PacT Series

Master**PacT** MTZ - MicroLogic Active Control Unit

User Guide

PacT Series offers world-class breakers and switches.

DOCA0265EN-08
07/2026

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Table of Contents

Table of Contents 3
Safety Information 7
About the Document 8
Introduction to the MicroLogic Active Control Unit 12
- PacT Series Master Range 13
- Presentation 14
- Description 18
- Trip Information/Test/Reset Button 23
- Local Indications 24
- EcoStruxure Power Commission Software 29
- EcoStruxure Power Device App 30
- Go2SE Landing Page 32
- Date and Time 34
- Power Supply 35
- Firmware Update 38
- Reboot or Restart MicroLogic Active Control Unit 40

Access Management 41
- Access Management Per Access Path 42
- Management of Access via HMI 43
- Management of Access via the USB Port 44

Using the MicroLogic Active Human Machine Interface 45
- MicroLogic Active HMI Description 46
- HMI Display Modes 49
- Quick View Mode 50
- Tree Navigation Mode 53
- Standard Protection Setting Procedure 60
- ERMS Function 66
- Measures Menu 67
- Alarms/History Menu 72
- Maintenance Menu 74
- Configuration Menu 75
- Protection Menu 78
- Pop-up Event Messages 81

Protection Functions 83
- Introduction 84
  - Electrical Distribution Protection 85
  - Setting Protection in Accordance With UL489SE Standard 88
- Standard Protection Functions 90
  - Long-Time Overcurrent Protection (L or ANSI 49RMS/51) 91
  - Short-Time Overcurrent Protection (S or ANSI 50TD/51) 96
  - Instantaneous Overcurrent Protection (I or ANSI 50) 99
  - Ground-Fault Protection (G or ANSI 50N-TD/51N) 104
  - Neutral Protection 109
- Other Protection Functions 111
  - Zone Selective Interlocking (ZSI) 112
  - Energy Reduction Maintenance Settings (ERMS) 116
- Advanced Protection Functions 120

Undervoltage Protection (ANSI 27) ... 121
Overvoltage Protection (ANSI 59) ... 124
Setting Guidelines ... 127
Protection Setting Guidelines ... 128
Setting the Long-Time Overcurrent Protection (L or ANSI49RMS/51) ... 130
Setting the Short-Time Overcurrent Protection (S or ANSI50TD/51) ... 133
Setting the Instantaneous Overcurrent Protection (I or ANSI 50) ... 136
Selectivity ... 137
Metering Functions ... 140
MicroLogic Active Measurement Availability and Display ... 141
MicroLogic Active Measurement Characteristics ... 145
MicroLogic Active Real-Time Measurements ... 149
MicroLogic Active E/EP/Ei Demand Value Calculation ... 152
MicroLogic Active Network Settings ... 154
MicroLogic Active E/EP/Ei Power Metering ... 155
MicroLogic Active E/EP/Ei Power Calculation Algorithm ... 158
MicroLogic Active E/EP/Ei Energy Metering ... 160
MicroLogic Active E/EP/Ei Power Factor PF and cos φ Measurement ... 162
Maintenance and Diagnostic Functions ... 165
Maintenance Tools ... 166
Assistance ... 167
Maintenance Schedule ... 168
Health State ... 169
Monitoring the Circuit Breaker ... 171
Monitoring the Tripping Circuit ... 172
Monitoring the Internal Functioning of the MicroLogic Active Control Unit ... 175
Monitoring the Communicating Voltage Releases ... 179
Monitoring the Contact Wear ... 181
Monitoring the Load Profile ... 183
Operation Functions ... 184
Control Modes ... 185
Opening Function ... 191
Closing Function ... 194
Communication Functions ... 197
ULP Wired Communication ... 198
NFC Communication ... 200
USB On-The-Go (OTG) Connection ... 202
USB Connection ... 203
Zigbee Wireless Communication ... 205
Cybersecurity Recommendations ... 209
Event Management ... 212
Event Definition ... 213
Event Type ... 215
Event Notifications ... 220
Event Display ... 222

Event History 223
Event List 225
MicroLogic Active Replacement 231
Presentation 232
Prepare the Replacement 234
Obtain Data from MicroLogic Active Control Unit 235
Prepare the MasterPacT MTZ1 Device 236
Prepare the MasterPacT MTZ2/MTZ3 Device 240
Replace MicroLogic Active Control Unit 243
Perform a Primary Injection Test 248
Perform a Secondary Injection Test 251
Test the Microswitch 252
Test the BCIM Module 253
Prepare Drawout MasterPacT MTZ Circuit Breaker for Setting 254
Set Replacement MicroLogic Active Control Unit 256
Appendices 258
Licensing Information 259

Safety Information

Important Information

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, 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 Document

Document Scope

The aim of this guide is to provide users, installers, and maintenance personnel with the technical information needed to operate MicroLogic™ Active control units in MasterPacT™ MTZ circuit breakers.

This guide applies to the following MicroLogic Active control units for IEC standard:

- MicroLogic Active 2.0 A, 5.0 A, 6.0 A
- MicroLogic Active 2.0 AP, 5.0 AP, 6.0 AP
- MicroLogic Active 2.0 E, 5.0 E, 6.0 E
- MicroLogic Active 2.0 EP, 5.0 EP, 6.0 EP
- MicroLogic Active 6.0 Ei

  NOTE: A MicroLogic Active 6.0 Ei control unit is a MicroLogic Active 6.0 E control unit without NFC wireless communication capability.

  All the information related to MicroLogic Active 6.0 E control units presented in this guide applies to MicroLogic Active 6.0 Ei control units, except information about NFC wireless communication.

Validity Note

This guide applies to MicroLogic Active control units with firmware version 004.004.000 or greater.

Online Information

The characteristics of the products described in this document are intended to match the characteristics that are available on www.se.com. As part of our corporate strategy for constant improvement, we may revise the content over time to enhance clarity and accuracy. If you see a difference between the characteristics in this document and the characteristics on www.se.com, consider www.se.com to contain the latest information.

Product Related Information

⚠⚠WARNING

HAZARD OF ELECTRIC SHOCK AND ARC FLASH

On power systems exceeding 600 Vac with an IT grounding system, the MasterPacT MTZ circuit breaker does not meet Class 2 accessibility requirements. Under such conditions and when the circuit breaker is energized:

- Do not touch the front face of the circuit breaker.
- Do not connect any device to the USB port of the MicroLogic Active control unit.
- Do not disconnect any device from the USB port of the MicroLogic Active control unit.
- Do not use the PC when it is connected to the USB port.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ CAUTION

HAZARD OF BURNS

Apply appropriate personal protective equipment (PPE) when the MasterPacT MTZ circuit breaker ambient temperature is above 50 °C (122 °F).

Failure to follow these instructions can result in injury or equipment damage.

General Cybersecurity Information

In recent years, the growing number of networked machines and production plants has seen a corresponding increase in the potential for cyber threats, such as unauthorized access, data breaches, and operational disruptions. You must, therefore, consider all possible cybersecurity measures to help protect assets and systems against such threats.

To help keep your Schneider Electric products secure and protected, it is in your best interest to implement the cybersecurity best practices as described in the Cybersecurity Best Practices document.

Schneider Electric provides additional information and assistance:

- Subscribe to the Schneider Electric security newsletter.
- Visit the Cybersecurity Support Portal web page to:
  - Find Security Notifications.
  - Report vulnerabilities and incidents.
- Visit the Schneider Electric Cybersecurity and Data Protection Posture web page to:
  - Access the cybersecurity posture.
  - Learn more about cybersecurity in the cybersecurity academy.
  - Explore the cybersecurity services from Schneider Electric.

Product Related Cybersecurity Information

⚠ WARNING

POTENTIAL COMPROMISE OF SYSTEM AVAILABILITY, INTEGRITY, AND CONFIDENTIALITY

- Change default passwords and PIN codes at first use to help prevent unauthorized access to device settings, controls, and information.
- Disable unused ports/services and default accounts to help minimize pathways for malicious attackers.
- Place networked devices behind multiple layers of cyber defenses (such as firewalls, network segmentation, and network intrusion detection and protection).
- Use cybersecurity best practices (for example, least privilege, separation of duties) to help prevent unauthorized exposure, loss, modification of data and logs, or interruption of services.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

For information about cybersecurity for MicroLogic Active control unit refer to Cybersecurity Recommendations, page 209 and DOCA0122•• *MasterPacT, ComPacT, PowerPacT - Cybersecurity Guide*, page 10.

Environmental Data

For product compliance and environmental information, refer to the Schneider Electric Environmental Data Program.

Available Languages of the Document

The document is available in these languages:

- English (DOCA0265EN), original language
- Spanish (DOCA0265ES)
- Chinese (DOCA0265ZH)

Related Documents for IEC Devices

Title of documentation	Reference number
MasterPacT MTZ with MicroLogic Active Control Unit - Catalog	LVPED225010EN
MasterPacT MTZ1 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide	DOCA0284EN DOCA0284ES DOCA0284ZH
MasterPacT MTZ1 - Fixed IEC Circuit Breaker with MicroLogic Active Control Unit - Instruction Sheet	PKR4242702
MasterPacT MTZ1 - Drawout IEC Circuit Breaker with MicroLogic Active Control Unit - Instruction Sheet	PKR4242802
MasterPacT MTZ2/MTZ3 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide	DOCA0285EN DOCA0285ES DOCA0285ZH
MasterPacT MTZ2/MTZ3 - Fixed IEC Circuit Breaker with MicroLogic Active Control Unit - Instruction Sheet	PKR4242002
MasterPacT MTZ2/MTZ3 - Drawout IEC Circuit Breaker with MicroLogic Active Control Unit - Instruction Sheet	PKR4243502
Breaker Communication and Isolation Module (BCIM) for MicroLogic Active Control Unit - User Guide	DOCA0387EN DOCA0387ES DOCA0387ZH
MasterPacT MTZ IEC Circuit Breakers with MicroLogic Active Control Unit - Maintenance Guide	DOCA0305EN DOCA0305ES DOCA0305ZH
MasterPacT MTZ IEC Circuit Breakers with MicroLogic Active Control Unit - End-User Maintenance Procedures	DOCA0306EN DOCA0306ES DOCA0306ZH
MasterPacT, ComPacT, PowerPacT Circuit Breakers - Modbus Communication - User Guide	DOCA0384EN DOCA0384ES DOCA0384FR DOCA0384ZH
MasterPacT MTZ - MicroLogic Active Control Unit - Firmware Release Notes	DOCA0267EN
MicroLogic Trip Units and Control Units - Firmware History	DOCA0155EN
Breaker Communication and Isolation Module (BCIM) for MicroLogic Active Control Unit - Firmware Release Notes	DOCA0395EN
MasterPacT, ComPacT, PowerPacT - Cybersecurity Guide	DOCA0122EN DOCA0122ES DOCA0122FR DOCA0122ZH
ULP (Universal Logic Plug) System - User Guide	DOCA0093EN DOCA0093ES DOCA0093FR DOCA0093ZH

Title of documentation	Reference number
Enerlin'X IFE - Ethernet Switchboard Server - User Guide	DOCA0084EN DOCA0084ES DOCA0084FR DOCA0084ZH
Enerlin'X IFE - Ethernet Interface for One Circuit Breaker - User Guide	DOCA0142EN DOCA0142ES DOCA0142FR DOCA0142ZH
Enerlin'X EIFE - Embedded Ethernet Interface for One MasterPacT MTZ Drawout Circuit Breaker - User Guide	DOCA0106EN DOCA0106ES DOCA0106FR DOCA0106ZH
EcoStruxure Panel Server - User Guide	DOCA0172EN DOCA0172ES DOCA0172FR DOCA0172DE DOCA0172IT DOCA0172PT

You can download these technical publications and other technical information from our website at www.se.com/ww/en/download/.

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Introduction to the MicroLogic Active Control Unit

What's in This Part

PacT Series Master Range 13
Presentation 14
Description 18
Trip Information/Test/Reset Button 23
Local Indications 24
EcoStruxure Power Commission Software 29
EcoStruxure Power Device App 30
Go2SE Landing Page 32
Date and Time 34
Power Supply 35
Firmware Update 38
Reboot or Restart MicroLogic Active Control Unit 40

PacT Series Master Range

Future-proof your installation with Schneider Electric's low-voltage and medium-voltage PacT Series. Built on legendary Schneider Electric innovation, the PacT Series comprises world-class circuit breakers, switches, residual current devices and fuses, for all standard and specific applications. Experience robust performance with PacT Series within the EcoStruxure-ready switchgear, from 16 to 6300 A in low-voltage and up to 40.5 kV in medium-voltage.

Presentation

MicroLogic Active Control Units for IEC Standard - Overview

MasterPacT MTZ circuit breakers with MicroLogic Active control units provide functions of protection, metering, diagnostics and communication.

MicroLogic Active control units allow local operation and monitoring of MasterPacT MTZ circuit breakers.

The MicroLogic Active control units for IEC standard are:

- With NFC wireless communication and without Zigbee wireless communication:
  - MicroLogic Active 2.0 A, 5.0 A, 6.0 A
  - MicroLogic Active 2.0 E, 5.0 E, 6.0 E
- With NFC and Zigbee wireless communication:
  - MicroLogic Active 2.0 AP, 5.0 AP, 6.0 AP
  - MicroLogic Active 2.0 EP, 5.0 EP, 6.0 EP
- Without wireless communication: MicroLogic Active 6.0 Ei

Convention

For this guide, electrical phases are described as *phase 1*, *phase 2*, *phase 3* and cover the IEC standard.

