application.

The second IO module must always be set to perform the predefined application 9, the custom application *(see page 45)*.

Configuration Procedure

Step	Action
1	Set the DIP switch located on the bottom of the IO module on position 2.
2	Set the application rotary switch on position 9.

Configuration Check

The consistency of the configuration of both IO modules are checked. If the configuration of both the modules is not correct, an IO module in ERROR mode alarm is generated.

Technical Characteristics

Environmental Characteristics

Characteristic		Value
Conforming to standards		• IEC/EN 60947-1 • IACS E10
		• UL508 • UL60950
		IACS E10
Certification		CE, cULus, EAC and FCC marking
Ambient temperature	Storage	-40 to +85 °C (-40 to +185 °F)
	Operation	-25 to +70 °C (-13 to +158 °F)
Protective treatment		ULV0, conforming to IEC/EN 60068-2-30
Pollution		Level 3

Mechanical Characteristics

Characteristic	Value
Shock resistance	Conforming to IEC 60068-2-27 15 g/11 ms, 1/2 sinusoidal
Resistance to sinusoidal vibrations	Conforming to IEC/EN 60068-2-6

Electrical Characteristics

Characteristics		Value
Power supply		24 Vdc, -20%/+10% (19.2–26.4 Vdc)
Consumption	Typical	24 Vdc, 165 mA at 20 °C
	Maximum with ULP	19.2 Vdc, 420 mA at 60 °C

Physical Characteristics

Characteristic	Value
Dimensions	72 x 115 x 71 mm (2.83 x 4.52 x 2.79 in)
Mounting	DIN rail
Weight	229.5 g (0.51 lb)
Degree of protection of the installed module	• On the front panel (wall-mounted enclosure): IP4x • IO module parts: IP3x • Connectors: IP2x
Connections	Screw type terminal blocks

24 Vdc Power Supply Characteristics

It is recommended to use an UL listed/UL recognized limited voltage/limited current or a Class 2 power supply with a 24 Vdc, 3 A maximum.

For more information, refer to the *ULP System User Guide*.

Digital Inputs Characteristics

Characteristic	Value
Digital input type	Self powered digital input with current limitations as per IEC 61131-2 type 2 standards (7 mA)
Input limit values at state 1 (close)	19.8–25.2 Vdc
	6.1–8.8 mA
Input limit values at state 0 (open)	0–19.8 Vdc
	0 mA

Characteristic	Value
Maximum cable length	10 m (33 ft) **NOTE:** For a length between 10 m (33 ft) and 300 m (1,000 ft), it is mandatory to use a shielded twisted cable. The shield cable is connected to the functional ground of the IO module.

Digital Outputs Characteristics

Characteristic	Value
Digital output type	Bistable relay
Rated load	5 A at 250 Vac
Rated carry current	5 A
Maximum switching voltage	380 Vac, 125 Vdc
Maximum switch current	5 A
Maximum switching power	1250 VA, 150 W
Minimum permissible load	10 mA at 5 Vdc
Contact resistance	30 mΩ
Maximum operating frequency	• 18000 operations/hr (mechanical) • 1800 operations/hr (electrical)
Digital output relay protection	External fuse of 5 A or less
Maximum cable length	10 m (33 ft)

Analog Inputs Characteristics

The IO module analog input can be connected to a Pt100 temperature sensor.

Characteristic	Values	
Range	-30 to 200 °C	-22 to 392 °F
Accuracy	• ± 2 °C from -30 to 20 °C • ± 1 °C from 20 to 140 °C • ± 2 °C from 140 to 200 °C	• ± 3.6 °F from -22 to 68 °F • ± 1.8 °F from 68 to 284 °F • ± 3.6 °F from 284 to 392 °F
Refresh interval	5 seconds	5 seconds

Chapter 2
IO Module Predefined Applications

What Is in This Chapter?

This chapter contains the following topics:

Application 1: Cradle Management

Presentation

The cradle management application is used to:

- record and check the position of drawout circuit breakers in the cradle.
- provide information about the preventive maintenance actions.
- notify the remote controller about the position of the drawout circuit breaker.
  NOTE: When the circuit breaker is detected as being in the disconnected position, the remote controller quits polling the Micrologic trip unit. If the remote controller does not quit polling, the remote controller receives the time-out response as long as the circuit breaker is disconnected.

The cradle information is available on:

- the FDM121 display unit.
- remote controller using the communication network.
- IFE webpages.

The monitoring from a remote controller using the communication network requires a communication interface module (IFM or IFE).

Compatible Devices

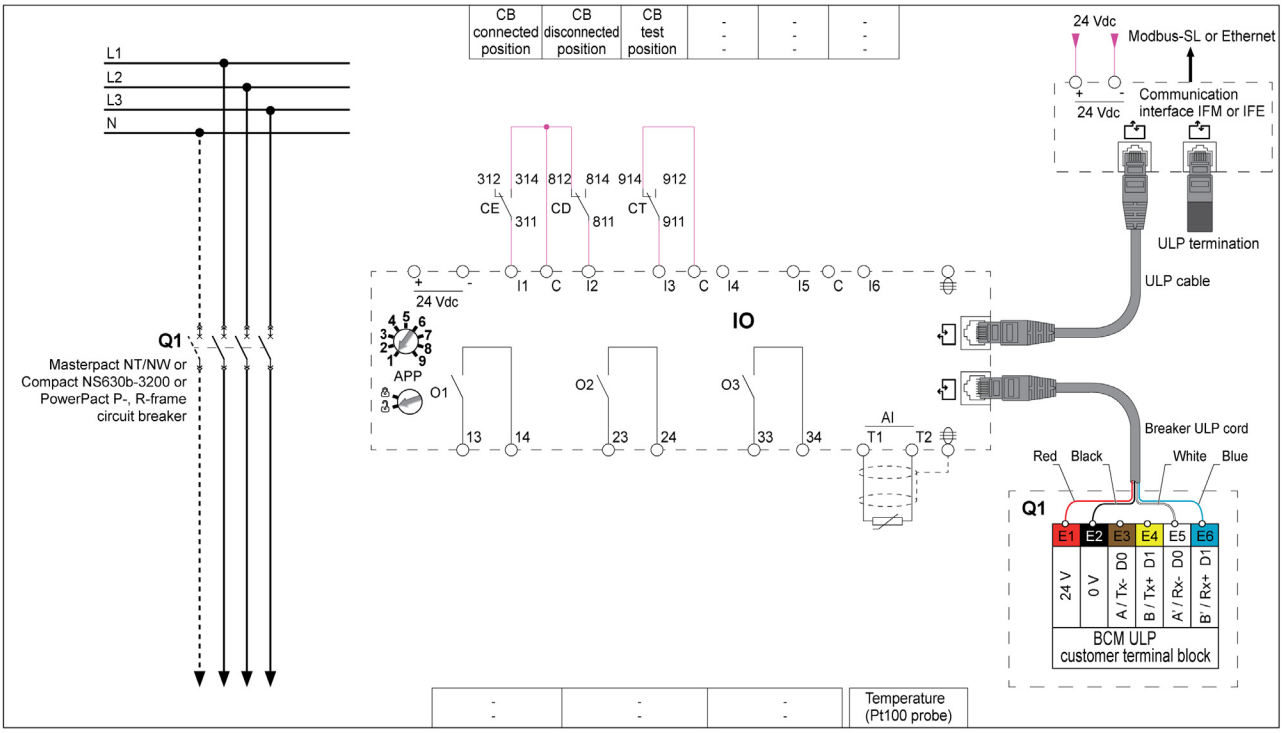
Range	Minimum Hardware Configuration Required
• Masterpact NT circuit breaker • Masterpact NW circuit breaker • Compact NS 630b-1600 circuit breaker	• Drawout circuit breaker + BCM ULP with firmware version 4.1.0 and above • Drawout switch-disconnector + BCM ULP with firmware version 4.1.0 and above
Compact NSX circuit breaker	• Withdrawable circuit breaker + BSCM with firmware version 2.2.7 and above • Withdrawable circuit breaker + Micrologic 5 or 6 trip unit with firmware version 1.0.0 and above • Withdrawable switch-disconnector + BSCM with firmware version 2.2.7 and above

Input/Output Assignment

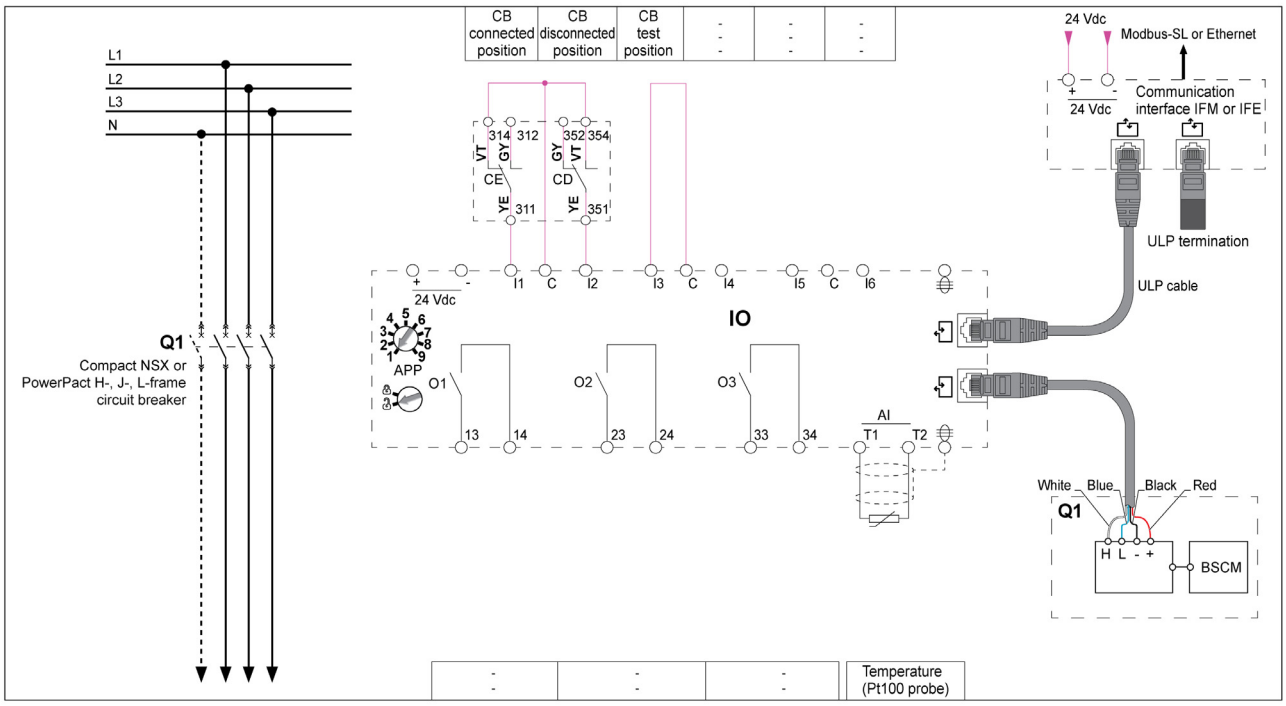
Input	Assignment
I1	Cradle connected position contact (CE)
I2	Cradle disconnected position contact (CD)
I3	Cradle test position contact (CT) **NOTE:** For Compact NSX devices: • the cradle test position contact is not applicable. • I3 must be always wired to have I3=1.
I4, I5, I6	Available
AI	Pt100 temperature sensor

Output	Assignment
O1, O2, O3	Available **NOTE:** The outputs can be assigned to the cradle position status with the customer engineering tool. For more information, refer to the user-defined applications *(see page 47)*.

Wiring Diagram for Masterpact NT/NW and Compact NS 630b-1600



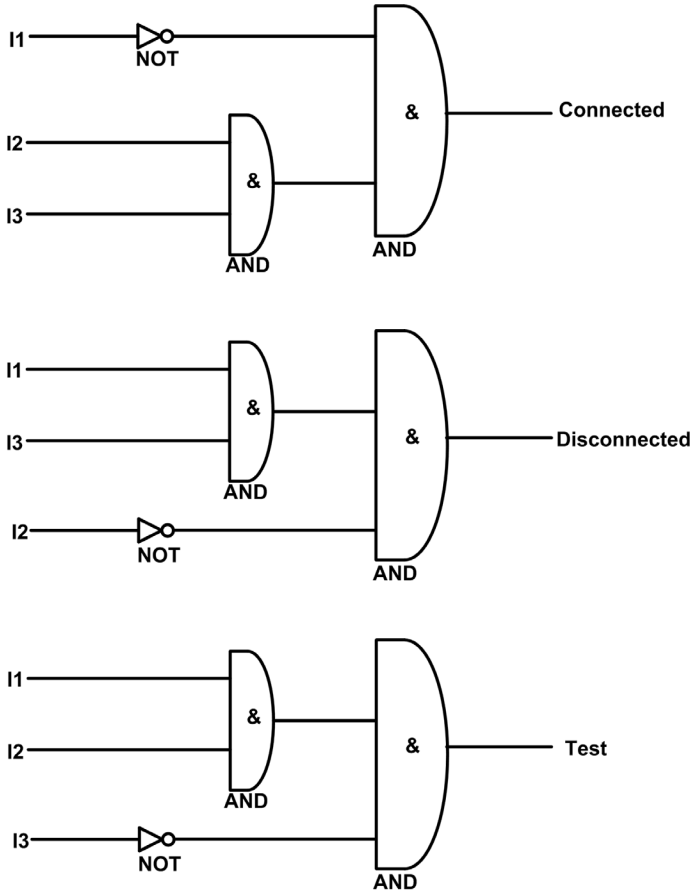
Wiring Diagram for Compact NSX



Cradle Position Status

The cradle position status is defined from the status of the digital inputs I1, I2, and I3:

- cradle in connected position (I1=0, I2=1, I3=1)
- cradle in disconnected position (I1=1, I2=0, I3=1)
- cradle in test position (I1=1, I2=1, I3=0)



I1	Cradle connected position contact (CE)
I2	Cradle disconnected position contact (CD)
I3	Cradle test position contact (CT)
Connected	Cradle is in connected position
Disconnected	Cradle is in disconnected position
Test	Cradle is in test position

Cradle Position Counters

The cradle position counters are:

- Cradle connected position counter
- Cradle disconnected position counter
- Cradle test position counter

A counter is linked to each cradle position state. The counter is incremented each time the linked state is activated.

The cradle position counters have the following properties:

- The counters are saved in non-volatile memory to prevent data loss in case of power loss.
- The counters are incremented from 0 to 65534.
- The cradle counter can be reset or preset using the customer engineering tool.

Application Events

The following events are generated by the application. For more information on IO module events, refer to Events and Alarms *(see page 24)*.

Code	Description	Type	Priority	Reset
2304 (0x0900)	Cradle position discrepancy	Alarm	Medium	Manual or remote
2305 (0x0901)	Cradle connected contact change	Event	No	N/A
2306 (0x0902)	Cradle disconnected contact change	Event	No	N/A
2307 (0x0903)	Cradle test contact change	Event	No	N/A
2308 (0x0904)	Remove device from cradle and put it back	Alarm	Medium	Manual or remote
2309 (0x0905)	Design life of the cradle, replacement of the cradle has to be performed within 6 months	Alarm	High	Manual or remote
2310 (0x0906)	Regreasing cradle and disconnecting-contact clusters to be performed by qualified maintenance staff	Alarm	Medium	Manual or remote
2311 (0x0907)	New Micrologic trip unit has been detected	Alarm	High	Manual or remote

Cradle Position Discrepancy Alarm

The IO module detects the cradle position discrepancy and generates an alarm when the cradle position contacts indicate that the circuit breaker is not in one of the allowable positions, connected, disconnected, or test.

Cradle Position Events

A time-stamped event is generated for each change on a cradle position state to record the date and time of each cradle operation.

Cradle Maintenance Alarms

Time-stamped alarms are generated to allow preventive maintenance actions:

- To remind the user to operate the cradle at least once in every year by moving the circuit breaker from connected position to disconnected position and from disconnected position to connected position. The alarm is generated after 11 months without disconnecting the circuit breaker.
- Replacement of the cradle: the cradle is designed to be connected 500 times and must be replaced before that number is reached. An alarm is generated when the cradle connected position counter reaches 450.
- Regrease the cradle and clusters: The cradle needs a comprehensive check-up when:
  - the cradle is in operation for five years,
  - or the cradle position counter reaches 250.

New Micrologic Detection Alarm

A time-stamped alarm is generated when the IO module detects that the Micrologic trip unit of the circuit breaker has been replaced. The detection is based on the Micrologic trip unit serial number.

Time-Stamped Information

The following time-stamped information is recorded:

- Last connection of the cradle
- Last disconnection of the cradle
- Last cradle in test position

The stamped information can be read by a remote controller using the communication network.

Application 2: Breaker Operation

Presentation

The application is used to control the opening and closing of the device.

The application takes into account:

- Control mode selection, defined by the control mode selector switch wired on a digital input.

NOTE: The selection of the control mode is not possible by a remote controller using the communication network or by the FDM121 display unit. The FDM121 display unit can be used to select the control mode when the IO module is not in breaker application.

- Local opening and closing orders issued from:
  - the local push-buttons wired on digital inputs.
  - the local FDM121 display unit.
- Remote opening and closing orders issued from:
  - a remote PLC outputs wired on digital inputs.
  - a remote controller using the communication network.
  - IFE web pages.
- Close inhibit order issued from:
  - the local selector switch wired on a digital input.
  - a remote controller using the communication network.

The close order can be inhibited either by a local command from the IO module or by a remote command from the remote controller.

After the close order has been inhibited locally, it has to be enabled by the local command from the IO module.

After the close order has been inhibited remotely, it has to be enabled by the remote command from the remote controller.

After the close order has been inhibited locally and remotely, it has to be enabled by the local command from the IO module and by the remote command from the remote controller.

The remote control orders issued from a remote controller using the communication network requires a communication interface module (IFM or IFE) and corresponds to:

- BCM ULP commands, refer to *Masterpact NT/NW and Compact NS Modbus Communication Guide*.
- BSCM commands, refer to *Compact NSX Modbus Communication Guide*.

Compatible Devices

Range	Minimum Hardware Configuration Required
• Masterpact NT circuit breaker • Masterpact NW circuit breaker • Compact NS 630b-1600 circuit breaker	• Fixed or drawout circuit breaker + BCM ULP with firmware version 4.1.0 and above + communicating coils MX and XF or communicating motor mechanism • Fixed or drawout switch-disconnector + BCM ULP with firmware version 4.1.0 and above + communicating coils MX and XF or communicating motor mechanism
Compact NSX circuit breaker	• Fixed or withdrawable circuit breaker + BSCM with firmware version 2.2.7 and above + communicating motor mechanism • Fixed or withdrawable switch-disconnector + BSCM with firmware version 2.2.7 and above + communicating motor mechanism

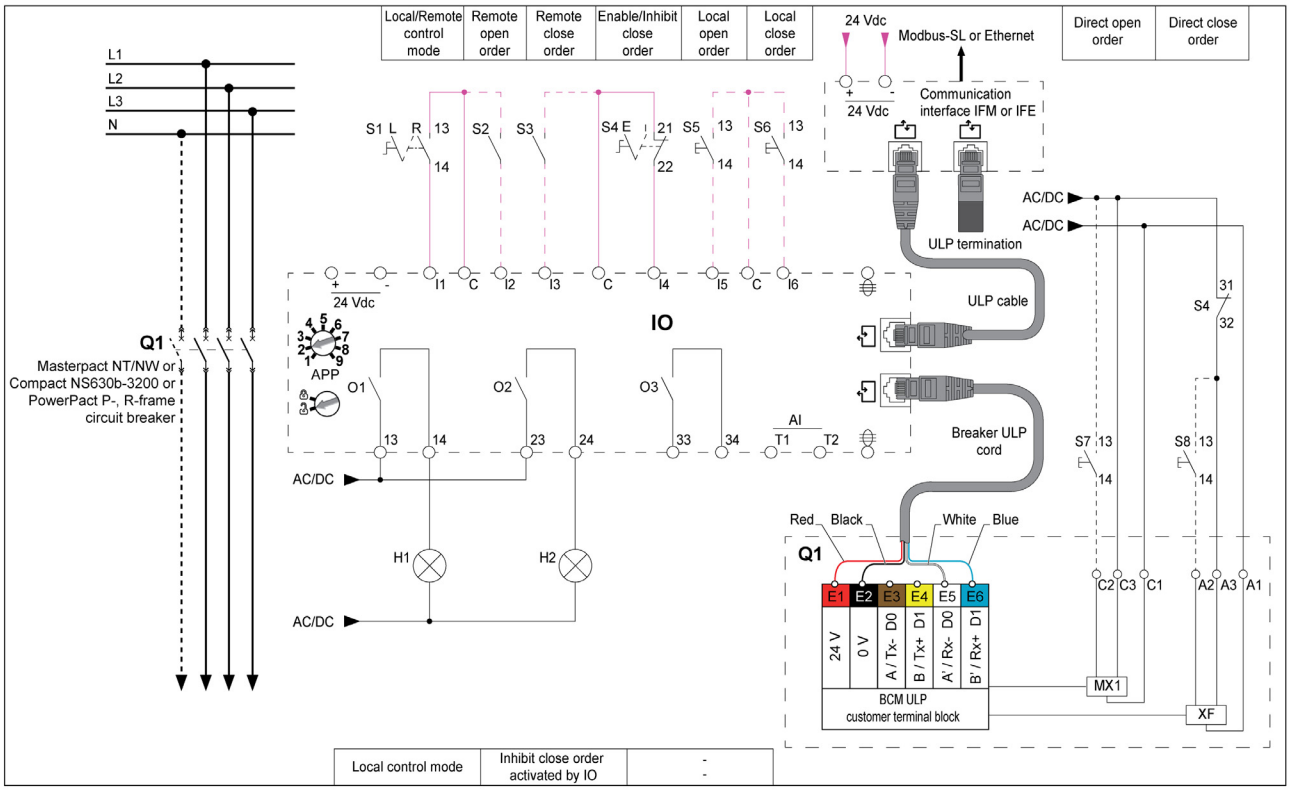
Input/Output Assignment

Input	Assignment
I1	Local(0)/Remote(1) control mode. If the input is not wired, the IMU is in local mode (I1=0). If there is a control mode selector switch, it is recommended to wire I1 to have I1=1.
I2	Remote open order
I3	Remote close order
I4	Inhibit(0)/Enable(1) close order. If the input is not wired, close order is inhibited (I4=0).
I5	Local open order
I6	Local close order