Range of MicroLogic Active Control Units for IEC Standard

The following table indicates the standard functions available on MasterPacT MTZ circuit breakers with MicroLogic Active control units for IEC standard:

Function	**MicroLogic Active 2.0 A/AP**	**MicroLogic Active 5.0 A/AP**	**MicroLogic Active 6.0 A/AP**	**MicroLogic Active 2.0 E/EP**	**MicroLogic Active 5.0 E/EP**	**MicroLogic Active 6.0 E/EP/Ei**
Commercial reference	LV933071/ LV933071W	LV933072/ LV933072W	LV933073/ LV933073W	LV947600/ LV947600W	LV947602/ LV947602W	LV947603/ LV947603W/ LV949603
Long-time overcurrent protection (L)	✓	✓	✓	✓	✓	✓
Short-time overcurrent protection (S)	–	✓	✓	–	✓	✓
Instantaneous overcurrent protection (I)	✓	✓	✓	✓	✓	✓
Ground-fault protection (G)	–	–	✓	–	–	✓
Neutral protection	✓	✓	✓	✓	✓	✓
Undervoltage protection	–	–	–	✓	✓	✓

Function	MicroLogic Active 2.0 A/AP	MicroLogic Active 5.0 A/AP	MicroLogic Active 6.0 A/AP	MicroLogic Active 2.0 E/EP	MicroLogic Active 5.0 E/EP	MicroLogic Active 6.0 E/EP/Ei
Overvoltage protection	–	–	–	✓	✓	✓
Overcurrent and trip cause indicators	✓	✓	✓	✓	✓	✓
Zone selective interlocking	–	✓	✓	–	✓	✓
Trip history	✓	✓	✓	✓	✓	✓
Setting change traceability	✓	✓	✓	✓	✓	✓
Current metering	✓	✓	✓	✓	✓	✓
Voltage, power and energy metering	–	–	–	✓	✓	✓
Embedded diagnostics	✓	✓	✓	✓	✓	✓

NOTE: The commercial reference is printed on the front face of the MicroLogic Active control unit and also identifies the standard.

MicroLogic Active Replacement

MicroLogic Active control units can be replaced on site.

For more information, refer to MicroLogic Active Replacement, page 231.

Communication Availability

MicroLogic Active control units support wired and wireless communication.

Communication type	MicroLogic Active 6.0 Ei	MicroLogic Active A/E	MicroLogic Active AP/EP
Wireless communication via NFC connection	–	✓	✓
Wireless communication via Zigbee connection	–	–	✓
Wired communication via the USB-C port	✓	✓	✓
Wired communication via the ULP system, by using the optional BCIM module	✓	✓	✓

Wired Communication

MicroLogic Active control units support local and remote wired communication.

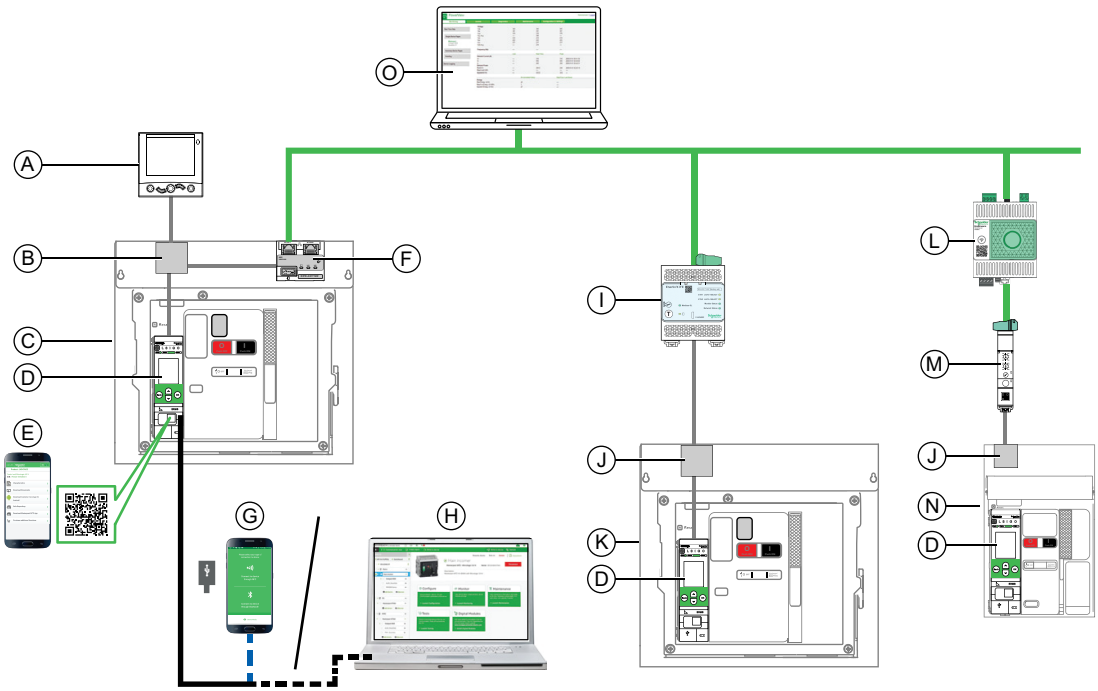
Local wired communication is enabled by connection via the USB-C port to:

- An Android smartphone running the EcoStruxure Power Device app through USB OTG connection, page 202
- A PC running EcoStruxure Power Commission software

Remote wired communication is enabled by using the optional BCIM module connected via the ULP system to:

- An Ethernet communication network with Modbus TCP/IP protocol
- A Serial Line communication network with Modbus-SL protocol

The following diagram shows examples of how MicroLogic Active control units communicate within a wired digital system:



Ethernet

USB connection

USB OTG connection

A. FDM121 display
B. ULP port module
C. MasterPacT MTZ2 drawout circuit breaker
D. MicroLogic Active control unit with BCIM module
E. Go2SE landing page
F. EIFE interface
G. EcoStruxure Power Device app through USB OTG connection
H. EcoStruxure Power Commission software through USB-C connection
I. IFE interface
J. COM terminal block
K. MasterPacT MTZ2 circuit breaker
L. Panel Server
M. IFM interface
N. MasterPacT MTZ1 circuit breaker
O. Panel Server, EIFE or IFE webpages

Wireless Communication

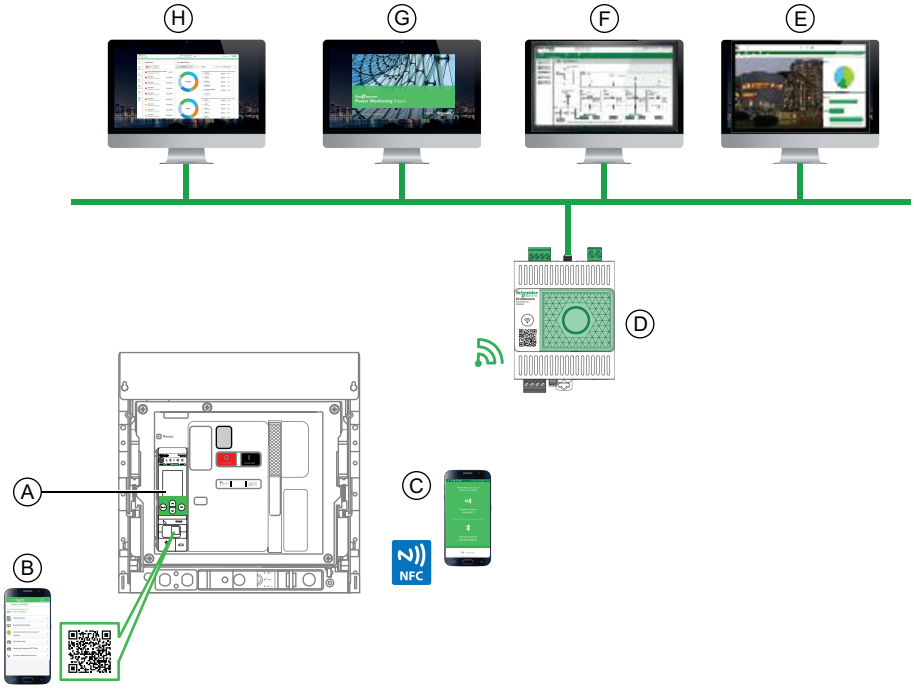
In addition to wired communication, MicroLogic Active control units support local wireless communication.

NOTE: Wireless communication is not available with MicroLogic Active 6.0 Ei control unit.

Local wireless communication includes:

- NFC wireless connection, page 200, to a smartphone running the EcoStruxure Power Device app
- Zigbee wireless connection, page 205, to a Panel Server gateway (MicroLogic Active AP/EP control units only)

The following diagram shows an example of how MicroLogic Active control units communicate within a wireless digital system:



Ethernet

Zigbee wireless communication

A MicroLogic Active control unit

B Go2SE landing page

C EcoStruxure Power Device app through NFC wireless communication

D Panel Server through Zigbee wireless communication, for MicroLogic Active AP/EP control units only

E POI Plus, industrial workstation with energy management software

F EcoStruxure Power Operation (PO) software

G EcoStruxure Power Monitoring Expert (PME) software

H Panel Server webpages

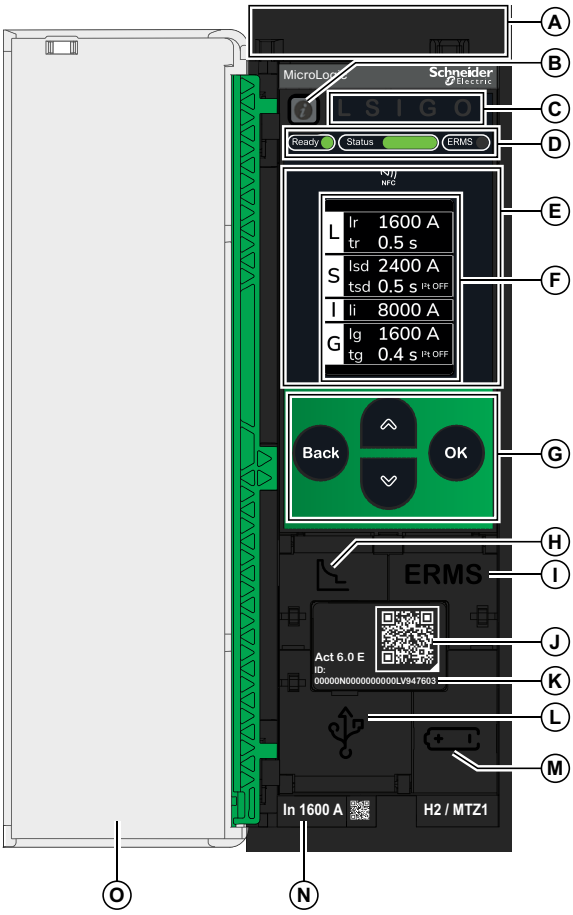
Description

Introduction

The MicroLogic Active control unit includes:

- LEDs to monitor the status of the circuit breaker.
- A local Human Machine Interface comprising a graphic display with colored backlight, navigation buttons, and direct access buttons.
- LEDs to monitor the cause of trips and alarms.

Control Unit Description



A MicroLogic Active type, indicated by the color of the head of the control unit:

- Black head: MicroLogic Active A/E control unit without Zigbee wireless communication
- Green head: MicroLogic Active AP/EP control unit with Zigbee wireless communication

B Trip information/test/reset button

C Trip cause LEDs

D Status LEDs:

- **Ready** LED
- **Status** bar
- **ERMS** LED

E NFC wireless communication zone (not available with MicroLogic Active 6.0 Ei control unit)

F Graphic display screen

G Navigation buttons

H Protection settings button (under sealable cover)

I ERMS button (under sealable cover)

J QR code to access product information

K Control unit type and identification number

L USB-C port (under sealable cover)

M Internal battery drawer module

N Sensor plug with the rated current of the circuit breaker

O MicroLogic sealable transparent cover

Trip Information/Test/Reset Button

For information about the button, see Trip Information/Test/Reset Button, page 23.

Trip Cause LEDs

The indications of the trip cause LEDs depend on the type of MicroLogic Active control unit.

LEDs	Description
L	MicroLogic Active 2.0, 5.0, 6.0: Overload pre-alarm, the load exceeds 90% and is lower than 105% of the Ir setting of the long-time protection.
	MicroLogic Active 2.0, 5.0, 6.0: Overload alarm, the load exceeds 105% of the Ir setting of the long-time protection.
	MicroLogic Active 2.0, 5.0, 6.0: Trip due to long-time protection.
S	MicroLogic Active 5.0, 6.0: Trip due to short-time protection.
I	MicroLogic Active 2.0, 5.0, 6.0: Trip due to instantaneous protection.
G	MicroLogic Active 6.0: Trip due to ground-fault protection.
O	MicroLogic Active 2.0, 5.0, 6.0: Trip due to advanced and other, customized protection.

NOTE: If the MicroLogic Active control unit is not powered, the trip cause LEDs go off after 2 hours. After this period, press the button to light them again.

Status LEDs

LED	Description
Ready LED	The **Ready** LED flashes slowly under normal operation.
Status bar	The **Status** bar alerts the user to the health state of the circuit breaker: • Green **Status** bar: no action required. • Orange **Status** bar: medium severity alarm that requires non-urgent maintenance action. • Red **Status** bar: high severity alarm that requires immediate maintenance action.
ERMS LED	The **ERMS** (Energy Reduction Maintenance Setting) LED informs the user when ERMS is engaged, and ERMS protection settings are operational: • Blue LED: ERMS engaged • Off: ERMS disengaged

For more information, see the description of Local Indications, page 24.

NFC Communication Zone

The NFC communication zone is used to establish an NFC connection, page 200 between a smartphone running the EcoStruxure Power Device app and the MicroLogic Active control unit. When the connection is established, the circuit breaker operating data is automatically uploaded to the smartphone.

NOTE: NFC communication is not available with MicroLogic Active 6.0 Ei control unit.

Display Screen with Navigation Buttons

The local HMI screen and buttons, page 46 are used to:

- Navigate the menu structure.
- Display monitored values.
- Access and edit configuration settings.

Protection Settings Button

The protection settings button, page 46 is used to directly access the protection setting procedure.

ERMS Button

The ERMS button, page 46 is used to directly engage and disengage the ERMS function.

QR Code

When the QR code on the front face of a MicroLogic Active control unit is scanned with a smartphone running a QR code reader and connected to the Internet, the Go2SE landing page, page 32 is displayed. The landing page displays some information about the device, including traceability information, and a list of menus.

Control Unit Identification Number

The identification number PPPPPPYYWWDLNNNNLV9••••• is made up as follows:

- The serial number of the MicroLogic Active control unit in the format PPPPPPYYWWDLNNNN, where the codes are defined as follows:
  - PPPPPP: Plant code
  - YY: Year (00 to 99), for example 24 for 2024
  - WW: Week of the year (01 to 53), for example 25
  - D: Day of the week, with 1 representing Monday and 7 representing Sunday, for example 5 for Friday
  - L: Unique manufacturing line code or machine code within the plant
  - NNNN: Unique product number (0001 to 9999) generated on the day of manufacturing, by the plant manufacturing line or the plant machine
- The commercial reference of the control unit in the format LV9•••••

Use the identification number to register your MicroLogic Active control unit through mySchneider app, the customer care mobile application.

Registering your MicroLogic Active control unit enables you to keep your records up to date and enables traceability.

Control Unit Type

The type of MicroLogic Active control unit, page 14 is indicated by a number and one or two letters:

- The number (for example, 6.0) defines the type of protection provided by the control unit.
- The first letter (A or E) defines the type of metering provided by the control unit.
- If present, a second letter indicates:
  - **P**: a MicroLogic Active control unit with Zigbee wireless communication.
  - **i**: a MicroLogic Active control unit without wireless communication.

USB-C Port

The USB-C port is protected by a cover which can be sealed to prevent access by unauthorized personnel. The cover is opened by breaking the seal with a flat screwdriver.

Open the cover of the USB-C port to connect the following devices:

- A Mobile Power Pack to supply power to the MicroLogic Active control unit, page 36.
- An Android smartphone running the EcoStruxure Power Device app through USB OTG connection, page 202.
- A PC running EcoStruxure Power Commission software, page 203.

⚠⚠WARNING

HAZARD OF ELECTRIC SHOCK AND ARC FLASH

On power systems exceeding 600 Vac with an IT grounding system, the MasterPacT MTZ circuit breaker does not meet Class 2 accessibility requirements. Under such conditions and when the circuit breaker is energized:

- Do not touch the front face of the circuit breaker.
- Do not connect any device to the USB port of the MicroLogic Active control unit.
- Do not disconnect any device from the USB port of the MicroLogic Active control unit.
- Do not use the PC when it is connected to the USB port.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTE: The MicroLogic Active control unit does not support USB keys. Even if a USB key is connected using an adapter, data is not transferred.

Internal Battery

The internal battery, page 36 powers the trip cause LEDs and the main diagnostic functions in the absence of any other power supply.

For information about testing the internal battery, see Trip Information/Test/Reset Button, page 23.

Sensor Plug

The protection ranges depend on the rated current In, defined by the sensor plug, page 85 present below the MicroLogic Active control unit.

Trip Information/Test/Reset Button

The button performs the following functions:

- Trip information
- Test internal battery and check trip cause LED functionality
- Reset latched events

Trip Information

After a trip event, press and hold the button for less than 3 seconds for information about the cause of the trip.

When a trip event happens, the related trip cause LED turns off after 2 hours. To re-light the trip cause LED, press the button for less than 3 seconds.

Test

At any time, press and hold the button for less than 3 seconds to test the internal battery and check trip cause LED functionality.

The trip cause LEDs switch off for one second, and then do one of the following:

- Switch on: the battery is OK.
- Blink sequentially: the battery is near the end of its life. Replace the battery, page 177.
- Do not light: verify that the plastic battery strip has been correctly removed. If the battery strip has been correctly removed but the LEDs still do not light, then replace the battery, page 177

  NOTE: This test must be carried out immediately after replacement of the internal battery to check the correct functioning of the new battery. It can then be carried out at any time in the life of the internal battery.

Reset

Press and hold the button for more than 3 seconds to reset latched events, for example trip events.

The trip cause LEDs switch off and the **Status** bar reverts to green.

Local Indications

The MicroLogic Active control unit and circuit breaker status are indicated locally by:

- The MicroLogic Active display screen
- The **Status** bar
- The **Ready** LED
- The trip cause LEDs

The availability of local indications depends on how the MicroLogic Active control unit is supplied:

- By external power supply: 24 Vdc auxiliary power supply or Mobile Power Pack connected to the USB-C port.
- By internal power supply: current flowing through the circuit breaker.

Under normal operating conditions:

- The MicroLogic Active display screen displays the good health state screen when quick view scrolling is active.
- The **Status** bar is green.
- The **Ready** LED flashes green.
- All trip cause LEDs are off.

When a trip event occurs:

- The MicroLogic Active display screen displays a pop-up message if the control unit is adequately supplied. The screen color is red.

  If the control unit is not adequately supplied, the MicroLogic Active display screen is off.
- The **Status** bar blinks red.
- The **Ready** LED flashes green or is off, depending on whether the control unit is adequately supplied, and the severity of the event.
- Each trip cause LED blinks red or is off, depending on the type of event.

When an alarm event occurs:

- The MicroLogic Active display screen displays a pop-up message if the control unit is adequately supplied. The screen color is red or orange, depending on the severity of the event.

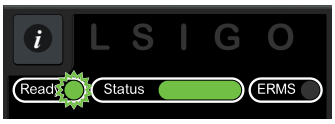
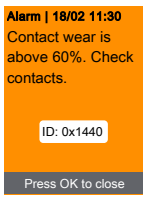
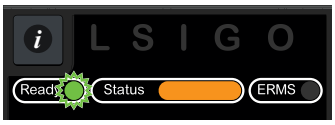
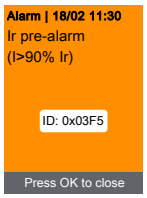
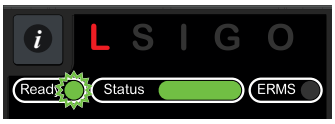
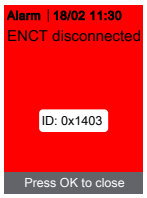
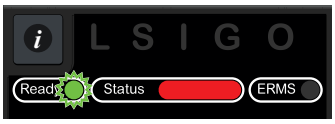
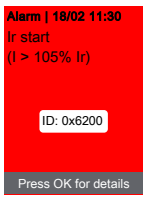
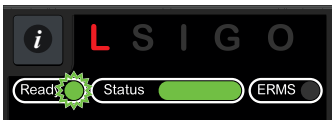
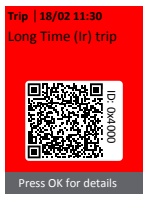
  If the control unit is not adequately supplied, the MicroLogic Active display screen is off.
- The **Status** bar is red or orange, depending on the severity of the event related to the circuit breaker health state.
- The **Ready** LED flashes green or is off, depending on whether the control unit is adequately supplied, and the severity of the event.
- The L trip cause LED is red or off, depending on the type of event. All other trip cause LEDs are off.

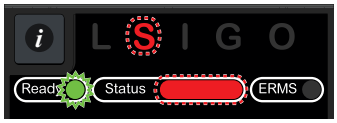
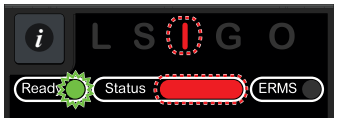
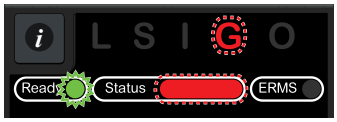
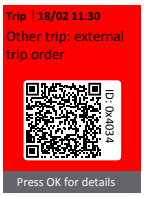
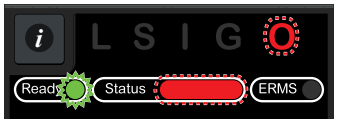
Indications With External Power Supply

When the MicroLogic Active control unit is supplied by an external power supply (24 Vdc auxiliary power supply or Mobile Power Pack), local indications are available on:

- The MicroLogic Active display screen
- The **Status** bar
- The **Ready** LED
- The trip cause LEDs

NOTE: The display screens shown are examples. The message on the screen varies depending on the cause of the trip or alarm.

Description	Display screen	Status and Trip cause LED display	Status and Trip cause LED description
The circuit breaker is in a good state of health. No action is required.			Ready LED: green flashing Status bar: green on ERMS LED: off All trip cause LEDs off
Medium severity alarm: action to be planned			Ready LED: green flashing Status bar: orange on ERMS LED: off All trip cause LEDs off
Overload pre-alarm: 90% Ir < Current < 105% Ir			Ready LED: green flashing Status bar: green on ERMS LED: off L trip cause LED: red on
High severity alarm: immediate action required			Ready LED: green flashing Status bar: red on ERMS LED: off All trip cause LEDs off
Overload alarm : Current ≥ 105 % Ir			Ready LED: green flashing Status bar: green on ERMS LED: off L trip cause LED: red on
Trip on long-time protection (L)			Ready LED: green flashing Status bar: red blinking ERMS LED: off L trip cause LED: red blinking

Description	Display screen	Status and Trip cause LED display	Status and Trip cause LED description
Trip on short-time protection (S)			Ready LED: green flashing Status bar: red blinking ERMS LED: off S trip cause LED: red blinking
Trip on instantaneous protection (I)			Ready LED: green flashing Status bar: red blinking ERMS LED: off I trip cause LED: red blinking
Trip on ground-fault protection (G)			Ready LED: green flashing Status bar: red blinking ERMS LED: off G trip cause LED: red blinking
Trip on advanced and other, customized protection (O)			Ready LED: green flashing Status bar: red blinking ERMS LED: off O trip cause LED: red blinking
Major internal incident detected. See Maintenance and Diagnostic Functions, page 165.			Ready LED: off Status bar: red blinking ERMS LED: off All trip cause LEDs: red blinking

Indications Without External Power Supply

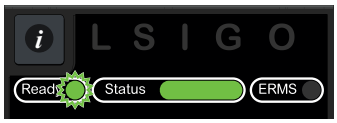
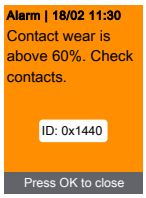
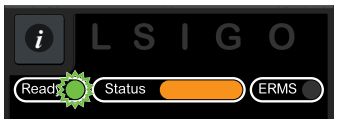
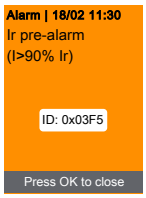
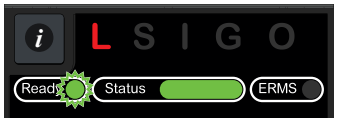
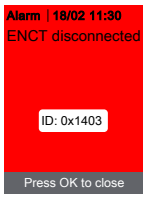
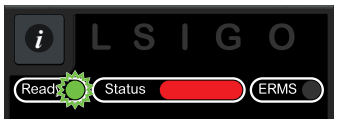
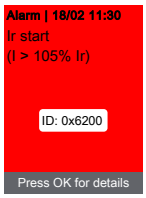
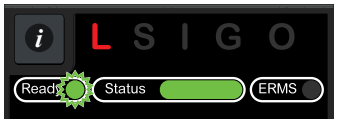
Without an external power supply, the MicroLogic Active control unit is supplied by the current transformers (CT) when the MasterPacT MTZ circuit breaker is closed.

In this case, local indications depend on the load current:

- When the load current is less than 20% In, local indications are available on:
  - The **Status** bar
  - The **Ready** LED
  - The trip cause LEDs

  The MicroLogic Active display screen is off.
- When the load current is higher than 20% In, local indications are available on:
  - The MicroLogic Active display screen
  - The **Status** bar
  - The **Ready** LED
  - The trip cause LEDs

  NOTE: The display screens shown are examples. The message on the screen varies depending on the cause of the trip or alarm.

Indications without external power supply	**Display screen** **(only when load current higher than 20% In)**	**Status and Trip cause LED display**	**Status and Trip cause LED description**
The circuit breaker is in good state of health, No action is required			Ready LED: green flashing Status bar: green on ERMS LED: off All trip cause LEDs off
Medium severity alarm: action to be planned			Ready LED: green flashing Status bar: orange on ERMS LED: off All trip cause LEDs off
Overload pre-alarm: 90% Ir < Current < 105% Ir			Ready LED: green flashing Status bar: green on ERMS LED: off L trip cause LED: red on
High severity alarm: immediate action required			Ready LED: green flashing Status bar: red on ERMS LED: off All trip cause LEDs off
Overload alarm: Current ≥ 105 % Ir			Ready LED: green flashing Status bar: green on ERMS LED: off L trip cause LED: red on

Indications After a Trip, Without External Power Supply

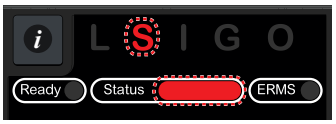
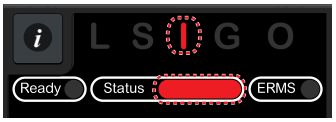
If a trip event happens while the MicroLogic Active control unit is not supplied by an external power supply, the internal battery provides a backup supply to the MicroLogic Active control unit.

In this case, local indications are available on:

- The **Status** bar
- The **Ready** LED
- The trip cause LEDs

The MicroLogic Active display screen is off.

The status bar and the trip cause LEDs switch off after 2 hours. Use the button to switch on the status bar and the trip cause LEDs.