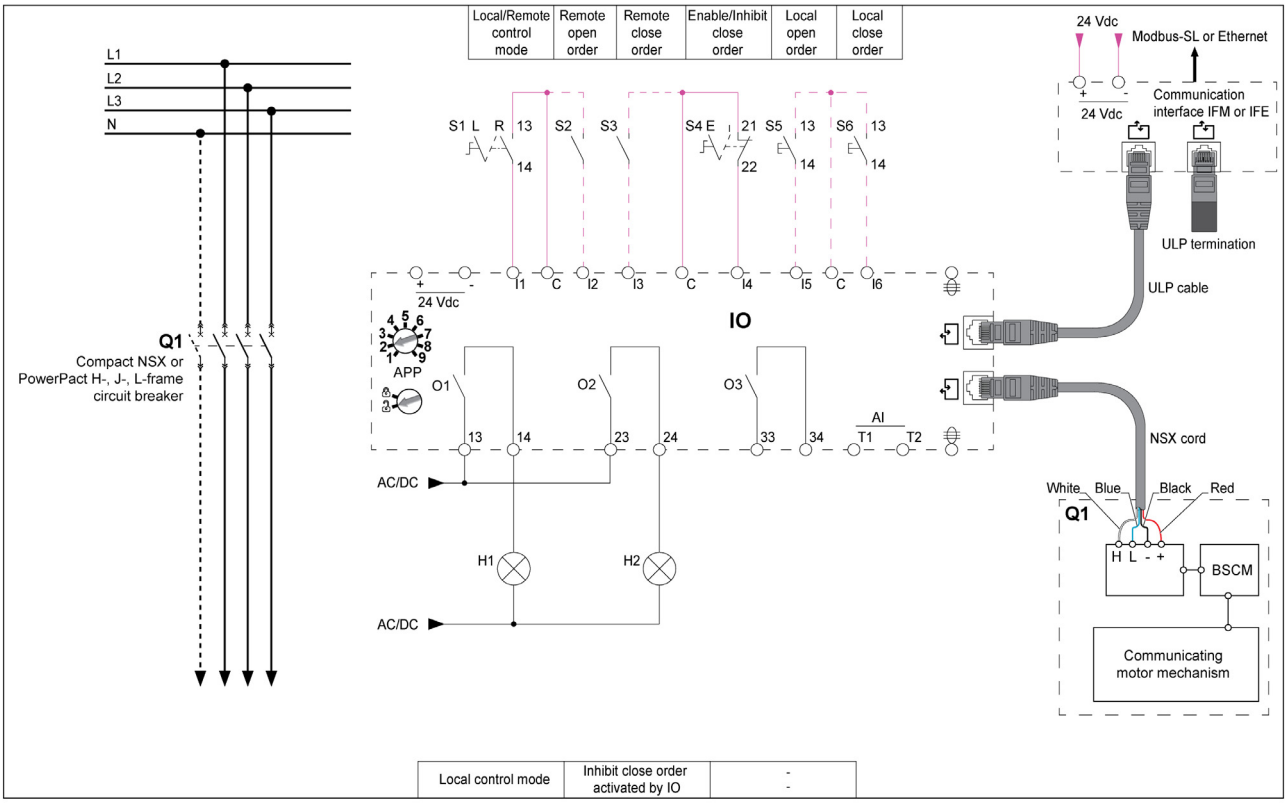
Input	Assignment
AI	Available

Output	Assignment
O1	Local control mode
O2	Inhibit close order activated by IO module
O3	Available

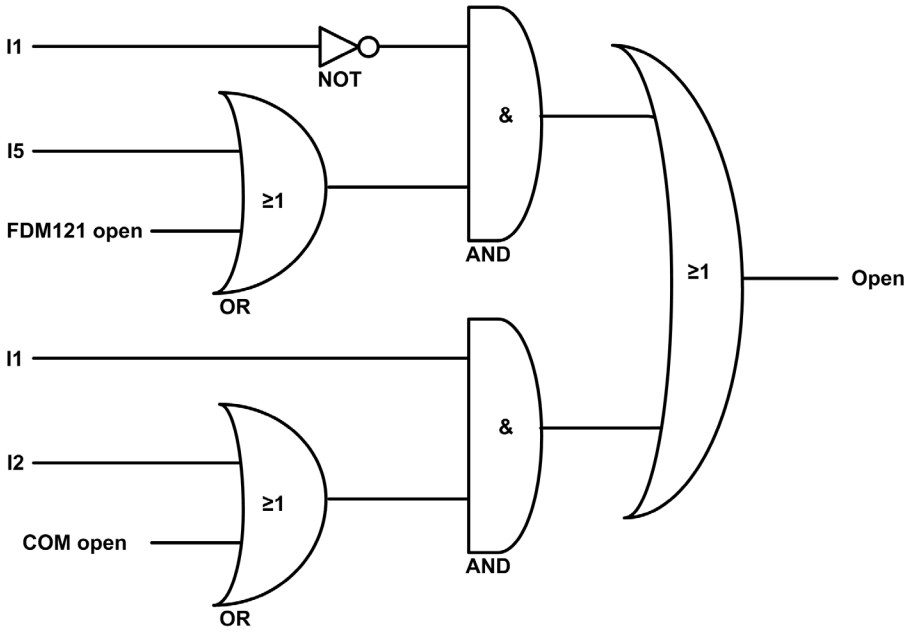
Wiring Diagram with Masterpact NT/NW and Compact NS Circuit Breaker



Wiring Diagram with Compact NSX Circuit Breaker



Device Open Command



I1	Local(0)/Remote(1) control mode
I2	Remote open order
I5	Local open order
FDM121 open	Open order from local FDM121 display unit
COM open	Open order from a remote controller using the communication network

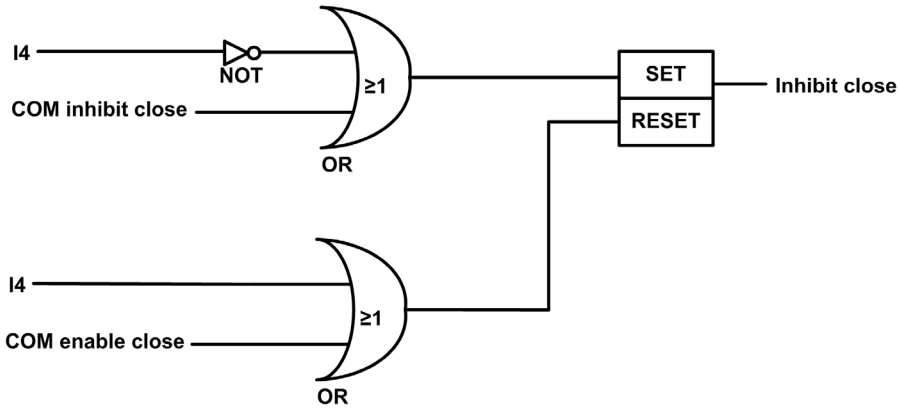
Open	Device open command to: ● communicating motor mechanism to open Compact NSX devices. ● MX communicating coil to open Masterpact NT/NW or Compact NS devices.

NOTE: The pulse width of the close orders must be set to minimum one second.

Masterpact NT/NW and Compact NS Circuit Breakers Direct Open Order

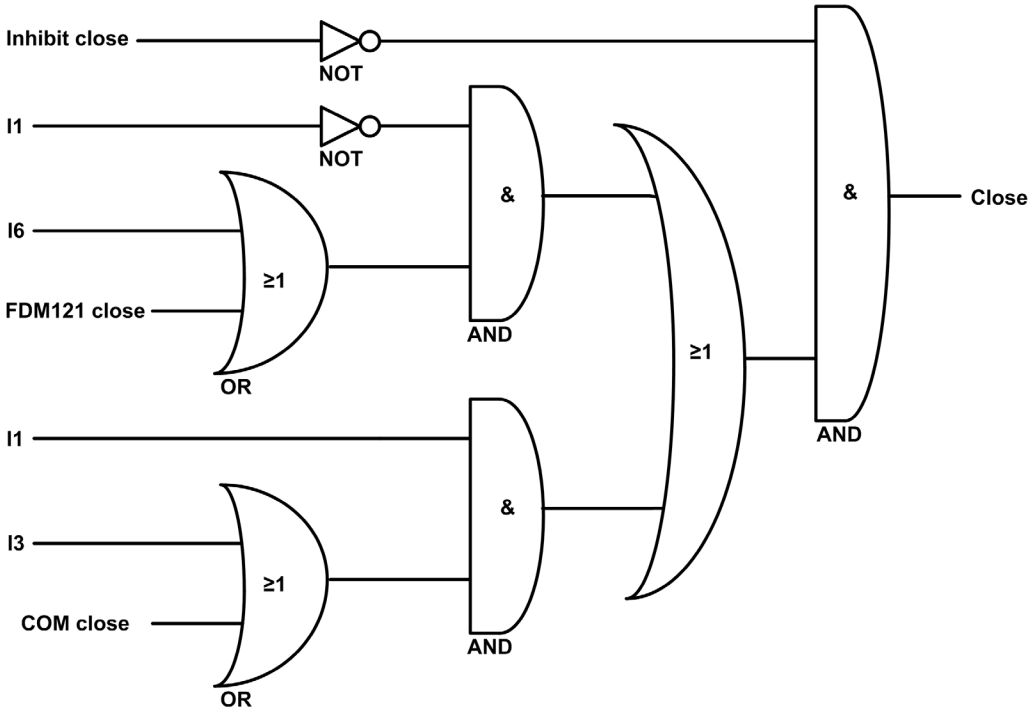
On Masterpact NT/NW and Compact NS devices, an open order command can be wired directly to the MX communicating coil to open the device, without taking into account the control mode or the data processed by the IO module.

Inhibit Close Order



I4	Inhibit(0)/Enable(1) close order
COM inhibit close	Inhibit close order from a remote controller using the communication network
COM enable close	Enable close order from a remote controller using the communication network
Inhibit close	Close order is inhibited(1) or enabled(0)

Device Close Command



Inhibit close	Close order inhibited(1) or enabled(0)
I1	Local(0)/Remote(1) control mode
I3	Remote close order
I6	Local close order
FDM121 close	Close order from the local the FDM121 display unit
COM close	Close order from a remote controller using the communication network
Close	Device close command to: ● communicating motor mechanism to close the Compact NSX device. ● XF communicating coil to close Masterpact NT/NW or Compact NS 630b-1600 devices.

NOTE: The pulse width of the close orders must be set to minimum one second.

Masterpact NT/NW and Compact NS 630b-1600 Circuit Breakers Direct Close Order

On Masterpact NT/NW and Compact NS 630b-1600 devices, a direct close order can be wired directly to the command XF communicating coil to close the devices, without taking into account the control mode or the data processed by the IO modules.

Application 3: Cradle Management and Energy Reduction Maintenance Setting

Presentation

Application 3 is the combination of two functions:

- The cradle management function, with the same features as the predefined application 1 *(see page 30)*.
- The energy reduction maintenance setting function described here in detail.

Energy Reduction Maintenance Setting Function

The energy reduction maintenance setting (ERMS) function is compatible only with the Masterpact NT/NW and Compact NS circuit breakers. It allows the selection of the Micrologic P and H trip unit settings: Normal and ERMS mode.

This application is used to reduce the instantaneous (Ii) protection settings in order to trip as fast as possible when a fault occurs. The factory setting for Ii protection in ERMS mode is 2xIn. This protection parameter can be modified using the customer engineering tool *(see page 17)*.

The ERMS mode is in the OFF state if the Ii setting is less than the ERMS setting.

⚠ DANGER

HAZARD OF ARC FLASH

- DO NOT change the Micrologic P/H trip unit setting while in ERMS mode.
- Seal the transparent cover of the Micrologic P and H trip unit when using the ERMS mode.

Failure to follow these instructions will result in death or serious injury.

If any of the basic protection settings using the rotary dial is modified on the Micrologic trip unit while in ERMS mode, the Micrologic trip unit switches immediately to the normal mode. The Micrologic trip unit returns automatically to the ERMS mode after 5 seconds.

The selection of the normal or ERMS mode is made by a selector switch connected to two inputs. When the ERMS mode is engaged, ERMS is displayed on the display of the Micrologic trip unit and a pilot light connected to output O3 is in the ON state.

The locking pad of the communication interface module (IFM or IFE) must be in the UNLOCK position (padlock open) while performing the energy reduction maintenance setting (ERMS).

The parameter **ACCESS PERMIT** in the COM setup/Remote setting menu on the display of the Micrologic trip unit must be set on **YES** for **IMU** without IFM/IFE.

This is based on the following behavior:

- **IMU** with **IFM/IFE**
  - **Setting access permit parameter:**
    The access permit parameter can be changed only from IFE/IFM using the LOCK/UNLOCK dial.
  - **Behavior:**
    ERMS ON and OFF orders are executed even if theaccess permit parameter is set as **NO**.
- **IMU** without **IFM/IFE**
  - **Setting access permit parameter:**
    The access permit parameter can be changed only from the display of the Micrologic trip unit.
  - **Behavior:**
    ERMS ON and OFF orders are not executed if the access permit parameter is set as **NO**.

NOTE: The ERMS ON and OFF orders are executed only when the access parameter is set to **YES** and the passcode in the Micrologic trip unit is set to **0000**.

For more information, refer to *Micrologic P and H Trip Units User Guides*.

Compatible Devices

Range	Minimum Hardware Configuration Required
• Masterpact NT circuit breaker • Masterpact NW circuit breaker • Compact NS 630b-1600 circuit breaker • Compact NS 1600b-3200 circuit breaker	Fixed or drawout circuit breaker + BCM ULP with firmware version 4.1.0 and above + Micrologic P trip unit with firmware version Plogic-2013AN or v8282 and above or Micrologic H trip unit with firmware version Hlogic-2013AN or v8282 and above

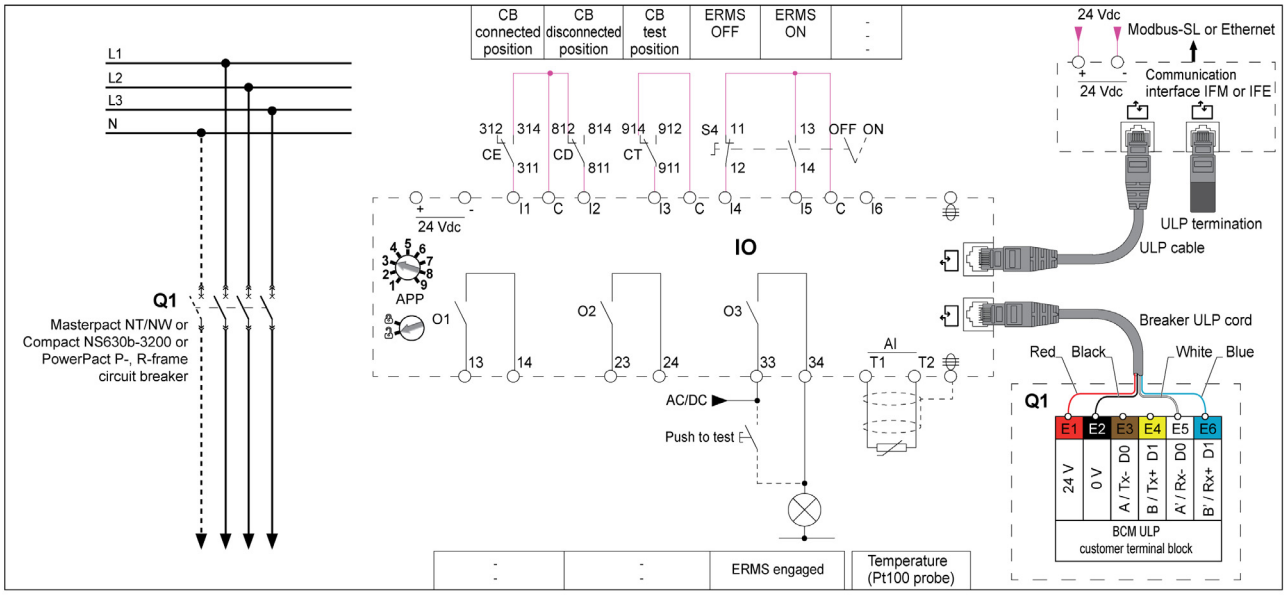
Input/Output Assignment

Input	Assignment
I1	Cradle connected position contact (CE)
I2	Cradle disconnected position contact (CD)
I3	Cradle test position contact (CT)
I4	Energy reduction maintenance setting OFF order
I5	Energy reduction maintenance setting ON order
I6	Available **NOTE:** The outputs can be assigned to the cradle position status with the customer engineering tool. For more information, refer to the user-defined applications *(see page 47)*.
AI	Pt100 temperature sensor

Output	Assignment
O1, O2	Available **NOTE:** The outputs can be assigned to the cradle position status with the customer engineering tool. For more information, refer to the user-defined applications *(see page 47)*.
O3	Energy reduction maintenance setting engaged

NOTE: Switch off the ERMS from the active module (IO module 1 or IO module 2) before changing the ERMS assignments. For example: When ERMS is assigned to IO module 1and you want to assign ERMS inputs to IO module 2 then switch off the ERMS in IO module 1and then assign ERMS inputs to IO module 2.

Wiring Diagram



ERMS Mode Engaged

A digital output is assigned to indicate that the ERMS mode is engaged. This output relay is closed in the ERMS mode.

ERMS may be activated after a short delay due to internal controls in the system. Ensure that the output 3 (O3) of IO module is ON, and Micrologic HMI displays ERMS before operating the equipment.

Cradle Management Events

The events generated by the cradle management function are the same as the events generated by the Application 1 *(see page 30)*.

ERMS Events

The following alarm is generated by the ERMS function. For more information on IO module events, refer to Events and Alarms *(see page 24)*.

Code	Description	Type	Priority	Reset
3072 (0x0C00)	Discrepancy with ERMS orders	Alarm	Medium	Manual or remote
3073 (0x0C01)	ERMS setting inconsistency	Alarm	High	Auto
3074 (0x0C02)	ERMS engaged for more than 24 hours	Alarm	High	Auto

NOTE: The alarms 3073 and 3074 are generated by BCM ULP module.

Discrepancy with ERMS Orders

The IO module detects the ERMS order discrepancy and generates an alarm when I4 and I5 are 1 or when I4 and I5 are 0.

When the alarm is generated while ERMS mode is engaged, it is necessary to reset the alarm in order to switch off the ERMS mode.

When the alarm is generated while ERMS mode is not engaged, it is necessary to reset the alarm in order to switch on the ERMS mode.

ERMS Setting Inconsistency

This event is generated in ERMS mode when the ERMS setting (Ierms) is set above the Ii protection setting of trip unit.

ERMS Engaged for More Than 24 Hours

A maintenance operation requiring switching the Ii protection settings in ERMS mode normally lasts for no more than a few hours. Therefore, when the ERMS mode is engaged for more than 24 hours, an event is generated to remind the user to switch the Ii protection settings back in normal mode.

Application 4: Light and Load Control

Presentation

- The light-control application is used to switch the lights on and off remotely. The lights are controlled by an impulse relay. The switch order can be either delayed or not.
- The load-control application is used to switch the loads on and off remotely. The loads are controlled by a contactor. The switch order can be either delayed or not.

The light and load orders are issued from:

- the local FDM121 display unit.
- the local push-buttons (S1, S2...) connected to the impulse relay (light control).
- a remote controller using the communication network.
- the IFE web pages, only when the IO module is connected to a circuit breaker.

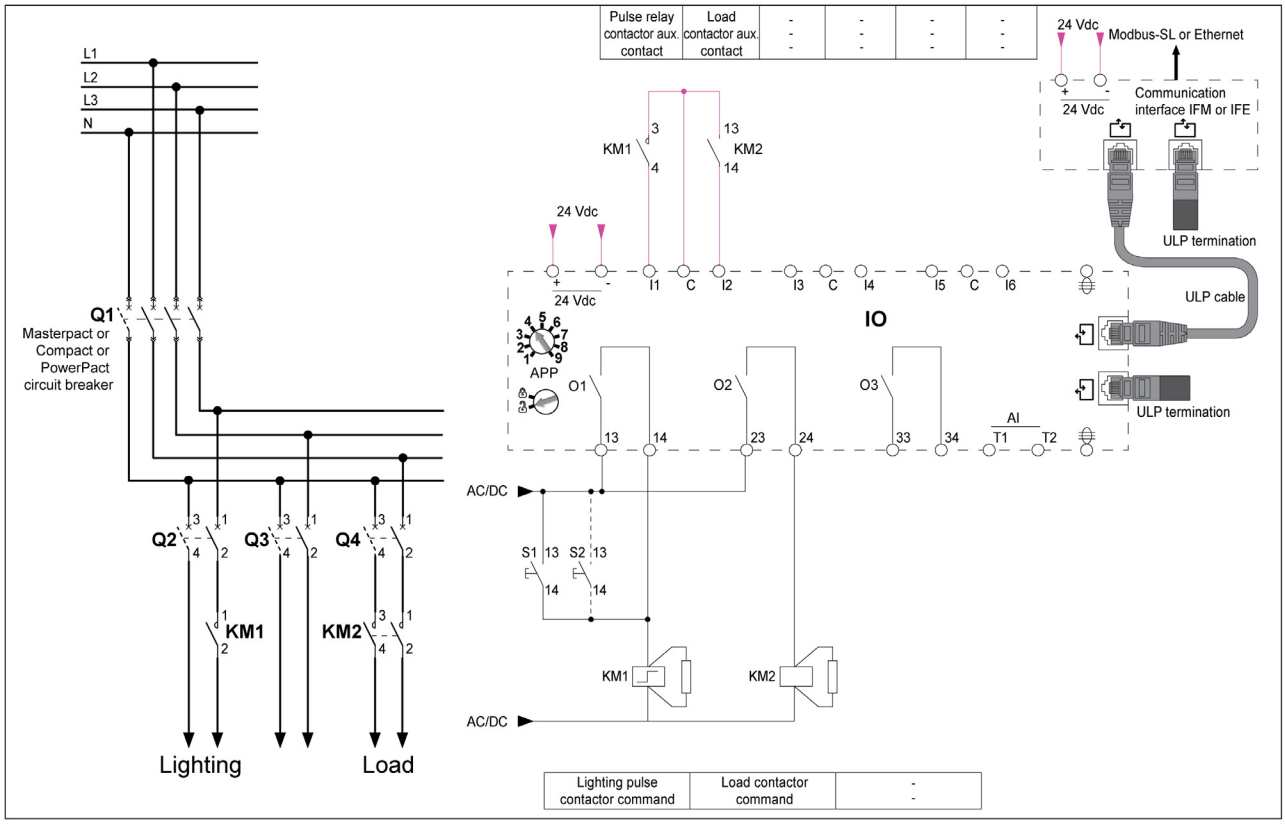
The orders issued from a remote controller using the communication network correspond to IO module commands. These orders require a communication interface module (IFM or IFE).

Input/Output Assignment

Input	Assignment
I1	Lighting pulse relay feedback
I2	Load contactor feedback
I3, I4, I5, I6	Available
AI	Available

Output	Assignment
O1	Lighting pulse relay command
O2	Load contactor command
O3	Available