Indications after a trip event, wthout external power supply	LED display	LED description
Trip on long-time protection (L)		Ready LED: off Status bar: red blinking ERMS LED: off L trip cause LED: red blinking
Trip on short-time protection (S)		Ready LED: off Status bar: red blinking ERMS LED: off S trip cause LED: red blinking
Trip on instantaneous protection (I)		Ready LED: off Status bar: red blinking ERMS LED: off I trip cause LED: red blinking
Trip on ground-fault protection (G)		Ready LED: off Status bar: red blinking ERMS LED: off G trip cause LED: red blinking
Trip on advanced and other, customized protection (O)		Ready LED: off Status bar: red blinking ERMS LED: off O trip cause LED: red blinking
Major internal incident detected. See Maintenance and Diagnostic Functions, page 165.		Ready LED: off Status bar: red blinking ERMS LED: off All trip cause LEDs: red blinking

EcoStruxure Power Commission Software

Overview

EcoStruxure Power Commission software helps you to manage a project as part of testing, commissioning, and maintenance phases of the project life cycle. The innovative features in it provide simple ways to configure, test, and commission the smart electrical devices.

EcoStruxure Power Commission software automatically discovers the smart devices and allows you to add the devices for an easy configuration. You can generate comprehensive reports as part of Factory Acceptance Test and Site Acceptance Test to replace your heavy manual work. Additionally, when the panels are under operation, any change of settings made can be easily identified by a yellow highlighter. This indicates the difference between the project and device values, and hence provides a system consistency during the operation and maintenance phase.

EcoStruxure Power Commission software enables the configuration of MasterPacT MTZ circuit breakers with MicroLogic Active control unit.

For more information, refer to the *EcoStruxure Power Commission Online Help*.

Click here to download the latest version of EcoStruxure Power Commission software.

Key Features

EcoStruxure Power Commission software performs the following actions for the supported devices and modules:

- Create projects by device discovery.
- Save the project in the EcoStruxure Power Commission cloud for reference.
- Upload standard protection settings to the device and download standard protection settings from the device.
- Compare the standard protection settings between the project and the device.
- Generate and print the device standard protection settings report.
- View the logs and maintenance information.
- View the alarm details.
- Check the system firmware compatibility status.
- Update to the latest device firmware.
- Perform automatic trip curve tests with preconfigured or custom test points.
- Perform arc energy reduction tests in compliance with NEC 240.87(C).

EcoStruxure Power Device App

Presentation

EcoStruxure Power Device app is a single mobile application with the necessary information and capabilities to operate and efficiently maintain devices in the EcoStruxure architecture.

The application enables you to connect to devices, including the following:

- MasterPacT MTZ circuit breakers
- TeSys GV4 motor circuit breakers
- Easergy P3 protection relays

The application can be installed on a smartphone by downloading the application from:

- Google Play Store for Android smartphones
- App Store for iOS smartphones
- iPhone 7 with iOS 13 are the minimum requirements for NFC connectivity.

MasterPacT MTZ Circuit Breakers in EcoStruxure Power Device App

With the EcoStruxure Power Device app, a smartphone can be used with MasterPacT MTZ circuit breakers as the primary interface for day-to-day and critical case maintenance. The MicroLogic Active control unit is identified on the application by scanning the QR code on the device.

EcoStruxure Power Device app is available through:

- NFC wireless communication (not available with MicroLogic Active 6.0 Ei control unit).
- USB OTG (On-The-Go) connection.

Using a USB OTG (On-The-Go) Connection

The MicroLogic Active control unit can be powered by an Android smartphone using the USB OTG connection, if necessary.

Using EcoStruxure Power Device app with a USB OTG connection gives access to and allows sharing of the following information types, organized in the following tabs:

- **Quick View**: gives an overview of standard protection settings, the health state of the circuit breaker, and recent event history.
- **Protection Setting**: displays standard protection settings currently selected, and allows modification of standard protection settings.

For more information, refer to the USB OTG (On-The-Go) connection procedure, page 202.

Using an NFC Connection

Connecting to EcoStruxure Power Device app with an NFC connection is always possible, even when the MicroLogic Active control unit is not powered. It gives access to the following information:

- Information about the MicroLogic Active control unit.
- Last trip context: trip type; date and time of last trip; current values before trip.
- Standard and ERMS protection settings (display only).
- ERMS status.
- Maintenance:
  - Displays diagnostic counters.
  - Electrical and mechanical operation. Mechanical operation only works if the Control unit is supplied by 24 Vdc.

For more information, refer to the NFC connection procedure, page 200.

NOTE: NFC communication is not available with MicroLogic Active 6.0 Ei control unit.

Go2SE Landing Page

Presentation

When the QR code on the front face of a MicroLogic Active control unit is scanned with a smartphone running a QR code reader and connected to the Internet, the Go2SE landing page is displayed.

The landing page displays:

- Information about the MicroLogic Active control unit, including traceability information.
- Information about the MasterPacT MTZ circuit breaker.
- Zigbee ID and installation code for MicroLogic Active AP/EP control unit.
- A list of menus.

Landing Page Description

The landing page is accessible from Android and iOS smartphones. It displays the same list of menus with slight differences in presentation.

The landing page shows:

- Product image
- Link to Download Product Data Sheet
- Link to Register Product
- **Overview**
  - Serial number
  - Reference
  - Description
- **Resource Center**
  - Access all documents
    - Instruction sheets
    - User guides
    - Videos
    - Brochures
    - Declarations of conformity
  - Access to resources sorted by usage:
    - Install
    - Operate
    - Maintain
    - Monitor
    - Cybersecurity
  - Environmental data
  - Spare Parts
- **Support**

Serial Number

The serial number provides traceability by encoding the manufacturing date and location of the MicroLogic Active control unit, page 20.

Zigbee ID and Installation Code

Click on **More details** to get the Zigbee ID and installation code. If using selective discovery, the Zigbee ID is used to discover a MicroLogic Active AP/EP control unit with a Panel Server.

The Zigbee ID (IEEE address) is a hexadecimal number with 16 characters, for example 8C6FB9FFFEF7A574.

The installation code is a hexadecimal number with 36 characters, for example 1F4A547964BC254A1F4A547964BC254ABC12.

mySchneider App

Selecting this application gives access to the Schneider Electric customer care mobile application **mySchneider** app that can be downloaded on Android and iOS smartphones. For smartphone compatibility, check on your application store. The customer care application offers self-service instructions and easy access to expert support and information.

Date and Time

Presentation

MicroLogic Active date and time are used for time stamping events to provide a chronological order.

The date and time of the MicroLogic Active control unit and the other ULP modules (BCIM module, EIFE or IFM interface) of the intelligent modular unit (IMU) are synchronized. Setting the date and time of one module sets the date and time of all the modules of the IMU.

NOTE: The date and time of MicroLogic Active and other ULP modules are automatically reset to default value for the date (Jan 01 2000) when the internal battery of the MicroLogic Active control unit is removed and the control unit has no other power supply.

Setting the Date and Time Manually

MicroLogic Active date and time can be set manually:

- On the MicroLogic Active display screen, from the tree navigation menu, at **Configuration > General > Date & Time**.
- With a web browser connected to the IFM or EIFE webpage.

Predefined Events

The following event is generated when date and time are set manually:

Code	Event	History	Severity
0x1107 (4359)	**Date and time set**	Operation	Low

Power Supply

MicroLogic Active Power Supplies

The MicroLogic Active control unit is powered by the current through the internal current transformers (CT).

- The standard protection functions of MicroLogic Active control units operate with the internal current supply.
- If the load current is higher than 20% of the rated current In, the internal current supply provides the power supply for the full functioning of the MicroLogic Active control unit.

To provide a power supply to the MicroLogic Active control unit when the load is below 20% of the rated current In, and maintain the full functioning of the MicroLogic Active control unit, optional external power supplies can be used.

⚠ WARNING

HAZARD OF 24 VDC SYSTEM NOT COMPLIANT WITH SELV REQUIREMENT

- Supply MicroLogic Active control units with 24 Vdc non-SELV (Safety Extra Low Voltage), paying attention to polarity.
- Do not connect MicroLogic Active control units to a 24 Vdc -SELV system as the MicroLogic Active control unit is not providing double or reinforced insulation from the main circuit. For example, do not use the non-SELV 24 Vdc power supply of a MicroLogic Active control unit to supply a MicroLogic X control unit or an SELV communication module.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

External power supplies include the following:

- Permanent power supplies: external 24 Vdc non-SELV (Safety Extra Low Voltage) power supply.
- Temporary power supplies connected to the USB-C port of the MicroLogic Active control unit:
  - External Mobile Power Pack through USB connection.
  - Android smartphone through USB OTG connection.
  - PC through USB connection.

Each external MicroLogic Active power supply is described further.

BCIM Power Supply

⚠ WARNING

HAZARD OF 24 VDC SYSTEM NOT COMPLIANT WITH SELV REQUIREMENT

- Supply the ULP port module or ULP module with a 24 Vdc SELV (Safety Extra Low Voltage) power supply, paying attention to polarity.
- Do not use the same power supply to supply the MicroLogic Active control unit and the ULP port module or the ULP module supplying the BCIM module.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The BCIM module is supplied by the 24 Vdc SELV (Safety Extra Low Voltage) power supply of the ULP port module or ULP module connected to the COM terminal block (for example IFE or IFM interface), depending on the architecture. This power supply must be independent of the MicroLogic Active control unit power supply.

For more information, refer to DOCA0387•• *Breaker Communication and Isolation Module (BCIM) for MicroLogic Active Control Unit - User Guide*, page 10.

Recommendations for External Power Supplies

Recommendations for the use of external 24 Vdc power supplies:

- The same 24 Vdc power supply can be used to supply several MicroLogic Active control units, depending on the overall power requirements of the system.
- Use a separate 24 Vdc power supply to supply the MN/MX/XF voltage releases or the MCH gear motor.
- Do not use the same 24 Vdc power supply to supply power to the MicroLogic Active control unit and the BCIM module.

Recommended 24 Vdc Power Supplies

For information about recommended 24 Vdc power supplies, refer to the *MasterPacT MTZ with MicroLogic Active Control Unit - Catalog*.

Mobile Power Pack

The Mobile Power Pack is an external battery that enables power to be supplied temporarily to the MicroLogic Active control unit.

The Mobile Power Pack enables use of the MicroLogic Active display screen and keypad for setting and displaying when the power supply to the MicroLogic Active control unit is interrupted.

The external Mobile Power Pack can be connected by using a USB cable (RS PRO, reference 182-8848) connected to the USB-C port on the MicroLogic Active control unit.

Check the charge level of the Mobile Power Pack by pressing the test button for one second. The indicator on the Mobile Power Pack lights up to indicate the remaining charge.

Internal Battery

When no other power supply is supplying the MicroLogic Active control unit, the internal battery powers the:

- Trip cause LEDs
- Status bar
- Internal clock (date and time)
- Maintenance schedule function

The internal battery is protected by a strip. Remember to remove the battery strip before operation. For information about the removal of the battery strip, consult the instruction sheets for MasterPacT MTZ circuit breakers in Related Documents, page 10.

Power Consumption

The following table lists the power consumption of the MicroLogic Active control unit and BCIM module:

Module		**Typical consumption (24 Vdc at 20 °C/68 °F)**	**Maximum consumption (21.6 Vdc at 60 °C/140 °F)**
MicroLogic Active control unit for MasterPacT MTZ circuit breaker	with external 24 Vdc power supply	200 mA	250 mA
	supplied through USB-C port	400 mA	500 mA
ULP port module for MasterPacT MTZ circuit breaker	supplying the BCIM module with communication function only	25 mA	32 mA
	supplying the BCIM module with communication and I/O functions	125 mA	232 mA

Firmware Update

Introduction

The primary reason for updating the firmware of a MicroLogic Active control unit is to obtain the latest MicroLogic Active features. If the latest MicroLogic Active features are not required, it is not mandatory to update the firmware of the MicroLogic Active control unit and the devices of the IMU.

The standard protection functions of the MicroLogic Active control unit remain active during a firmware update.

Use the latest version of EcoStruxure Power Commission software, page 29 for all firmware updates.

For more information about firmware updates refer to the following documents, page 10:

- DOCA0155•• *MicroLogic Trip Units and Control Units - Firmware History*
- DOCA0267•• *MasterPacT MTZ - MicroLogic Active Control Unit - Firmware Release Notes*
- DOCA0387•• *Breaker Communication and Isolation Module (BCIM) for MicroLogic Active Control Unit - User Guide*
- DOCA0395•• *Breaker Communication and Isolation Module (BCIM) for MicroLogic Active Control Unit - Firmware Release Notes*

After updating the firmware version of the MicroLogic Active control unit, use the **Firmware Update** table in EcoStruxure Power Commission software to check firmware compatibility with the BCIM module.

NOTE: Only the compatibility of MicroLogic Active control unit and the BCIM module is checked. The firmware of the other modules of the ULP system must be checked separately.

Checking the Firmware Version

Check the firmware version:

- On the MicroLogic Active display screen from the tree navigation menu, at **Maintenance > Assistance > Firmware version**
- With EcoStruxure Power Commission software
- With EcoStruxure Power Device app

Updating Firmware With EcoStruxure Power Commission Software

NOTICE

INTERRUPTION OF POWER SUPPLY

The MicroLogic Active control unit must be continuously powered during the firmware update.

Failure to follow these instructions will result in deterioration of the control unit.

The prerequisites for updating the firmware with EcoStruxure Power Commission software are the following:

- The latest version of EcoStruxure Power Commission software must be downloaded and installed on the PC.
- The PC must be connected to a power supply. Standby mode must be deactivated to avoid the possibility of interruption during the update.
- The PC must be connected to the USB-C port on the MicroLogic Active control unit.
- The MicroLogic Active control unit must be powered by the PC.

The user must be authenticated and have the related permission to launch the firmware update.

For more information, refer to *EcoStruxure Power Commission Online Help*.

Click here to download the latest version of EcoStruxure Power Commission software.