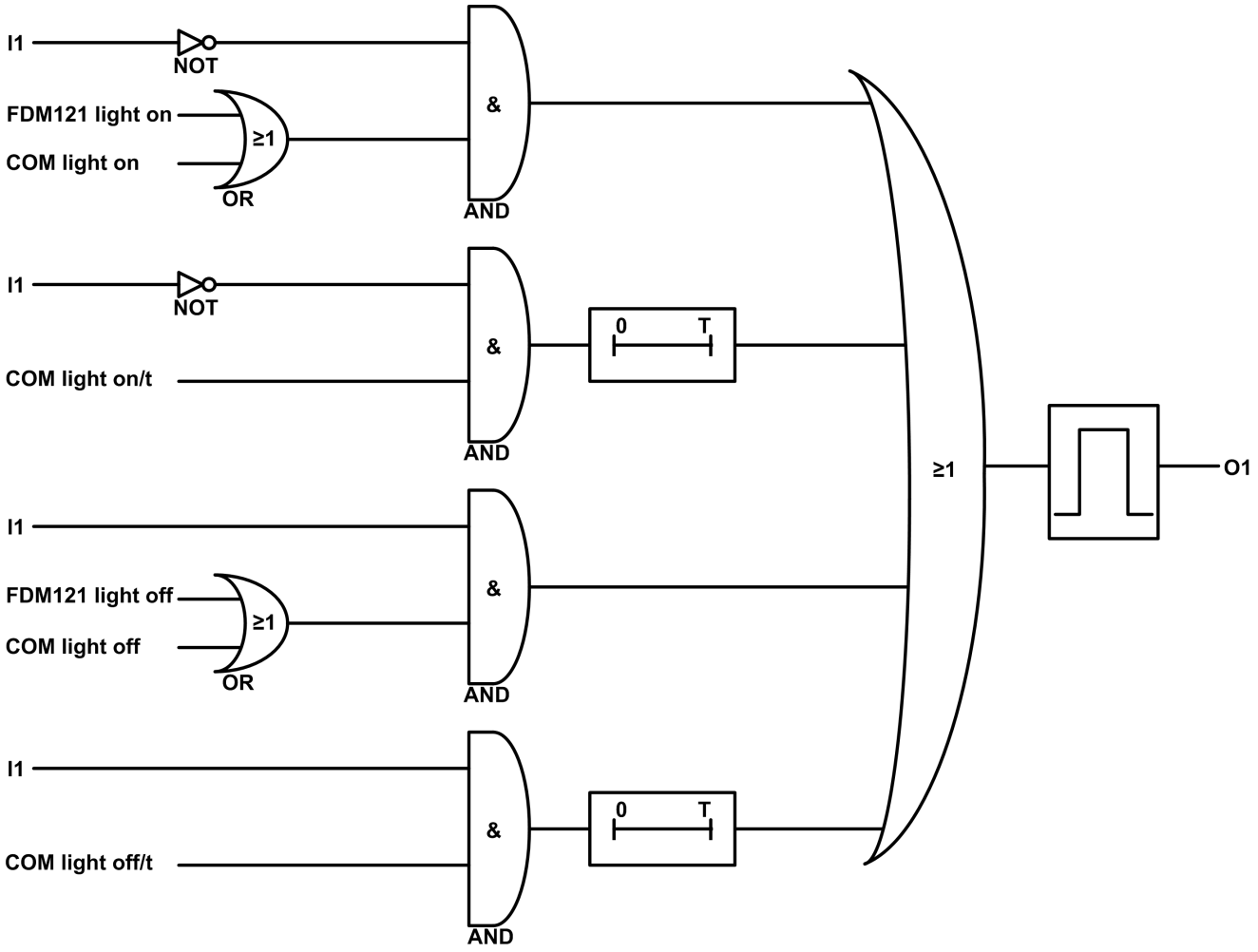
Wiring Diagram



Light Control Block Diagram

The light is controlled by an impulse relay. The relay is switched off and on after receiving a command pulse delivered by the IO module or local push-buttons.

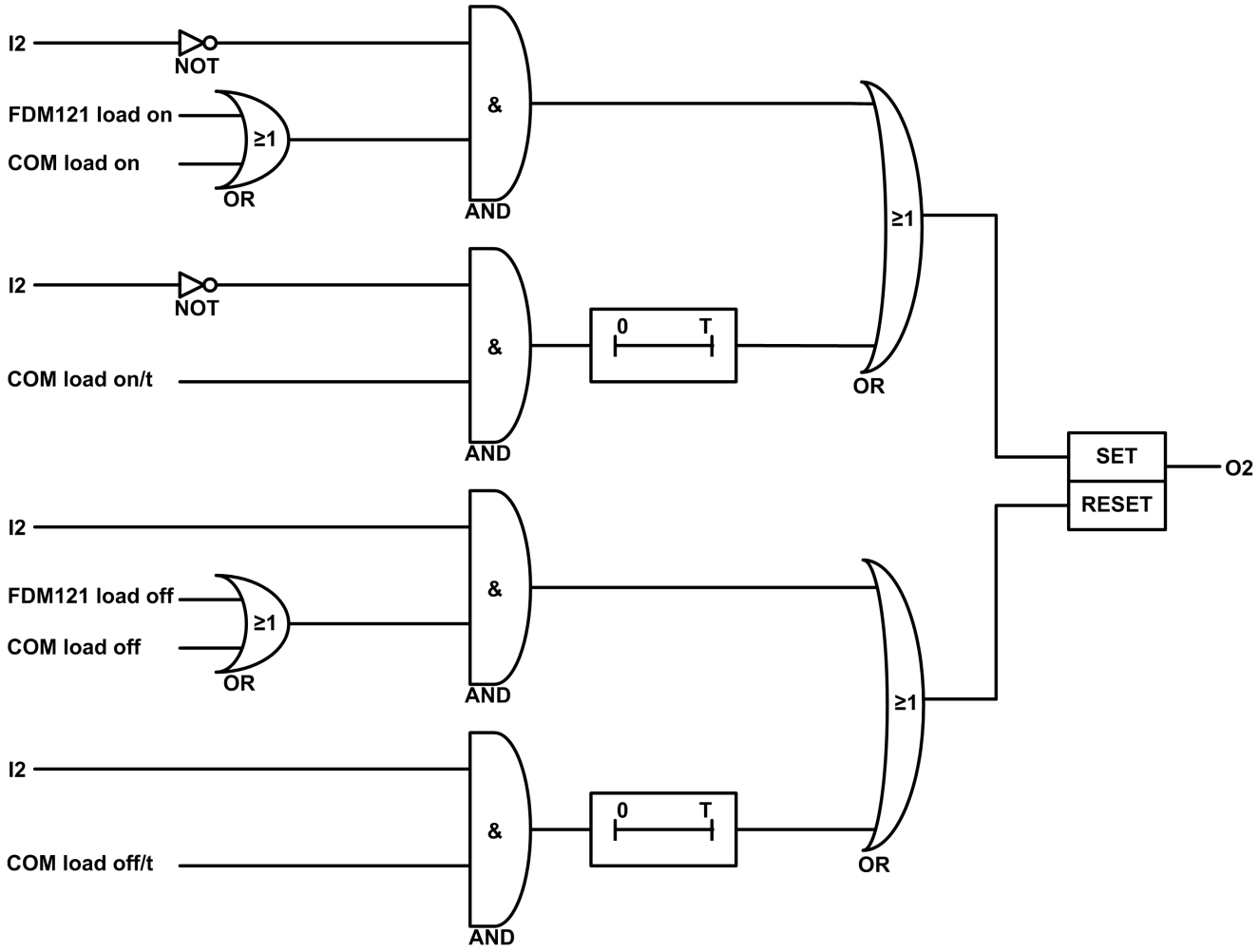
The delayed switching order specifies the waiting time in seconds before execution of the order by the IO module.



I1	Lighting impulse relay feedback
FDM121 light on	Instantaneous light switch on order from the FDM121 display unit
COM light on	Instantaneous light switch on order from a remote controller using the communication network
COM light on/t	Delayed light switch on order with t seconds delay from a remote controller using the communication network
FDM121 light off	Instantaneous light switch off order from the FDM121 display unit
COM light off	Instantaneous light switch off order from a remote controller using the communication network
COM light off/t	Delayed light switch off order with t seconds delay from a remote controller using the communication network
O1	Lighting impulse relay command

Load Control Block Diagram

The load is controlled by a contactor. The contactor is switched on and off by the IO module. The delayed switching order specifies the waiting time in seconds before execution of the order by the IO module.



I2	Load contactor feedback
FDM121 load on	Instantaneous load switch on order from the FDM121 display unit
COM load on	Instantaneous load switch on order from a remote controller using the communication network
COM load on/t	Delayed load switch on order with t seconds delay from a remote controller using the communication network
FDM121 load off	Instantaneous load switch off order from the FDM121 display unit
COM load off	Instantaneous load switch off order from a remote controller using the communication network
COM load off/t	Delayed load switch off order with t seconds delay from a remote controller using the communication network
O2	Load contactor command

Application Events

The following events are generated by the application. For more information on IO module events, refer to Events and Alarms *(see page 24)*.

Code	Description	Type	Priority	Reset
2560 (0x0A00)	Aux contact of the load contactor 1 is not closed	Alarm	Medium	Manual or remote
2561 (0x0A01)	Aux contact of the load contactor 1 is not opened	Alarm	Medium	Manual or remote

Application 9: Custom

Presentation

The custom application is used to perform user-defined applications with the IO modules.

IO module 2 is always assigned to application 9 to perform user-defined applications. If IO module 2 is not assigned to application 9, IO module 2 is in a conflict mode.

The user-defined applications performed by the IO modules require prior configuration using a customer engineering tool *(see page 17)*.

User-Defined Applications

The user-defined applications are categorized according to:

- Protection functions
- Control functions
- Energy management functions
- Monitoring functions

Each user-defined application is described in IO Module User-Defined Applications *(see page 47)*.

Chapter 3
IO Module User-Defined Applications

What Is in This Chapter?

This chapter contains the following sections:

Section 3.1
Protection Functions

Energy Reduction Maintenance Setting (ERMS)

Presentation

The energy reduction maintenance setting (ERMS) user-defined application has the same features and generates the same events as the ERMS function of predefined application 3 *(see page 39)*.

Compatible Devices

Range	Minimum Hardware Configuration Required
• Masterpact NT circuit breaker • Masterpact NW circuit breaker • Compact NS 630b-1600 circuit breaker • Compact NS 1600b-3200 circuit breaker	Fixed or drawout circuit breaker + BCM ULP with firmware version 4.1.0 and above + Micrologic P trip unit with firmware version Plogic-2013AN or v8282 and above or Micrologic H trip unit with firmware version Hlogic-2013AN or v8282 and above.

Input/Output Assignments

The tables below list the possible assignment of the digital inputs and outputs, according to the predefined application selected on the IO module:

Inputs	Predefined Application Selected									
	1	2	3	4	5	6	7	8	9 (IO1)	9 (IO2)
ERMS OFF order	I4	–	–	I4	–	–	–	–	I4	I4
ERMS ON order	I5	–	–	I5	–	–	–	–	I5	I5

Outputs	Predefined Application Selected									
	1	2	3	4	5	6	7	8	9 (IO1)	9 (IO2)
ERMS engaged	O3	–	–	O3	–	–	–	–	O3	O3

Section 3.2
Control Functions

What Is in This Section?

This section contains the following topics:

Enable/Inhibit Close Order

Presentation

The application is used to inhibit the close order of the device in local or remote control mode.

The application takes into account an inhibit close order issued from:
- the local selector switch wired on a digital input.
- the remote controller using the communication network.

The close order can be inhibited either by a local command from the IO module or by a remote command from the remote controller.

When the close order has been inhibited locally, it can only be enabled by the local command from the IO module.

When the close order has been inhibited remotely, it can only be enabled by the remote command from the remote controller.

When the close order has been inhibited locally and remotely, it can only be enabled by the local command from the IO module and by the remote command from the remote controller.

Compatible Devices

Range	Minimum Hardware Configuration Required
• Masterpact NT circuit breaker • Masterpact NW circuit breaker • Compact NS 630b-1600 circuit breaker	• Fixed or drawout circuit breaker + BCM ULP with firmware version 4.1.0 and above + communicating coil XF or communicating motor mechanism • Fixed or drawout switch-disconnector + BCM ULP with firmware version 4.1.0 and above + communicating coil XF or communicating motor mechanism
Compact NSX circuit breaker	• Fixed or withdrawable circuit breaker + BSCM with firmware version 2.2.7 and above + communicating motor mechanism • Fixed or withdrawable switch-disconnector + BSCM with firmware version 2.2.7 and above + communicating motor mechanism

Input/Output Assignment

The tables below list the possible assignment of the digital inputs and outputs, according to the predefined application selected on the IO module:

Input	Predefined Application Selected									
	1	2	3	4	5	6	7	8	9 (IO1)	9 (IO2)
Enable/Inhibit close order: • I=0: inhibit close order • I=1: enable close order	I4–I6	–	I6	I3–I6	–	–	–	–	I1–I6	–

Output	Predefined Application Selected									
	1	2	3	4	5	6	7	8	9 (IO1)	9 (IO2)
Inhibit close order activated by IO Module: • O=0: close order is enabled • O=1: close order is inhibited	O1–O3	–	O1, O2	O3	–	–	–	–	O1–O3	O1–O3

User-Defined Output

Presentation

The user-defined output allows the control of any of the digital outputs. The orders are issued from:

- a remote controller using a communication network.
- the IFE web pages, only when the IO module is connected to a circuit breaker.

The time response between the order coming from the communication module and the physical activation of the output is greater than 500 ms.

It is possible to force and unforce the output with any type of assignment.

The orders issued from a remote controller using the communication network corresponds to IO module commands. These orders require a communication interface module (IFM or IFE).

The user-defined output can be assigned using the customer engineering tool.

Input/Output Assignment

The table below lists the possible assignment of the digital outputs, according to the predefined application selected on the IO module:

Output	Predefined Application Selected									
	1	2	3	4	5	6	7	8	9 (IO1)	9 (IO2)
User-defined output	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3

Section 3.3
Energy Management Functions

What Is in This Section?

This section contains the following topics:

Energy Counter Reset

Presentation

The energy counter reset is used to reset the IO module user-defined pulse counters. The energy counter reset order can be activated by:

- a push-button connected to an IO module digital input, the counters are reset when input is 1.
- a remote controller using the communication network.
- the IFE web pages, only when the IO module is connected to a circuit breaker.

The order issued from a remote controller using the communication network corresponds to IO module command. This order requires a communication interface module (IFM or IFE).

Input/Output Assignment

The table below lists the possible assignment of the digital inputs according to the predefined application selected on the IO module:

Inputs	Predefined Application Selected									
	1	2	3	4	5	6	7	8	9 (IO1)	9 (IO2)
Energy counter reset: I=1 resets the energy counters	I4–I6	–	I6	I3–I6	–	–	–	–	I1–I6	I1–I6

User-Defined Pulse Counters

Presentation

Pulse counters are used to calculate the total and partial consumption of energy or the total and partial volume measured by a metering device with a pulse output:

- Energy meters: measuring active, reactive, or apparent energy
- Volume meters: measuring volumes in cubic-meters

The pulse output of the metering device must be wired to an IO module digital input, configured as a pulse digital input *(see page 18)*.

Each pulse counter calculates:

- The total consumption, not a resettable value.
- The partial consumption, a resettable value indicating the consumption since the last reset.

The partial counters can be displayed on:

- a FDM121 display unit.
- the IFE web pages, only when the IO module is connected to a circuit breaker.

The partial consumption can be reset from:

- the energy counter reset input *(see page 53)*
- a remote controller using the communication network.
- the customer engineering tool *(see page 17)*.

The date and time of the last reset of the partial consumption is recorded.

If the pulse counter calculates active energy, the instantaneous active power is also calculated.

The consumption values are saved in non-volatile memory to prevent a data loss if there is a power loss.

The monitoring from a remote controller using the communication network requires a communication interface module (IFM or IFE).

Input/Output Assignment

The table below lists the possible assignment of the digital inputs, according to the predefined application selected on the IO module:

Inputs	**Predefined Application Selected**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9 (IO1)**	**9 (IO2)**
Pulse counter on input 1	–	–	–	–	–	–	–	–	I1	I1
Pulse counter on input 2	–	–	–	–	–	–	–	–	I2	I2
Pulse counter on input 3	–	–	–	I3	–	–	–	–	I3	I3
Pulse counter on input 4	I4	–	–	I4	–	–	–	–	I4	I4
Pulse counter on input 5	I5	–	–	I5	–	–	–	–	I5	I5
Pulse counter on input 6	I6	–	I6	I6	–	–	–	–	I6	I6

Section 3.4
Monitoring Functions

What Is in This Section?

This section contains the following topics:

Cradle Management

Presentation

The cradle management application is performed by the predefined application 1 *(see page 30)*. In addition, the user-defined application allows the assignment of the cradle position to available digital outputs for local indication.

NOTE: The cradle and the drawer applications cannot be configured together.

Compatible Devices

Range	Minimum Hardware Configuration Required
• Masterpact NT circuit breaker • Masterpact NW circuit breaker • Compact NS 630b-1600 circuit breaker	• Drawout circuit breaker + BCM ULP with firmware version 4.1.0 and above • Drawout switch-disconnector + BCM ULP with firmware version 4.1.0 and above
Compact NSX circuit breaker	• Withdrawable circuit breaker + BSCM with firmware version 2.2.7 and above • Withdrawable circuit breaker + Micrologic 5 or 6 trip unit with firmware version 1.0.0 and above • Withdrawable switch-disconnector + BSCM with firmware version 2.2.7 and above

Input/Output Assignment

The tables below list the possible assignment of the digital inputs and outputs, according to the predefined application selected in the IO module:

Inputs	Predefined Application Selected									
	1	2	3	4	5	6	7	8	9 (IO1)	9 (IO2)
Cradle connected position contact (CE)	–	–	–	–	–	–	–	–	–	I1
Cradle disconnected position contact (CD)	–	–	–	–	–	–	–	–	–	I2
Cradle test position contact (CT)	–	–	–	–	–	–	–	–	–	I3

NOTE: For Compact NSX devices:
- the cradle test position contact is not applicable.
- I3 must be always wired to have I3=1.

Outputs	Predefined Application Selected									
	1	2	3	4	5	6	7	8	9 (IO1)	9 (IO2)
Cradle connected position status	O1, O2, O3	O3	O1, O2	O3	–	–	–	–	O1, O2, O3	O1, O2, O3
Cradle disconnected position status	O1, O2, O3	O3	O1, O2	O3	–	–	–	–	O1, O2, O3	O1, O2, O3
Cradle test position status	O1, O2, O3	O3	O1, O2	O3	–	–	–	–	O1, O2, O3	O1, O2, O3

Drawer Management

Presentation

The drawer management application is used to record and check the position of withdrawable drawers.

The monitoring from a remote controller using the communication network requires a communication interface module (IFM or IFE).

NOTE: The cradle and the drawer applications cannot be configured together.

Input/Output Assignment

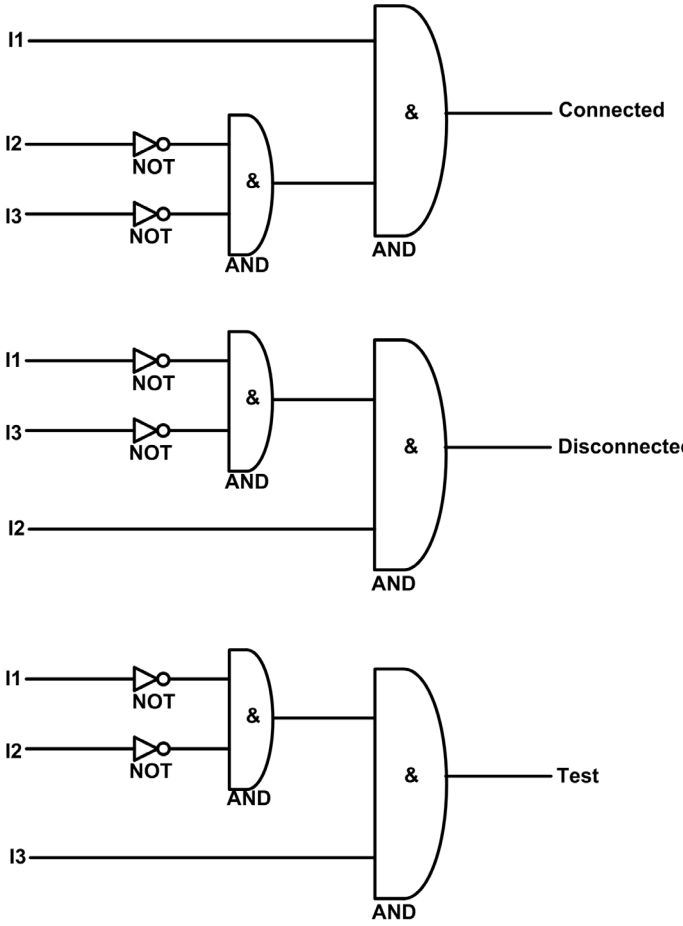
The table below lists the possible assignment of the digital inputs, according to the predefined application selected on the IO module:

Inputs	Predefined Application Selected									
	1	2	3	4	5	6	7	8	9 (IO1)	9 (IO2)
Drawer connected position contact (CE)	–	–	–	–	–	–	–	–	I1	I1
Drawer disconnected position contact (CD)	–	–	–	–	–	–	–	–	I2	I2
Drawer test position contact (CT)	–	–	–	–	–	–	–	–	I3	I3

Drawer Position Status

The drawer position status is defined from the status of the digital inputs I1, I2, and I3.

- Drawer in connected position (I1=1, I2=0, I3=0)
- Drawer in disconnected position (I1=0, I2=1, I3=0)
- Drawer in test position (I1=0, I2=0, I3=1)



I1	Drawer connected position contact (CE)
I2	Drawer disconnected position contact (CD)

I3	Drawer test position contact (CT)
Connected	Drawer is in connected position
Disconnected	Drawer is in disconnected position
Test	Drawer is in test position

Drawer Position Counters

The drawer position counters are:

- Drawer connected position counter
- Drawer disconnected position counter
- Drawer test position counter

A counter is linked to each drawer position state. The counter is incremented on each rising edge of the linked state.

The drawer position counters have the following properties:

- The counters are saved in non-volatile memory to prevent a data loss if there is a power loss.
- The counters are incremented from 0 to 65534.
- The counters can be preset to any value from 0 to 65534, using either the customer engineering tool, or the FDM121 display unit.

Application Events

The following event is generated by the application. For more information on IO module events, refer to Events and Alarms *(see page 24)*.

Code	Description	Type	Priority	Reset
2432 (0X980)	Drawer position discrepancy	Alarm	Medium	Manual or Remote

Drawer Position Discrepancy Alarm

The IO module detects any drawer position discrepancy and generates an alarm when the drawer position contacts indicate that the drawer is not in one of the possible positions, connected, disconnected, test, or none of the positions.

Cooling System

Presentation

The cooling system application is used to record the events related to the switchboard environment:

- Events related to switchboard states, connected on digital inputs.
- Events related to the temperature measured by Pt100 sensors, connected to analog inputs. These events can be assigned to digital outputs for local signalization.

The temperatures measured by the Pt100 sensors can be displayed on:

- the FDM121 display unit.
- the IFE web pages, only when the IO module is connected to a circuit breaker.

Input/Output Assignment for Switchboard Contact Acquisition

The switchboard contacts connected to the digital inputs must be normally-closed contacts. The falling edge of one input generates an event.

The table below lists the possible assignment of the digital inputs, according to the predefined application selected on the IO module:

Inputs	Predefined Application Selected									
	1	2	3	4	5	6	7	8	9 (IO1)	9 (IO2)
Switchboard temperature contact	I4–I6	–	I6	I3–I6	–	–	–	–	I1–I6	I1–I6
Switchboard ventilation contact	I4–I6	–	I6	I3–I6	–	–	–	–	I1–I6	I1–I6
Switchboard door contact	I4–I6	–	I6	I3–I6	–	–	–	–	I1–I6	I1–I6

Input/Output Assignment for Switchboard Temperature Control

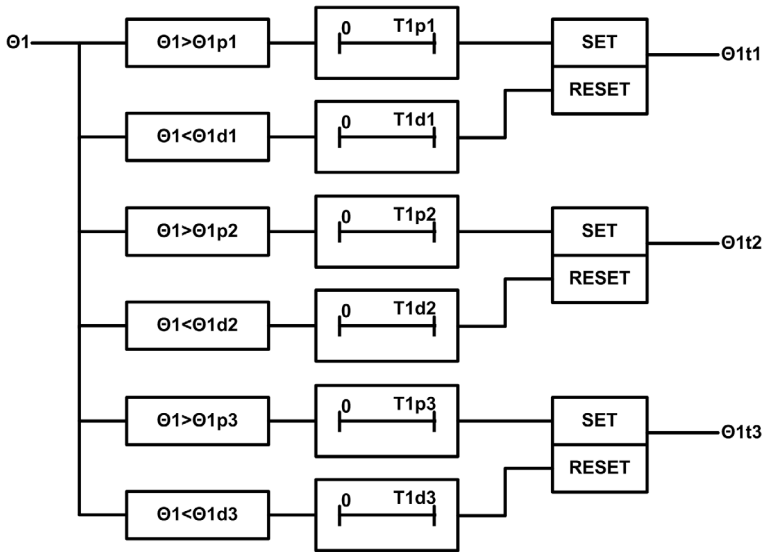
The analog input of each IO module can be assigned to the measure of temperature using a Pt100 sensor:

- The analog input of IO module1 can be assigned to a Pt100 sensor called temperature sensor 1.
- The analog input of IO module 2 can be assigned to a Pt100 sensor called temperature sensor 2.