Predefined Events

The following events can be generated when a firmware update is performed:

Code	Event	History	Severity
0x0D09 (3337)	**Firmware discrepancy within control unit.**	Diagnostic	Medium
0x112B (4395)	**Control unit firmware update mode**	Operation	Low
0x112C (4396)	**Control unit firmware update unsuccessful**	Operation	Low

Recommended Actions

Code	Event	Recommended actions
0x0D09 (3337)	**Firmware discrepancy within control unit.**	Check the firmware version of the MicroLogic Active control unit with EcoStruxure Power Commission software. If not latest, update the firmware of the MicroLogic Active control unit.
0x112B (4395)	**Control unit firmware update mode**	Wait until the update of the MicroLogic control unit firmware is completed.
0x112C (4396)	**Control unit firmware update unsuccessful**	Restart the update procedure. If the message is displayed again, plan to replace the MicroLogic Active control unit.

Contact Schneider Electric Support or your Schneider Electric Services representative for more information about who can carry out the recommended actions.

Reboot or Restart MicroLogic Active Control Unit

Reboot MicroLogic Active Control Unit

Events which require a reboot of the MicroLogic Active control unit are:

- **Internal access loss. Reboot control unit** (code 0x1473, page 175)
- **Protection settings not accessible 2** (code 0x1474, page 175)
- **Invalid PowerTag communication** (code 0x1421, page 205)

Reboot the MicroLogic Active control unit by simultaneously pressing the 5 buttons , **OK**, **Back**, **Up**, and **Down**.

IMPORTANT: The standard protection functions remain active during the reboot process.

Restart MicroLogic Active Control Unit

Restart of the MicroLogic Active control unit is required when:

- The rated frequency setting is changed (MicroLogic Active E/EP/Ei control unit only)
- The MicroLogic Active HMI does not display protection alarms or measures screens
- The MicroLogic Active loses the Zigbee signal

Restart the MicroLogic Active control unit in one of the following ways:

- Switch off the power supply to the MicroLogic Active control unit, and switch it back on.
- Click the **Restart Module** button on the **Launch Firmware Upgrade** page of EcoStruxure Power Commission software.

The settings of the MicroLogic Active control unit are not affected by the restart.

IMPORTANT: The standard protection functions remain active during the restart.

Access Management

What's in This Part

Access Management Per Access Path 42
Management of Access via HMI 43
Management of Access via the USB Port 44

Access Management Per Access Path

General Description

Data on MicroLogic Active control units can be accessed:

- From the MicroLogic Active HMI (PIN code protected)
- On a device connected to the MicroLogic Active USB-C port (password protected):
  - An Android smartphone running EcoStruxure Power Device app, page 30 through USB OTG connection
  - A PC running EcoStruxure Power Commission software, page 29
- On remote controllers through the ULP modules of the IMU system
- On a smartphone running EcoStruxure Power Device app, page 30 through NFC connection
- On Panel Server webpages and on servers or remote controllers connected to Panel Server, through Zigbee wireless communication (MicroLogic Active AP/EP control unit only)

The following table describes the functions which can be accessed via each access path, and the required protection mechanisms (if any).

Function	Description	Access path				
		HMI	USB port	IMU	Zigbee	NFC
Monitoring	Read settings, measurements, and data	✓	-	✓	✓	✓
Settings	Set MicroLogic Active control unit settings	✓ (1)	✓ (2)	✓ (4)	-	-
Reset counters	Reset minimum and maximum values	✓	-	✓	-	-
Test	Send test commands	✓ (1)	-	-	-	-
Firmware update	Update firmware to the latest version	-	✓ (2)	-	-	-
Operation	Send commands to open and close the circuit breaker	-	-	✓ (3)	-	-
MicroLogic Active replacement	Set the settings of a replacement MicroLogic Active control unit	✓ (1)	-	-	-	-

✓ Access allowed without restriction

✓ (1) Access protected by PIN code

✓ (2) Access protected by USB password

✓ (3) Access only allowed in Auto Remote control mode

✓ (4) Access only allowed when the **Remote Setting** parameter is set to **ON**

Management of Access via HMI

Description

Access to MicroLogic Active data is available on the MicroLogic Active HMI.

Access to protected parameters is protected by a PIN code. This PIN code has no expiry date.

By default, the PIN code is associated with the SecurityAdmin account.

When you access a protected parameter for the first time, you are prompted to create a SecurityAdmin account and set a PIN code. You are then prompted to enter the PIN code each time you access a protected parameter. If you enter the wrong PIN code 5 times, the account is locked for 4 minutes.

You can postpone account creation by selecting **Do it later**. In this case, you are prompted to create an account each time you access a protected parameter.

The following actions are protected by PIN code:

- HMI PIN code modification
- Protection function setting
- Protection function testing
- Date and time modification
- Control mode modification
- Replacement MicroLogic Active setting

PIN Code Change

The PIN code can be changed on the MicroLogic Active control unit HMI, page 75.

The PIN code must consist of 6 digits, from 0 to 9.

PIN Code Reset

The PIN code can be reset by pressing **Reset all users** when connecting to EcoStruxure Power Commission software or EcoStruxure Power Device app.

After pressing **Reset all users**, a confirmation pop-up message appears on the screen. Click to confirm and complete the procedure.

NOTE: reset of the USB password also results in reset of the PIN code.

Management of Access via the USB Port

Description

Access to data via the USB port is done with:

- EcoStruxure Power Device app, page 30
- EcoStruxure Power Commission software, page 29

Access via the USB port is protected by the USB password. This password has no expiry date.

USB Password Creation

When you connect to EcoStruxure Power Commission software or EcoStruxure Power Device app, you are prompted to create a SecurityAdmin account. You can postpone account creation by selecting **Skip**.

The default password is schneider123.

USB Password Change

The USB password can be changed with EcoStruxure Power Commission software.

Entering the current password is required to change the password.

A password is composed of 8 to 32 ASCII characters, with the following constraints:

- Only ASCII [32–126] allowed
- At least one uppercase character
- At least one lowercase character
- Must not contain the username
- Must be different to the previous password

USB Password Reset

The USB password can be reset by pressing **Reset Password** when connecting to EcoStruxure Power Commission software or EcoStruxure Power Device app.

After pressing **Reset Password**, a confirmation pop-up message appears on the screen. Click to confirm and complete the procedure.

NOTE: reset of the USB password also results in reset of the PIN code.

Using the MicroLogic Active Human Machine Interface

What's in This Part

MicroLogic Active HMI Description 46
HMI Display Modes 49
Quick View Mode 50
Tree Navigation Mode 53
Standard Protection Setting Procedure 60
ERMS Function 66
Measures Menu 67
Alarms/History Menu 72
Maintenance Menu 74
Configuration Menu 75
Protection Menu 78
Pop-up Event Messages 81

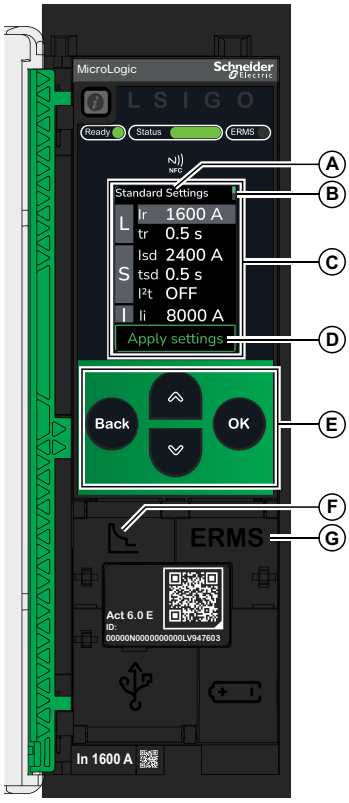
MicroLogic Active HMI Description

Introduction

The human machine interface (HMI) of the MicroLogic Active control unit includes:

- A color display screen
- Navigation buttons to navigate through the menu structure, and access monitored parameters and configuration settings
- A button providing direct access to protection function settings
- A button providing direct engagement and disengagement of the ERMS function

Display Screen and Buttons



A Screen name

B Scroll bar indicating the relative position of listed items

C Functional screen content

D Context-specific action enabled by pressing **OK**

E Navigation buttons

F Protection settings button

G ERMS button

Navigation Buttons

Button	Description
	Use the up and down buttons: • To increment or decrement a configuration setting, either numerical values or predefined list items • To move between: ◦ Screens within the same level of menu hierarchy ◦ List items The up and down buttons do not support looping back, except for numerical value selection (0 to 9). For non-numerical value selection, at the terminus of a menu structure or item list, the up button (at the beginning of the list) or down button (at the end of the list) is no longer active. The up and down navigation behavior is the same for all menus and lists.
	Use the **OK** button: • To validate a selection • To navigate from the level currently displayed in the hierarchy to the selected sublevel immediately below it. In this way, navigation is possible from: ◦ The active menu to the immediate submenu ◦ A configuration parameter to its configuration setting • To navigate from the currently selected parameter digit, to the next digit on the right. • To simultaneously validate a setting and navigate to the next setting. For example, to confirm the value of a parameter digit, and navigate to the next digit on the right. • To acknowledge actions, for example, when a confirmation screen is displayed. • To view details and acknowledge an event pop-up screen or error message.
	Use the **Back** button: • To navigate up one level of hierarchy. • To navigate from the currently selected parameter digit, to the previous digit on the left.

Direct Access Buttons

Direct access buttons are protected by a cover. The cover can be sealed to avoid access to the protection settings or ERMS function by unauthorized personnel. The cover is opened by breaking the seal with a flat screwdriver.

Button	Description
	Use the Protection setting button to directly access the Standard Protection menu. See Standard Protection Setting Procedure, page 60. This does not include ERMS settings, which are adjusted through EcoStruxure Power Commission software.
	Use the ERMS button to engage or disengage the ERMS function. See ERMS Function, page 66.

Display Screen Language

To change the display screen language, go to the tree navigation menu and select:

Configuration > General > Language

Selections include:

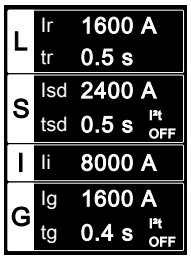
- English (UK)
- Spanish
- German
- Chinese
- Portugese

The default language for the IEC standard MicroLogic Active control unit is English (UK).

Start-up Screen

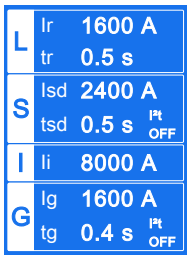
The start-up screen is displayed every time the MicroLogic Active control unit is energized. None of the buttons on the control unit are functional while this screen is displayed. The screen is displayed for the period of the control unit start-up time. At the end of this period, the LSIG home screen or any active pop-up screen is displayed.

LSIG Home Screen



The LSIG home screen displays the protection settings which are currently being used by the protection functions.

The default LSIG home screen displays the standard protection settings.



When ERMS is engaged, the LSIG home screen is blue and displays the ERMS protection settings.

HMI Display Modes

Presentation

The MicroLogic Active control unit HMI supports the following display modes:

- Quick View mode to display a selection of screens
- Tree Navigation mode to access all screens through a menu structure

NOTE: Both Quick View and Tree Navigation display modes are overridden by event messages, page 81.

Quick View Mode

Quick View mode is activated after 3 minutes of inactivity on the MicroLogic Active control unit keypad.

In Quick View mode the display scrolls through a selection of screens in a repeated loop.

Tree Navigation Mode

In Tree Navigation display mode, use the navigation buttons to navigate the menu structure. Tree Navigation display mode presents a single network of menus, with monitoring values and editable configuration settings.

Tree navigation is accessible from the LSIG home screen by pressing one of the navigation buttons, **OK**, **Back**, **Up**, or **Down**.

Refer to the MicroLogic Active local HMI description, page 47 for information about how to use the HMI buttons to:

- Navigate the menu structure
- Access and edit settings

Quick View Mode

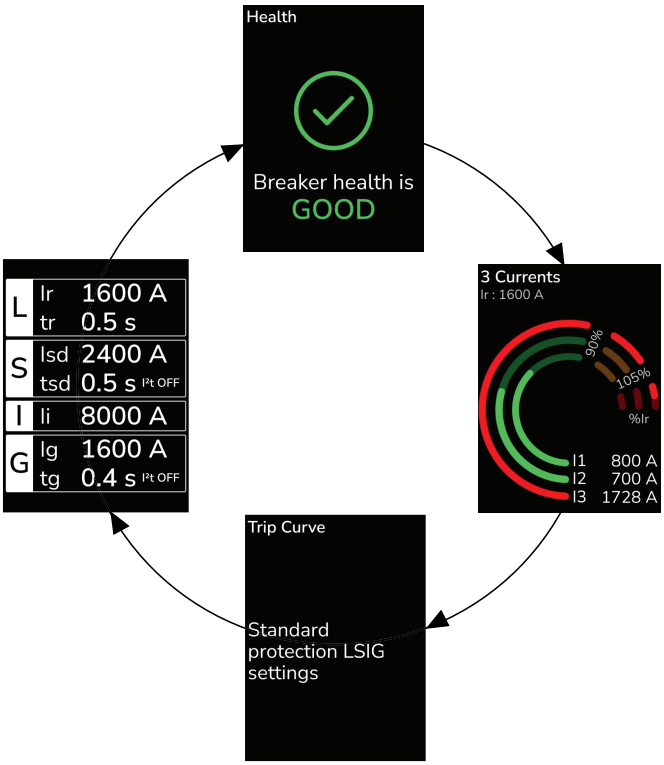
Quick View

Quick view presents a sequence of screens, depending on the type of MicroLogic Active control unit. The screens display a snapshot of the status and operating values of the control unit. The values shown on the protection screens are the active protection settings currently used by the protection functions.