The table below lists the possible assignment of the digital outputs, according to the predefined application selected on the IO module:

Outputs	Predefined Application Selected									
	1	2	3	4	5	6	7	8	9 (IO1)	9 (IO2)
Temperature sensor 1 threshold 1 overrun	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3
Temperature sensor 1 threshold 2 overrun	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3
Temperature sensor 1 threshold 3 overrun	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3
Temperature sensor 2 threshold 1 overrun	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3
Temperature sensor 2 threshold 2 overrun	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3
Temperature sensor 2 threshold 3 overrun	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3

Temperature Sensor 1 Processing



Θ1	Temperature measured by Pt100 sensor 1 connected to IO module 1 analog input
Θ1p1	Temperature sensor 1 threshold 1 pick-up value
T1p1	Temperature sensor 1 threshold 1 pick-up delay
Θ1d1	Temperature sensor 1 threshold 1 drop-out value
T1d1	Temperature sensor 1 threshold 1 drop-out delay
Θ1t1	Temperature sensor 1 threshold 1 overrun
Θ1p2	Temperature sensor 1 threshold 2 pick-up value
T1p2	Temperature sensor 1 threshold 2 pick-up delay
Θ1d2	Temperature sensor 1 threshold 2 drop-out value
T1d2	Temperature sensor 1 threshold 2 drop-out delay
Θ1t2	Temperature sensor 1 threshold 2 overrun
Θ1p3	Temperature sensor 1 threshold 3 pick-up value
T1p3	Temperature sensor 1 threshold 3 pick-up delay
Θ1d3	Temperature sensor 1 threshold 3 drop-out value
T1d3	Temperature sensor 1 threshold 3 drop-out delay
Θ1t3	Temperature sensor 1 threshold 3 overrun

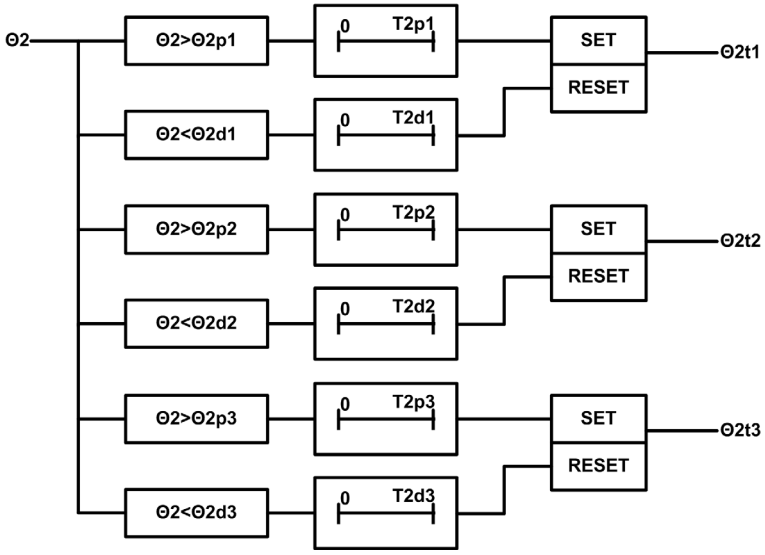
Temperature Sensor 1 Parameters

The following parameters can be set using the customer engineering tool *(see page 17)*.

	Description	Setting Range	Factory Setting
Θ1p1	Temperature sensor 1 threshold 1 pick-up value	-50–250 °C (-122–482 °F)	50 °C (122 °F)
T1p1	Temperature sensor 1 threshold 1 pick-up delay	1–3600 s	10 s
Θ1d1	Temperature sensor 1 threshold 1 drop-out value	-50–250 °C (-122–482 °F)	45 °C (113 °F)
T1d1	Temperature sensor 1 threshold 1 drop-out delay	1–3600 s	10 s
Θ1p2	Temperature sensor 1 threshold 2 pick-up value	-50–250 °C (-122–482 °F)	60 °C (140 °F)
T1p2	Temperature sensor 1 threshold 1 pick-up delay	1–3600 s	10 s
Θ1d2	Temperature sensor 1 threshold 2 drop-out value	-50–250 °C (-122–482 °F)	55 °C (131 °F)
T1d2	Temperature sensor 1 threshold 2 drop-out delay	1–3600 s	10 s
Θ1p3	Temperature sensor 1 threshold 3 pick-up value	-50–250 °C (-122–482 °F)	70 °C (158 °F)

	Description	Setting Range	Factory Setting
T1p3	Temperature sensor 1 threshold 3 pick-up delay	1–3600 s	10 s
Θ1d3	Temperature sensor 1 threshold 3 drop-out value	-50–250 °C (-122–482 °F)	65 °C (149 °F)
T1d3	Temperature sensor 1 threshold 3 drop-out delay	1–3600 s	10 s

Temperature Sensor 2 Processing



Θ2	Temperature measured by Pt100 sensor 2 connected to IO module 2 analog input
Θ2p1	Temperature sensor 2 threshold 1 pick-up value
T2p1	Temperature sensor 2 threshold 1 pick-up delay
Θ2d1	Temperature sensor 2 threshold 1 drop-out value
T2d1	Temperature sensor 2 threshold 1 drop-out delay
Θ2t1	Temperature sensor 2 threshold 1 overrun
Θ2p2	Temperature sensor 2 threshold 2 pick-up value
T2p2	Temperature sensor 2 threshold 2 pick-up delay
Θ2d2	Temperature sensor 2 threshold 2 drop-out value
T2d2	Temperature sensor 2 threshold 2 drop-out delay
Θ2t2	Temperature sensor 2 threshold 2 overrun
Θ2p3	Temperature sensor 2 threshold 3 pick-up value
T2p3	Temperature sensor 2 threshold 3 pick-up delay
Θ2d3	Temperature sensor 2 threshold 3 drop-out value
T2d3	Temperature sensor 2 threshold 3 drop-out delay
Θ2t3	Temperature sensor 2 threshold 3 overrun

Temperature Sensor 2 Parameters

The following parameters can be set using the customer engineering tool *(see page 17)*.

	Description	Setting Range	Factory Setting
Θ2p1	Temperature sensor 2 threshold 1 pick-up value	-50–250 °C (-122–482 °F)	50 °C (133 °F)
T2p1	Temperature sensor 2 threshold 1 pick-up delay	1–3600 s	10 s
Θ2d1	Temperature sensor 2 threshold 1 drop-out value	-50–250 °C (-122–482 °F)	45 °C (133 °F)
T2d1	Temperature sensor 2 threshold 1 drop-out delay	1–3600 s	10 s
Θ2p2	Temperature sensor 2 threshold 2 pick-up value	-50–250 °C (-122–482 °F)	60 °C (140 °F)

	Description	Setting Range	Factory Setting
T2p2	Temperature sensor 2 threshold 1 pick-up delay	1–3600 s	10 s
Θ2d2	Temperature sensor 2 threshold 2 drop-out value	-50–250 °C (-122–482 °F)	55 °C (131 °F)
T2d2	Temperature sensor 2 threshold 2 drop-out delay	1–3600 s	10 s
Θ2p3	Temperature sensor 2 threshold 3 pick-up value	-50–250 °C (-122–482 °F)	70 °C (158 °F)
T2p3	Temperature sensor 2 threshold 3 pick-up delay	1–3600 s	10 s
Θ2d3	Temperature sensor 2 threshold 3 drop-out value	-50–250 °C (-122–482 °F)	65 °C (149 °F)
T2d3	Temperature sensor 2 threshold 3 drop-out delay	1–3600 s	10 s

Application Events

The following events are generated by the application. For more information on the IO module events, refer to Events and Alarms *(see page 24)*.

Code IO1	Code IO2	Description	Type	Priority	Reset
2823 (0x0B07)	2823 (0x0B07)	Switchboard temperature contact	Alarm	Medium	Manual or remote
2824 (0X0B08)	2824 (0x0B08)	Switchboard ventilation contact	Alarm	Medium	Manual or remote
2825 (0x0B09)	2825 (0x0B09)	Switchboard door contact	Alarm	Medium	Manual or remote
1585 (0x0631)	1841 (0x0731)	Switchboard temperature threshold 1	Alarm	Low	Auto
1586 (0x0632)	1842 (0x0732)	Switchboard temperature threshold 2	Alarm	Medium	Manual or remote
1587 (0x0633)	1843 (0x0733)	Switchboard temperature threshold 3	Alarm	High	Manual or remote

Predefined Input Acquisition

Presentation

The IO module can acquire predefined indications delivered by external devices through digital inputs for signalization purposes: the status of the input with its predefined description is displayed on FDM121 display unit.

The predefined indications that can be assigned to digital inputs are listed in the following table. Each change of state of a predefined input generates an event. For more information on the IO module events, refer to Events and Alarms *(see page 24)*.

Code	Predefined Indication	Type	Priority	Reset
2816 (0x0B00)	Earth-leakage trip signal contact	Alarm	Medium	Manual or remote
2817 (0x0B01)	Control voltage presence contact	Alarm	Medium	Manual or remote
2818 (0x0B02)	Surge protection status contact	Alarm	Medium	Manual or remote
2819 (0x0B03)	Surge failure contact	Alarm	Medium	Manual or remote
2820 (0x0B04)	Switch-Disconnector ON/OFF indication contact (OF)	Alarm	Medium	Manual or remote
2821 (0x0B05)	Fuse blown indication contact	Alarm	Medium	Manual or remote
2822 (0x0B06)	Emergency stop	Alarm	High	Manual or remote

Input/Output Assignment

The table below lists the possible assignment of the digital inputs, according to the predefined application selected on the IO module:

Inputs	Predefined Application Selected									
	1	2	3	4	5	6	7	8	9 (IO1)	9 (IO2)
Predefined input	I4–I6	–	I6	I3–I6	–	–	–	–	I1–I6	I1–I6

User-Defined Input Acquisition

Presentation

The IO module can acquire user-defined indications delivered by external devices through digital inputs. The status of the input is displayed on the FDM121 display unit. The indication description can be entered using the customer engineering tool *(see page 17)*.

Each change of state of a user-defined input generates an event. For more information on the IO module events, refer to Events and Alarms *(see page 24)*.

Code IO1	Code IO2	Description	Type	Priority	Reset
1579 (0x062B)	1835 (0x072B)	User-defined input 1	Alarm	Medium	Manual or remote
1580 (0x062C)	1836 (0x072C)	User-defined input 2	Alarm	Medium	Manual or remote
1581 (0x062D)	1837 (0x072D)	User-defined input 3	Alarm	Medium	Manual or remote
1582 (0x062E)	1838 (0x072E)	User-defined input 4	Alarm	Medium	Manual or remote
1583 (0x062F)	1839 (0x072F)	User-defined input 5	Alarm	Medium	Manual or remote
1584 (0x0630)	1840 (0x0730)	User-defined input 6	Alarm	Medium	Manual or remote

Input/Output Assignment

The table below lists the possible assignment of the digital inputs, according to the predefined application selected on the IO module:

Inputs	Predefined Application Selected									
	1	2	3	4	5	6	7	8	9 (IO1)	9 (IO2)
User-defined input 1	–	–	–	–	–	–	–	–	I1	I1
User-defined input 2	–	–	–	–	–	–	–	–	I2	I2
User-defined input 3	–	–	–	I3	–	–	–	–	I3	I3
User-defined input 4	I4	–	–	I4	–	–	–	–	I4	I4
User-defined input 5	I5	–	–	I5	–	–	–	–	I5	I5
User-defined input 6	I6	–	I6	I6	–	–	–	–	I6	I6

Input Indicator

Presentation

The input indicator application is used to control the digital output according to the status of a digital input, for local indication of the input status.

Any digital input of one of the IO modules can be assigned to an available digital output of one of the IO modules. The input indicator can be assigned using the customer engineering tool.

Input/Output Assignment

The table below lists the possible assignment of the digital outputs, according to the predefined application selected on the IO module:

Outputs	Predefined Application Selected									
	1	2	3	4	5	6	7	8	9 (IO1)	9 (IO2)
IO 1 inputs I1 to I6	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3
IO 2 inputs I1 to I6	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3

Threshold Overrun of Input Counter Indicator

Presentation

The input counter threshold overrun event can be assigned to the digital outputs for local indication. The input counter threshold counter output can be configured using the customer engineering tool.

Input/Output Assignment

The table below lists the possible assignment of the digital outputs, according to the predefined application selected on the IO module:

Outputs	Predefined Application Selected									
	1	2	3	4	5	6	7	8	9 (IO1)	9 (IO2)
IO 1 input I1 counter overrun to input I6 counter overrun	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3
IO 2 input I1 counter overrun to input I6 counter overrun	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3

Breaker Status Indicator

Presentation

The following device status can be assigned to the digital outputs for local indication:

- Position indicator status (OF)
- Trip indicator status (SD)
- Electrical trip indicator status (SDE)
- Ready to close status (PF)
  NOTE: The ready to close (PF) status is available only with Masterpact and Compact NS devices.

The circuit breaker status can be configured to the IO module digital output for local indication using the customer engineering tool.

Compatible Devices

Range	Minimum Hardware Configuration Required
• Masterpact NT circuit breaker • Masterpact NW circuit breaker • Compact NS 630b-1600 circuit breaker • Compact NS 1600b-3200 circuit breaker	• Fixed or drawout circuit breaker + BCM ULP with firmware version 4.1.0 and above • Fixed or drawout switch-disconnector + BCM ULP with firmware version 4.1.0 and above
Compact NSX circuit breaker	• Fixed or withdrawable circuit breaker + BSCM with firmware version 2.2.7 and above • Fixed or withdrawable switch-disconnector + BSCM with firmware version 2.2.7 and above

Input/Output Assignment

The table below lists the possible assignment of the digital outputs, according to the predefined application selected on the IO module:

Outputs	Predefined Application Selected									
	1	2	3	4	5	6	7	8	9 (IO1)	9 (IO2)
Position indicator status (OF)	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3
Trip indicator status (SD)	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3
Electrical trip indicator status (SDE)	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3
Ready-to-close status (PF)	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3

Maintenance Indicator

Presentation

On Masterpact NW circuit breakers, the contact wear alarm can be assigned to an available digital output for local indication.

The maintenance indicators can be configured using the customer engineering tool.

NOTE: On Compact NSX circuit breakers, the contact wear alarm can be assigned to an available digital output for local indication as one of the 10 user-defined contact alarms. For more information, refer to the user-defined Alarm Indicator *(see page 72)*.

Compatible Devices

Range	Minimum Hardware Configuration Required
• Masterpact NW circuit breaker	Fixed or drawout circuit breaker + BCM ULP with firmware version 4.1.0 and above + Micrologic P or H trip unit

Input/Output Assignment

The table below lists the possible assignment of the digital outputs, according to the predefined application selected on the IO module:

Outputs	Predefined Application Selected									
	1	2	3	4	5	6	7	8	9 (IO1)	9 (IO2)
Contact wear alarm	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3

Trip Indicator

Presentation

Trip event can be assigned to an available digital output for local indication. The trip events that can be assigned to a digital output depend on the circuit breaker. The trip indicator can be configured using the customer engineering tool.

Trip	Compatible Masterpact or Compact NS Devices (1)	Compatible Compact NSX Devices (1)
Long-time protection Ir	Devices 1 and 2	Devices 3, 4, and 5
Short-time protection Isd	Devices 1 and 2	Devices 3, 4, and 5
Instantaneous protection Ii	Devices 1 and 2	Devices 3, 4, and 5
Earth-fault protection Ig	Devices 1 and 2	Devices 3, 4, and 5
Earth-leakage (Vigi) protection IΔn	Devices 1 and 2	Device 4
Integrated instantaneous protection	Devices 1 and 2	Devices 3, 4, and 5
Trip unit in STOP mode	–	Devices 3, 4, and 5
Instantaneous with earth-leakage protection	–	Device 4
Reflex tripping protection	–	Devices 3, 4, and 5
Unbalance motor protection	–	Device 5
Jam motor protection	–	Device 5
Underload motor protection	–	Device 5
Unbal protection	Device 2	–
I1 Max protection	Device 2	–
I2 Max protection	Device 2	–
I3 Max protection	Device 2	–
IN Max protection	Device 2	–
Vmin protection	Device 2	–
Vmax protection	Device 2	–
Vunbal protection	Device 2	–
Reverse power protection	Device 2	–
Fmin protection	Device 2	–
Fmax protection	Device 2	–
Phase rotation	Device 2	–
Multi-trip indication (OR of the available trip event)	Devices 1 and 2	Devices 3, 4, and 5
The compatible devices are defined further *(see page 69)*		

Compatible Devices

Range	Minimum Hardware Configuration Required	Note
• Masterpact NT circuit breaker • Masterpact NW circuit breaker • Compact NS 630b-1600 circuit breaker • Compact NS 1600b-3200 circuit breaker	Fixed or drawout circuit breaker + BCM ULP with firmware version 4.1.0 and above + Micrologic A or E trip unit with firmware version 1.0.3 and above	Device 1
	Fixed or drawout circuit breaker + BCM ULP with firmware version 4.1.0 and above + Micrologic P or H trip unit with firmware version 1.0.3 and above	Device 2
Compact NSX circuit breaker	Fixed or withdrawable circuit breaker + Micrologic 5 trip unit with firmware version 1.0.3 and above	Device 3
	Fixed or withdrawable circuit breaker + Micrologic 6 trip unit with firmware version 1.0.3 and above	Device 4
	Fixed or withdrawable circuit breaker + Micrologic 6 EM trip unit with firmware version 1.0.3 and above	Device 5

Input/Output Assignment

The table below lists the possible assignment of the digital outputs, according to the predefined application selected on the IO module:

Outputs	Predefined Application Selected									
	1	2	3	4	5	6	7	8	9 (IO1)	9 (IO2)
Trip	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3

Pre-Alarm Indicators

Presentation

On a Compact NSX circuit breaker with Micrologic 5 or 6 trip unit, pre-alarms can be assigned to an available digital output for local indication. The pre-alarms that can be assigned to a digital output depend on the Micrologic trip unit. The pre-alarm indicator can be configured using a customer engineering tool *(see page 17)*.

Pre-Alarm	Compatible Micrologic Trip Units
Long-time protection Ir pre-alarm (PAL Ir)	Micrologic 5 or 6 trip unit
Earth-fault protection Ig pre-alarm (PAL Ig)	Micrologic 5 trip unit
Earth-leakage protection IDn pre-alarm (PAL I∆n)	Micrologic 6 trip unit

For more information, refer to the *Compact NSX Micrologic 5/6 Trip Units User Guide*.

Compatible Devices

Range	Minimum Hardware Configuration Required
Compact NSX circuit breakers	Fixed or withdrawable circuit breaker + Micrologic 5 or 6 trip unit

Input/Output Assignment

The table below lists the possible assignment of the digital outputs, according to the predefined application selected on the IO module:

Inputs	Predefined Application Selected									
	1	2	3	4	5	6	7	8	9 (IO1)	9 (IO2)
Pre-alarm	O1–O3	O3	O1, O2	O3	–	–	–	–	–	–

User-Defined Alarm Indicator

Presentation

On Compact NSX circuit breakers with Micrologic 5 or 6 trip units, ten alarms can be assigned to an available digital output for local indication. The alarm indicator can be configured using the customer engineering tool *(see page 17)*.

For more information, refer to the *Compact NSX Micrologic 5/6 Trip Units User Guide*.

Compatible Devices

Range	Minimum Hardware Configuration Required
Compact NSX circuit breakers	Fixed or withdrawable circuit breaker + Micrologic 5 or 6 trip unit

Input/Output Assignment

The table below lists the possible assignment of the digital outputs, according to the predefined application selected on the IO module:

Inputs	Predefined Application Selected									
	1	2	3	4	5	6	7	8	9 (IO1)	9 (IO2)
User-defined alarm 1	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3
User-defined alarm 2	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3
User-defined alarm 3	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3
User-defined alarm 4	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3
User-defined alarm 5	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3
User-defined alarm 6	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3
User-defined alarm 7	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3
User-defined alarm 8	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3
User-defined alarm 9	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3
User-defined alarm 10	O1–O3	O3	O1, O2	O3	–	–	–	–	O1–O3	O1–O3

Chapter 4
Troubleshooting

What Is in This Chapter?

This chapter contains the following topics:

Troubleshooting

Description

Symptoms	Cause	Action
IO module applications are not working as expected	Application is not validated	• Check if all the input and output LEDs have the blinking pattern • Check the application rotary switch position • Press the Test/reset button for 5 to 15 seconds to validate the application
	System configuration is not correct	• Check if ULP LED has a blinking pattern *(see page 17)* • Check if there is any hardware or firmware discrepancy with the customer engineering tool *(see page 17)* and follow the instructions. For details, refer to *Compatibility Matrix* in *RSU Online Help*.
	ULP wiring is not correct	• Press the Test/reset button for 1 to 5 seconds on the IO module to check all ULP modules are properly wired on IMU system • Follow the instructions as per the customer engineering tool *(see page 17)*
	Digital input and digital output wiring is not correct	Force the state of the input and output with the customer engineering tool to check the wiring.
Digital output is not working	Wiring issue	• Check the digital output LED status • Check if a digital output is forced or not • Check if a digital output is assigned with any other assignment • If still not working, contact Schneider Electric service personnel
	Configuration issue	• Check if the right application is selected • Check the output assignment using the customer engineering tool
	Digital output is damaged	• Check the number of digital output operations counter • Replace the IO module if threshold is crossed
Digital input is not working	Wiring issue	• Check the digital input LED status • Check if a digital input is forced or not • Check if a digital input is assigned with the pulse input
	Configuration issue	• Check if the right application is selected • Check if the debounce setting of the digital input is correct
Pt100 is not working	Configuration issue	• Check the analog input LED status • Check if the correct IO module application is selected • Check if an analog input is configured to Pt100 • Check the ULP LED status for degraded blinking pattern ULP LED *(see page 14)*
	Wiring issue	• Check the analog input LED status • Switch off and switch on the module
	Wrong Pt100 sensor	Check if the right Pt100 is connected
IO module is in degraded mode, according to the ULP LED *(see page 14)*	Configuration file transfer aborted from the customer engineering tool	Reload the configuration file with the correct assignments
IO module is in configuration discrepancy mode, according to the ULP LED *(see page 14)*	Duplicate assignments within the same IO module	Check the application assignments with the customer engineering tool
	Duplicate assignments across the two IO module	Check the application assignments with the customer engineering tool
	Cradle management and drawer management applications are configured together	Configure only one of the applications, cradle management, and drawer management, with the customer engineering tool

Symptoms	Cause	Action
Switching on to ERMS mode is not possible	Discrepancy with ERMS order alarm is active	Reset the alarm
	Inconsistency of the ERMS setting	Check and modify the ERMS setting
Switching off the ERMS mode is not possible	Discrepancy with ERMS order alarm is active	Reset the alarm
	Inconsistency of the ERMS setting	Check and modify the ERMS setting
Closing the circuit breaker is not possible either locally or remotely	Inhibit close order is activated by the IO module	Enable the close order from the IO module.
	Inhibit close order is activated by a remote controller using the communication network	Enable the close order from the remote controller.

Protecting the Environment

Recycling Packaging

The packing materials from this equipment can be recycled. Help protect the environment by recycling them in appropriate containers.

Thank you for playing your part in protecting the environment.

End-of-Life Recycling

At the end of life, the modules of the ULP system have been optimized to decrease the amount of waste and valorize the components and materials of the product in the usual end of life treatment process.

The design has been achieved so as components are able to enter the usual end of life treatment processes as appropriate: depollution if recommended, reuse and/or dismantling if recommended to increase the recycling performances and shredding for separating the rest of materials.

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