The active protection settings are:

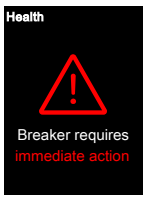
- Standard protection settings, by default.
- ERMS protection settings, when ERMS is engaged.
- Fallback protection settings, when the MicroLogic Active control unit reverts to fallback protection settings after the event **Last protection settings have not been applied.** (code 0x142F, page 175).

The following is an example of the Quick View screens for the MicroLogic Active 6.0 control unit when standard protection settings are active.



List of Quick View Screens

Depending on the type of the MicroLogic Active control unit, Quick View displays the following screens:

Screen	Description	MicroLogic Active type
Health(1)	Displays the health state of the circuit breaker: Good health state (green) Medium-severity detected alarm that requires an action to be planned (orange) High-severity detected alarm that requires immediate action (red) 	MicroLogic Active 2.0, 5.0 and 6.0
Current(1)	Displays I1, I2, I3 RMS current on phase 1, 2, 3 values as bar graphs expressed in % of Ir.The three current values are displayed in Amps under the bar graph.	MicroLogic Active 2.0, 5.0 and 6.0
Trip Curve	Displays the message: • **Standard protection LSIG settings**, by default. • **ERMS protection LSIG settings**, when ERMS is engaged. • **Fallback protection LSIG settings**, when fallback settings are in use.	MicroLogic Active 2.0, 5.0 and 6.0
LI settings	Displays a selection of active protection settings: • Long time overcurrent protection threshold Ir • Long time overcurrent protection time delay tr • Instantaneous overcurrent protection threshold Ii	MicroLogic Active 2.0
LSI settings	Displays a selection of active protection settings: • Long time overcurrent protection threshold Ir • Long time overcurrent protection time delay tr • Short time overcurrent protection threshold Isd • Short time overcurrent protection time delay tsd • Instantaneous overcurrent protection threshold Ii	MicroLogic Active 5.0
LSIG settings	Displays a selection of active protection settings: • Long time overcurrent protection threshold Ir • Long time overcurrent protection time delay tr • Short time overcurrent protection threshold Isd • Short time overcurrent protection time delay tsd • Instantaneous overcurrent protection threshold Ii • Ground- fault protection threshold Ig • Ground- fault protection time delay tg	MicroLogic Active 6.0
(1) Screen data is refreshed every second.		

NOTE: When ERMS is engaged, the Quick View screens are blue.

Starting Quick View Scrolling

Quick View scrolling starts automatically after 3 minutes of inactivity on the MicroLogic Active control unit keypad, as long as there is no pending user action.

The display scrolls through a selection of screens in a repeated loop. Each screen is displayed for 5 seconds before the next screen is displayed.

Stopping Quick View Scrolling

Stop Quick View scrolling by pressing the **Back** button. The LSIG home screen is displayed.

When the MicroLogic Active control unit detects any of the following events, Quick View scrolling is interrupted and a pop-up message is displayed, page 81:

- Trip
- High severity alarm
- Medium severity alarm

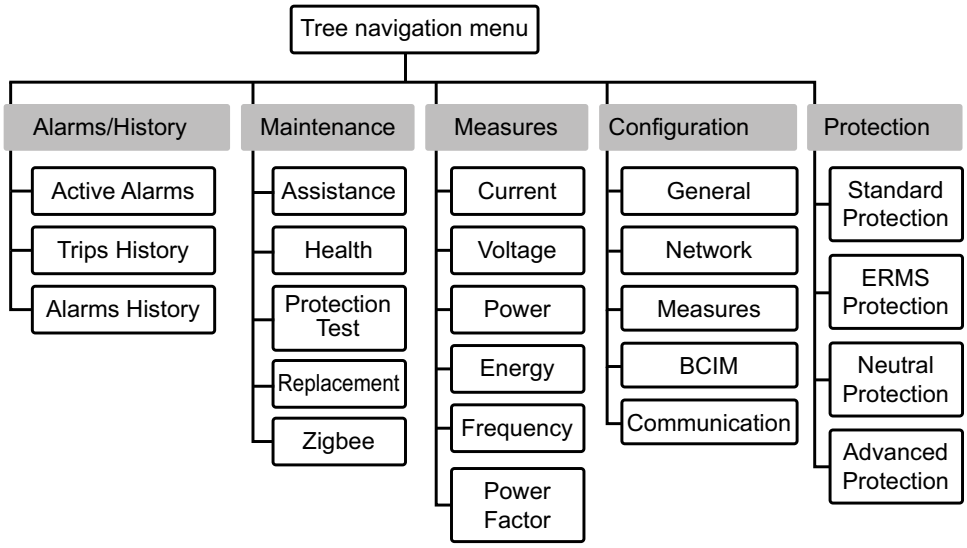
Tree Navigation Mode

Tree Structure Screen Display

Use Tree Navigation mode to navigate manually through the MicroLogic Active control unit menu structure. Tree Navigation mode enables the following actions:

- Display measurement values for the control unit
- View active alarms, and event history
- View maintenance items, and a history of service records
- Display and edit control unit configuration settings
- Display protection settings

Tree navigation begins at the tree navigation menu:



Click the link on one of the following level 2 menus to see its content:

Level 1	Level 2
Tree navigation menu	**Alarms/History**, page 72
	Maintenance, page 74
	Measures, page 67
	Configuration, page 75
	Protection, page 78

Navigating in the Menu Structure

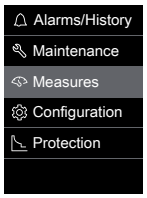
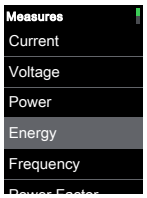
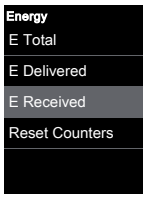
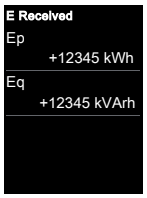
Use the navigation buttons on the face of the MicroLogic Active control unit to navigate in the menu structure, and to access displayed values and configurable settings.

The possible operations are listed below, and are illustrated with an example:

- Display data, for example, energy values
- Reset values or counters, for example, reset the maximum RMS current
- Select options in a list, for example, language
- Edit a value, for example, nominal voltage
- Validate a pop-up message, for example, a pop-up trip message

Displaying Data

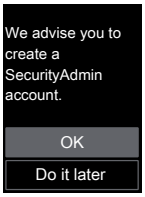
The following example shows how to display energy values:

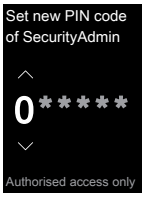
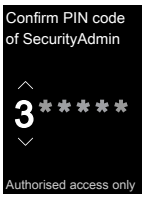
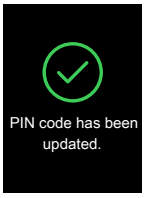
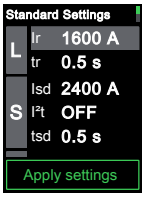
Step	Action	Screen
1	To reach the tree navigation menu: • From the LSIG home screen, press any navigation button. • From any other screen, press **Back** repeatedly, until you reach the tree navigation menu. Press the down button to select **Measures**.	
2	Press **OK**. The **Measures** menu opens. Press the down button to select **Energy**.	
3	Press **OK**. The **Energy** menu opens. Press the down button to select **E received**.	
4	Press **OK**. The **E received** screen is displayed.	
5	To exit the **E received** screen, press the **Back** button to return to the **Energy** menu.	–

Setting the PIN Code

A PIN code can be used to protect key features and parameters of the MicroLogic Active control unit. For more information about the use of the PIN code, see Management of Access via HMI, page 43.

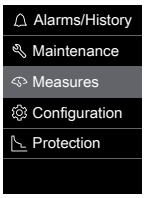
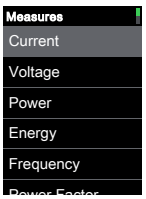
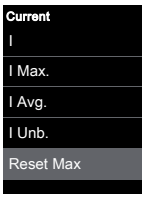
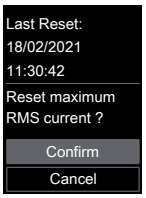
The following example shows how to set the PIN code of the MicroLogic Active control unit.

Step	Action	Screen
1	Use a flat screwdriver to break the seal and lift the cover of the protection settings button.	–
2	Press the protection settings button.	–
3	You are prompted to create a SecurityAdmin account: • Press **OK** to create a SecurityAdmin account and set the PIN code. • Press **Do it later** for direct access to LSIG parameters modification, without creating a SecurityAdmin account. In this case, you are taken directly to step 11.	

Step	Action	Screen
4	If you pressed **OK** in step 3, the PIN code setting screen opens.	
5	Set a new PIN code as follows: • Press the up and down buttons to increment or decrement the selected digit by one. • Press **OK** to confirm the current digit value, and move to the next digit on the right. • Press **Back** to go back to the previous digit on the left.	–
6	Press **OK** on the right-most digit to confirm the PIN code.	–
7	The PIN code confirmation screen opens.	
8	Enter the same PIN code submitted in step 5. Press **OK** on the right-most digit to confirm the new PIN code.	–
9	The PIN code update notification screen opens.	
10	Press **OK**.	–
11	The **Standard Settings** menu opens.	
12	Close and seal the cover of the protection settings button.	–

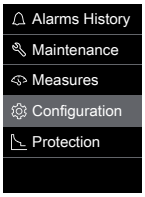
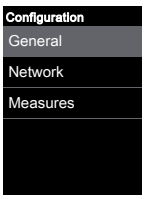
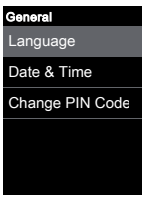
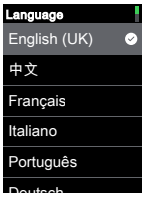
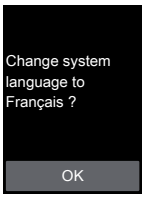
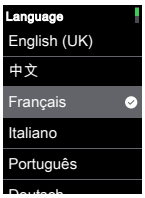
Resetting Values

Some menus present values or counters that can be reset. The following example shows how to navigate to and reset the maximum RMS current:

Step	Action	Screen
1	To reach the tree navigation menu: • From the LSIG home screen, press any navigation button. • From any other screen, press **Back** repeatedly, until you reach the tree navigation menu. Press the down button to select **Measures**.	
2	Press **OK**. The **Measures** menu opens. Select **Current**.	
3	Press **OK**. The **Current** menu opens. Press the down button to select **Reset Max**.	
4	Press **OK**. The date and time of the last reset are displayed.	
5	Press **OK**. The reset confirmation screen opens. In the reset confirmation screen, use the up and down buttons to select, and then press **OK** on one of the following: • **Confirm** to reset the maximum RMS current. After a delay the new reset date and time are displayed. Press **Back** to return to the **Current** screen. • **Cancel** to return to the **Current** screen without resetting the value.	

Selecting Options in a List

Some menus present options in a list. The following example shows how to navigate to and select language options:

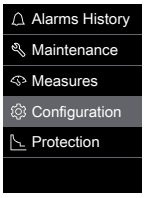
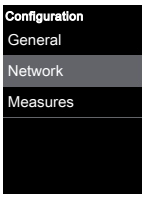
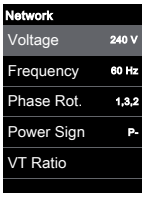
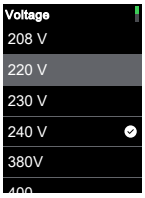
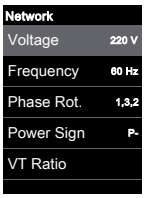
Step	Action	Screen
1	To reach the tree navigation menu: • From the LSIG home screen, press any navigation button. • From any other screen, press **Back** repeatedly, until you reach the tree navigation menu. Press the down button to select **Configuration**.	
2	Press **OK**. The **Configuration** menu opens. Select **General**.	
3	Press **OK**. The **General** menu opens. Select **Language**.	
4	Press **OK**. The **Language** menu opens.	
5	Press the up and down buttons to select a language and press **OK**.	–
6	The language change confirmation screen opens. Press **OK** to confirm that you want to change to the selected language.	
7	After a delay, a confirmation check appears next to the selected language.	

Editing and Saving Parameter Settings

When editing a parameter setting, use the up and down buttons to increment or decrement the setting by a single-step amount.

This function applies to both numeric values and list selections.

The following example shows how to edit the nominal voltage:

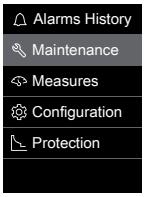
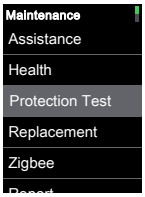
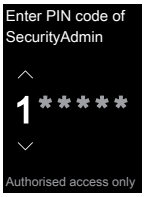
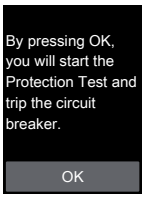
Step	Action	Screen
1	To reach the tree navigation menu: • From the LSIG home screen, press any navigation button. • From any other screen, press **Back** repeatedly, until you reach the tree navigation menu. Press the down button to select **Configuration**.	
2	Press **OK**. The **Configuration** menu opens. Press the down button to select **Network**.	
3	Press **OK**. The **Network** menu opens. Select **Voltage**. In the example, the voltage setting is **240 V**.	
4	Press **OK**. The **Voltage** menu opens. Press the up and down buttons to select the voltage you require and press **OK**.	
5	Press **OK** to return to the **Network** menu with the selected value validated. In the example, the new voltage setting is **220 V**.	

If the modification did not succeed, a detected error message appears. Press **OK** to confirm the message, and then the previous menu is displayed.

Performing a Protection Test on MicroLogic Active Control Unit

The protection test function simulates a trip generated by:

- Instantaneous overcurrent protection for MicroLogic Active 2.0 and 5.0 control units. For more information about the instantaneous overcurrent protection test, see Protection Test for MicroLogic Active 2.0 and 5.0, page 102.
- Ground-fault protection for MicroLogic Active 6.0 control units. For more information about the ground-fault protection test, see Protection Test for MicroLogic Active 6.0, page 107.

Step	Action	Screen
1	To reach the tree navigation menu: • From the LSIG home screen, press any navigation button. • From any other screen, press **Back** repeatedly, until you reach the tree navigation menu. Press the down button to select **Maintenance**.	
2	Press **OK**. The **Maintenance** menu opens. Select **Protection Test**.	
3	Press **OK**. If a SecurityAdmin account has been created, the PIN code menu opens. If a SecurityAdmin account has not been created, see Setting the PIN Code, page 54.	
4	Enter the PIN code as follows: • Press the up and down buttons to increment or decrement the selected digit by one. • Press **OK** to confirm the current digit value, and move to the next digit on the right. • Press **Back** to go back to the previous digit on the left.	–
5	Press **OK** on the right-most digit to confirm the PIN code.	–
6	The protection test confirmation menu opens. Press **OK** to confirm that you want to start the protection test and trip the circuit breaker.	
7	A countdown begins from 5 to 1 s.	
8	• For MicroLogic Active 2.0 and 5.0 control units, the **Ii test trip** pop-up trip message appears. • For MicroLogic Active 6.0 control units, the **Ig test trip** pop-up trip message appears. Press **OK** to close the pop-up trip message.	

Standard Protection Setting Procedure

Standard Protection Setting Session

The procedure for setting a standard protection function conforms to UL489SE, with an exclusive editing session and a two-step procedure for submitting and applying standard protection setting changes.

Access to the protection function is protected by a PIN code.

The standard protection functions are:

- Long time overcurrent protection
- Short time overcurrent protection
- Instantaneous time overcurrent protection
- Ground fault protection
- Neutral protection

Two modes of protection setting are available:

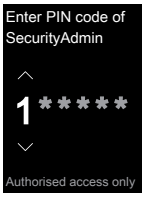
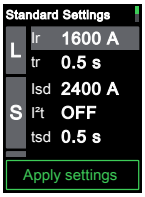
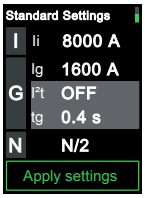
- Quick settings mode
- Fine adjustment mode

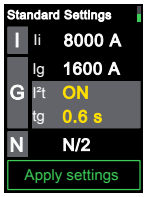
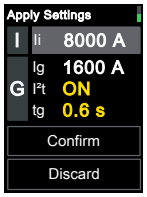
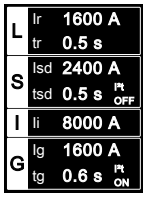
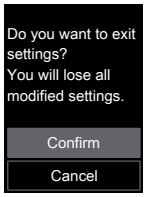
The availability of the setting modes depends on the type of standard protection setting, described in Standard Protection Functions, page 90.

If the MicroLogic Active control unit power supply is interrupted, use the Mobile Power Pack to enable the protection setting procedure on the MicroLogic Active HMI.

Setting Protection Using Quick Setting Mode

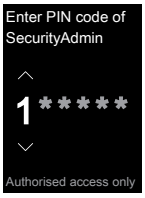
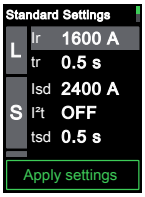
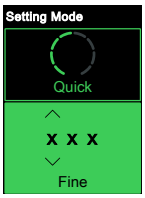
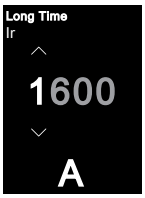
The following example shows how to set the ground fault protection using quick setting mode:

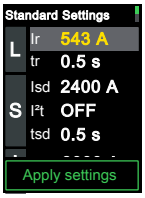
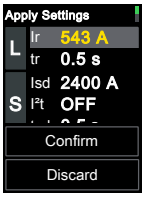
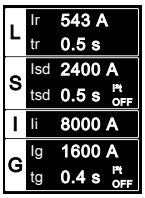
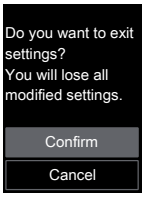
Step	Action	Screen
1	Use a flat screwdriver to break the seal and lift the cover of the protection settings button. • Press the protection settings button. • Press **OK**. **NOTE:** Press the protection settings button at any time during the following procedure if you want to cancel the settings and exit the **Standard Settings** menu.	–
2	If a SecurityAdmin account has been created, the PIN code menu opens. If a SecurityAdmin account has not been created, see Setting the PIN Code, page 54.	
3	Enter the PIN code as follows: • Press the up and down buttons to increment or decrement the selected digit by one. • Press **OK** to confirm the current digit value, and move to the next digit on the right. • Press **Back** to go back to the previous digit on the left.	–
4	Press **OK** on the right-most digit to confirm the PIN code and enter the editing session. **NOTE:** After 5 minutes of inactivity, the editing session closes and the display reverts to the LSIG home screen.	–
5	The **Standard Settings** menu opens. • Each standard protection function is represented by a label with a single letter (**L**, **S**, **I** , **G** or **N**) on a grey background. • The grey background indicates that parameters are editable. • Parameters for each protection function are displayed next to the label. • A parameter displayed on a grey background indicates that the parameter is selected for editing.	
6	Press the down button to select the **I²t** and **tg** parameters in the **G** area.	
7	Press **OK** to edit the **I²t** parameter.	–
8	The **I²t** setting menu is displayed. In the example,**I²t OFF** is selected.	
9	Press the up button to select **I²t ON**. Press **OK** to confirm selection of **I²t ON**, and to edit the **tg** parameter.	

Step	Action	Screen
10	The **Ground fault tg** quick setting menu is displayed. **NOTE:** If both setting modes are available for the selected protection setting, the **Setting Mode** menu opens, and you have to select **Quick setting** mode.	
11	Press the up and down buttons to scroll through available settings. Press **OK** to confirm the new setting.	
12	The **Standard Settings** menu is displayed. Parameter settings which have been modified but not applied, are displayed in yellow.	
13	Use the up, down and **OK** buttons to select the next parameter to edit, and repeat from step 8.	–
14	To apply the new settings, use the down button to scroll to **Apply settings**.	–
15	Press **OK** to apply the new settings. The **Apply settings** menu opens.	
16	Use the down button to do one of the following: • Scroll down to **Confirm**, and press **OK** to confirm that you want to apply the new settings. • Scroll down to **Discard**, and press **OK** to confirm that you want to discard the new settings.	–
17	If you selected **Confirm** in step 17, after a delay, the screen displays the LSIG home screen with the new settings.	
18	If you selected **Discard** in step 17, the screen displays a confirmation menu asking you to confirm that you want to exit settings. Do one of the following: • Press **OK** to confirm that you want to exit settings. You return to the screen from which the request was initially made. • Use the down button to scroll down to **Cancel** and press **OK** to continue editing. This takes you back to step 13.	
19	Close and seal the cover of the protection settings button.	–

Setting Protection Using Fine Adjustment Mode

The following example shows how to set the long-time overcurrent protection using fine adjustment mode:

Step	Action	Screen
1	Use a flat screwdriver to break the seal and lift the cover of the protection settings button. • Press the protection settings button. • Press **OK**. **NOTE:** Press the protection settings button at any time during the following procedure if you want to cancel the settings and exit the **Standard Settings** menu.	–
2	If a SecurityAdmin account has been created, the PIN code menu opens. If a SecurityAdmin account has not been created, see Setting the PIN Code, page 54.	
3	Enter the PIN code as follows: • Press the up and down buttons to increment or decrement the selected digit by one. • Press **OK** to confirm the current digit value, and move to the next digit on the right. • Press **Back** to go back to the previous digit on the left.	–
4	Press **OK** on the right-most digit to confirm the PIN code and enter the editing session. **NOTE:** After 5 minutes of inactivity, the editing session closes and the display reverts to the LSIG home screen.	–
5	The **Standard Settings** menu opens. • Each standard protection function is represented by a label with a single letter (**L**, **S**, **I** , **G** or **N**) on a grey background. • The grey background indicates that parameters are editable. • Parameters for each protection function are displayed next to the label. • A parameter displayed on a grey background indicates that the parameter is selected for editing.	
6	In the example, the **Ir** parameter in the **L** (long-time overcurrent protection settings) area is selected for editing.	–
7	Press **OK** to edit the **Ir** parameter. The setting mode menu opens. Press the down button to select **Fine adjustment** mode. **NOTE:** If only one setting mode is available for the selected protection setting, the setting mode menu will not open. Instead, the selected protection setting menu will open.	
8	Press **OK**. The **Long time Ir** fine adjustment menu is displayed, with the cursor over the first digit. The first digit is displayed in white to indicate that it is selected for editing.	
9	Press the up and down buttons to increment or decrement the selected digit by one. • Press **OK** to confirm the current digit value, and move to the next digit on the right. • Press **Back** to go back to the previous digit on the left.	–

Step	Action	Screen
10	Press **OK** on the right-most digit to confirm the new parameter setting.	
11	The **Standard Settings** menu is displayed. Parameter settings which have been modified but not applied, are displayed in yellow.	
12	Use the up, down and **OK** buttons to select the next parameter to edit, and repeat from step 9.	–
13	To apply the new settings, use the down button to scroll to **Apply settings**.	–
14	Press **OK** to apply the new settings. The **Apply settings** confirmation menu opens.	
15	Use the down button to do one of the following: • Scroll down to **Confirm**, and press **OK** to confirm that you want to apply the new settings. • Scroll down to **Discard**, and press **OK** to confirm that you want to discard the new settings.	–
16	If you selected **Confirm** in step 16, after a delay, the screen displays the LSIG home screen with the new settings.	
17	If you selected **Discard** in step 16, the screen displays a confirmation menu asking you to confirm that you want to exit settings. Do one of the following: • Press **OK** to confirm that you want to exit settings. You return to the screen from which the request was initially made. • Use the down button to scroll down to **Cancel** and press **OK** to continue editing. This takes you back to step 12.	
18	Close and seal the cover of the protection settings button.	–

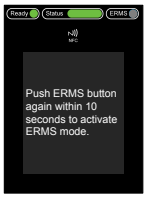
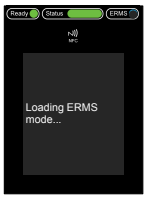
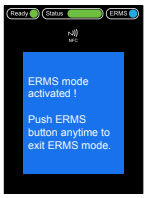
Pop-up Notices

The following table indicates the necessary action to take if a pop-up notice is displayed while editing a protection setting:

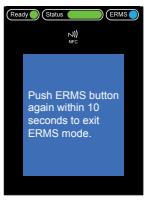
Message	Description	Action
Access denied. Another session already opened	You cannot open an editing session to set protection settings because a session is open on another interface. Protection settings are for display only, and can be consulted on the **Protection** menu in tree navigation mode. It is not possible to set settings as long as a session is open on another interface. Try again later.	Press **OK** to acknowledge the message and return to the LSIG home screen

ERMS Function

Engaging the ERMS Function

Step	Action	Screen
1	Use a flat screwdriver to lift the cover of the **ERMS** button.	–
2	Press the **ERMS** button to engage the ERMS function.	–
3	The ERMS engage request menu opens.	
4	Press the **ERMS** button again, within 10 seconds, to confirm ERMS engagement. The ERMS loading window is displayed. **IMPORTANT:** If the ERMS settings are higher than the standard protection settings, ERMS is not activated and a pop-up message is displayed.	
5	If the ERMS settings are lower than the standard protection settings, the **ERMS mode activated** message is displayed.	
6	While the ERMS function is engaged: • The **ERMS** LED is lit in blue. • The LSIG home screen is blue. • The Quick View screens are blue. • All other screens are not blue.	
7	Close and seal the cover of the **ERMS** button.	–

Disengaging the ERMS Function

Step	Action	Screen
1	Use a flat screwdriver to break the seal and lift the cover of the **ERMS** button.	–
2	Press the **ERMS** button to disengage the ERMS function.	–
3	The ERMS disengage confirmation menu opens.	
4	Press the **ERMS** button again, within 10 seconds, to confirm ERMS disengagement.	–
5	Close the cover of the **ERMS** button.	–

Measures Menu

Presentation

In this guide, electrical phases are described as *phase 1*, *phase 2*, *phase 3* and cover IEC standard.

Description

The **Measures** menu contains the following submenus:

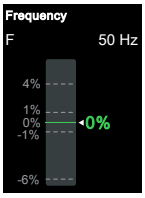
Level 1	Level 2	Level 3	Function description
Tree navigation menu	**Measures**	**Current**	Current real-time measurements
		Voltage	Voltage real-time measurements
		Power	Power real-time measurements
		Energy	Energy real-time measurements
		Frequency	Frequency real-time measurements
		Power factor	Power factor real-time measurements

Measures Screens with Quality Gauge

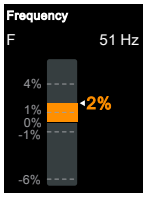
A quality gauge is displayed on the following screens to give a graphical representation of the measurement compared to the expected range:

- Real-time maximum of 3 phase current unbalances, **Iunb**
- Average of 3 RMS phase-to-phase voltages **Vavg VLL(V)**
- Real-time maximum of 3 phase-to-phase voltage unbalances **Vunb VLL(%)**
- Frequency **F**

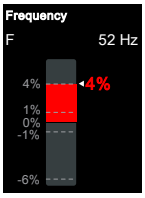
For example, for the frequency screen, the following screens indicate the measurement compared to the expected range:



Green color indicates measurement is OK: the difference between the measured and expected frequency is less than 1%



Orange color indicates measurement is out of range: the difference between the measured and expected frequency is between +1% and 4% or between -1% and -6%



Red color indicates measurement is significantly out of range: the difference between the measured and expected frequency is greater than +4% or less than -6%

Current

The **Current** menu presents the following measurements:

Level 3	Level 4	Level 5	Parameter name
Current	**I**	**I1 (A)**	RMS current on phase 1
		I2 (A)	RMS current on phase 2
		I3 (A)	RMS current on phase 3
		IN (A)(1)	RMS current on neutral
		Ig (A)(2)	RMS current on ground
	I Max	**I1 Max (A)**	Maximum RMS current on phase 1
		I2 Max (A)	Maximum RMS current on phase 2
		I3 Max (A)	Maximum RMS current on phase 3
		I Unb Max (%)	Maximum of maximum of 3 phase current unbalances
		IN Max (A)(1)	Maximum RMS current on neutral
		Ig Max (A)(2)	Maximum of RMS current on ground
	I Avg	**I Avg (A)**(3)	Average of 3 phase RMS currents
	I Unb	**I (1,2,3) (%)**	Real-time maximum of 3 phase current unbalances, with quality gauge
	Reset Max		Reset of maximum RMS current, with date and time of last reset

(1) Applies to 4-pole circuit breakers or 3-pole circuit breakers with ENCT wired and configured

(2) Applies to MicroLogic Active 6.0

(3) Applies to MicroLogic Active E

Voltage

The **Voltage** menu presents the following measurements:

Level 3	Level 4	Level 5	Parameter name
Voltage	**V**	**V12 (V)**	RMS phase-to-phase voltage 1-2
		V23 (V)	RMS phase-to-phase voltage 2-3
		V31 (V)	RMS phase-to-phase voltage 3-1
		V1N (V)(1)	RMS phase-to-neutral voltage 1-N
		V2N (V)(1)	RMS phase-to-neutral voltage 2-N
		V3N (V)(1)	RMS phase-to-neutral voltage 3-N
	V Max	**V12 Max (V)**	Maximum RMS phase-to-phase voltage 1-2
		V23 Max (V)	Maximum RMS phase-to-phase voltage 2-3
		V31 Max (V)	Maximum RMS phase-to-phase voltage 3-1
		VLL Unb Max (%)	Maximum of maximum of 3 phase-to-phase voltage unbalances
		VLN Unb Max (%)(1)	Maximum of maximum of 3 phase-to-neutral voltage unbalances
		V1N Max (V)(1)	Maximum RMS phase-to-neutral voltage 1-N
		V2N Max (V)(1)	Maximum RMS phase-to-neutral voltage 2-N
		V3N Max (V)(1)	Maximum RMS phase-to-neutral voltage 3-N
	V Min	**V12 Min (V)**	Minimum RMS phase-to-phase voltage 1-2

Level 3	Level 4	Level 5	Parameter name
		V23 Min (V)	Minimum RMS phase-to-phase voltage 2-3
		V31 Min (V)	Minimum RMS phase-to-phase voltage 3-1
		V1N Min (V)(1)	Minimum RMS phase-to-neutral voltage 1-N
		V2N Min (V)(1)	Minimum RMS phase-to-neutral voltage 2-N
		V3N (Min V)(1)	Minimum RMS phase-to-neutral voltage 3-N
	V Avg	**VLL (V)**	Average of 3 RMS phase-to-phase voltages (V12+V23+V31)/3, with quality gauge
		VLN (V)(1)	Average of 3 RMS phase-to-neutral voltages (V1N+V2N+V3N)/3
	V Unb	**VLL (%)**	Real-time maximum of 3 phase-to-phase voltage unbalances, with quality gauge
		VLN (%)(1)	Real-time maximum of 3 phase-to-neutral voltage unbalances
	Reset Min Max		Reset of minimum and maximum RMS voltage, with date and time of last reset
(1) Applies to 4-pole circuit breakers or 3-pole circuit breakers with ENVT wired and configured.			

Power

The **Power** menu presents the following measurements:

Level 3	Level 4	Level 5	Parameter name
Power	**P**	**P1 (kW)**(1)	Active power on phase 1
		P2 (kW)(1)	Active power on phase 2
		P3 (kW)(1)	Active power on phase 3
		Ptot (kW)	Total active power
	P MAX	**P1 Max (kW)**	Maximum active power on phase 1
		P2 Max (kW)	Maximum active power on phase 2
		P3 Max (kW)	Maximum active power on phase 3
		Ptot Max (kW)	Maximum total active power
	Q	**Q1 (kvar)**(1)	Reactive power on phase 1
		Q2 (kvar)(1)	Reactive power on phase 2
		Q3 (kvar)(1)	Reactive power on phase 3
		Qtot (kvar)	Total reactive power
	Q MAX	**Q1 Max (kvar)**(1)	Maximum reactive power on phase 1
		Q2 Max (kvar)(1)	Maximum reactive power on phase 2
		Q3 Max (kvar)(1)	Maximum reactive power on phase 3
		Qtot Max (kvar)	Maximum total reactive power
	S	**S1 (kVA)**(1)	Apparent power on phase 1
		S2 (kVA)(1)	Apparent power on phase 2
		S3 (kVA)(1)	Apparent power on phase 3
		Stot (kVA)	Total apparent power
	S Max	**S1 Max (kVA)**(1)	Maximum apparent power on phase 1
		S2 Max (kVA)(1)	Maximum apparent power on phase 2
		S3 Max (kVA)(1)	Maximum apparent power on phase 3

Level 3	Level 4	Level 5	Parameter name
		Stot Max (kVA)	Maximum total apparent power
	Reset Max		Reset of maximum power, with date and time of last reset
(1) Applies to 4-pole circuit breakers or 3-pole circuit breakers with ENVT wired and configured.			

Energy

The **Energy** menu presents the following measurements:

Level 3	Level 4	Level 5	Parameter name
Energy	**E total**	**Ep (kWh)**	Total active energy
		Eq (kVArh)	Total reactive energy
		Es (kVAh)	Total apparent energy
	E delivered	**Ep (kWh)**	Total active energy delivered into the load (counted positively)
		Eq (kVArh)	Total reactive energy delivered into the load (counted positively)
	E received	**Ep (kWh)**	Total active energy received out of the load (counted negatively)
		Eq (kVArh)	Total reactive energy received out of the load (counted negatively)
	Reset counters		Reset of accumulated energy, with date and time of last reset

Frequency

The **Frequency** menu presents the following measurements:

Level 3	Level 4	Level 5	Parameter name
Frequency	**F**	**F (Hz)**	Frequency with quality gauge
	F Max / Min	**F Max (Hz)**	Maximum frequency
		F Min (Hz)	Minimum frequency
	Phase Rotation	**Reference**	Reference phase rotation
		Measure	Measured phase rotation
		Rotation	Phase rotation status: • **OK**: Measured phase rotation matches reference phase rotation • **Inverse**: Measured phase rotation does not match reference phase rotation
	Reset Min Max		Reset of minimum and maximum frequency, with date and time of last reset

Power Factor Menu

The **Power factor** menu presents the following data:

Level 3	Level 4	Parameter name
Power Factor	**PF**	Total power factor
	Cos φ	Total fundamental power factor

Level 3	Level 4	Parameter name
	Network	The parameters displayed depend on the sign convention for power factor and cos phi selected. • If **IEEE** is selected, the displayed parameter is: ◦ **Leading** in the case of lead ◦ **Lagging** in the case of lag • If **IEC** is selected (factory setting) the displayed parameter is: ◦ **Capacitive** in the case of lead ◦ **Inductive** in the case of lag

Alarms/History Menu

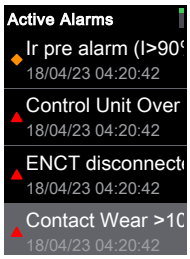
Description

The **Alarms/History** menu contains the following menus:

Level 1	Level 2	Level 3	Function description
Tree navigation menu	**Alarms/ History**	**Active Alarms**	Displays events of medium and high severity of entry/exit type, after the occurrence of the alarm and before the completion. Trips are not displayed.
		Trips history	Displays the history of trips, with the date and time that the trip occurred.
		Alarms history	Displays the history of events of medium and high severity, with the date and time that the alarm occurred. Trips are not displayed in this history.

NOTE: Trip history and alarm history events are listed in chronological order, with the most recent event first. Events are only listed in chronological order if the internal battery is working.

Active Alarms Screens

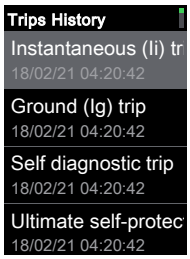


An active alarms screen contains the following information:

- Screen title: **Active Alarms**
- A list of active alarms with the date and time of occurrence.

Use the up/down buttons and **OK** button to navigate between active alarm screens.

Trips History Screens



A trips history screen contains the following information:

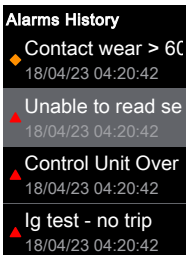
- Screen title: **Trips history**
- A list of trip events with the date and time of occurrence.

Trips history events are listed in chronological order, with the most recent event first.

NOTE: Events are only listed in chronological order if the internal battery is working.

Use the up/down buttons and **OK** button to navigate to a trip event description screen.

Alarms History Screens



An alarms history screen contains the following information:

- Screen title: **Alarms history**
- A list of alarm events with the date and time of occurrence. A symbol next to an alarm event indicates the severity of the alarm.
  - A red triangle indicates a high severity alarm.
  - An orange diamond indicates a medium severity alarm.

Alarms history events are listed in chronological order, with the most recent event first.

NOTE: Events are only listed in chronological order if the internal battery is working.

Maintenance Menu

Description

The **Maintenance** menu contains the following submenus:

Level 1	Level 2	Level 3	Function description
Tree navigation menu	**Maintenance**	**Assistance**	Presents information about the firmware version of the MicroLogic Active control unit, page 167.
		Health	Describes the health state of the circuit breaker, page 169.
		Protection Test	Perform a protection test on the MicroLogic Active HMI, page 59.
		Replacement	Set the circuit breaker information in a replacement MicroLogic Active control unit.
		Zigbee	Perform a Zigbee wireless communication test (for certification only).

Assistance

The **Assistance** menu presents the following data:

Level 3	Level 4	Function description
Assistance	**Firmware Version**	Displays the MicroLogic Active firmware version in the format aaa.bbb.ccc. **NOTE:** The **Core Protect Version** is also available to view but this is only used when requested by Schneider Electric Customer Care.

Health

The **Health** menu presents the following data:

Level 3	Level 4	Function description
Health	**Contact wear**	Displays wear of the contacts as a percentage

Replacement

The **Replacement** menu presents the following data:

Level 3	Level 4	Level 5	Function description
Replacement	**Manuf. Maint**	**Last manufacturer maintenance**	Set the number of months since the last manufacturer maintenance.
	Contact Wear	**Contact Wear Preset**	Set the wear of the contacts as a percentage.
	ID	**Range**	Select the circuit breaker range.
		Rating	Select the circuit breaker rating.
		Performance	Select the circuit breaker performance.

Configuration Menu

Description

The **Configuration** menu contains the following submenus:

Level 1	Level 2	Level 3	Function description
Tree navigation menu	**Configuration**	**General**	Settings of the HMI display and control of access to protection settings.
		Network	Settings of nominal voltage and frequency, and power sign.
		Measures	Settings of measurement calculation.
		BCIM	Settings of the BCIM module.
		Communication	Settings of communication parameters.

General

The **General** menu presents the following data:

Level 3	Level 4	Level 5	Function description
General	**Language**, page 48		List of display screen languages.
	Date & time, page 34	DD/MM/YYY HH:MM:SS	Set the date format. Available options are: • DD/MM/YYYY • MM/DD/YYYY • YYYY/MM/DD Set the time. **NOTE:** Configuration of the date and time format is protected by the PIN code of the SecurityAdmin account.
	Change PIN code, page 54	–	Change the PIN code by using tree navigation mode. **NOTE:** Changing the PIN code is protected by the PIN code of the SecurityAdmin account.

Network

The **Network** menu presents the following data:

Level 3	Level 4	Level 5	Parameter name
Network	**Voltage**	**Vn (V)**	Rated voltage. Setting values include: 208 / 220 / 230 / 240 / 380 / 400 / 415 / 440 / 480 / 500 / 525 / 550 / 575 / 600 / 660 / 690 V. Factory setting = 400.
	Frequency	**Hz**	Rated frequency • **50 Hz** (factory setting) • **60 Hz**
	Phase Rot.	–	**1,2,3**
		–	**1,3,2**
	Power sign, page 157	–	Power flow sign setting: • **P+** = the active power flows from upstream (top) to downstream (bottom) (factory setting). • **P–** = the active power flows from downstream (bottom) to upstream (top).

Level 3	Level 4	Level 5	Parameter name
	VT ratio, page 154	**VT Primary**	VT primary voltage. Values from 100 to 1,250 V, in increments of 1 V.
		VT Secondary	VT secondary voltage. Values from 100 to 690 V, in increments of 1 V.

Measures

The **Measures** menu presents the following data:

Level 3	Level 4	Level 5	Parameter name
Measures	**PF/Var**, page 164		Sign convention for cos φ, PF power factor, and reactive power: • **IEC** (factory setting) • **IEEE**
	System type, page 154	**Poles Nbr**	**3P** or **4P**
		ENVT	External neutral voltage tap. Setting values include: • If 4P: **NO** (for display only) • If 3P: **NO** or **YES** (factory setting) **NOTE:** If **ENVT** setting is **NO**, the **VT ratio** sub menu is hidden.
		ENCT	External neutral current transformer. Setting values include: • If 4P: **NO** (for display only) • If 3P: **NO** (factory setting) or **YES**
	P Calc, page 155		Total power calculation method: • **Vector** • **Arithmetic** (factory setting)
	E Calc, page 161		Energy Accumulation mode. Energy values to be used in energy calculations: • **Absolute** (factory setting) • **Signed**

BCIM

The **BCIM** menu presents the following data:

Level 3	Level 4	Level 5	Level 6	Function description
BCIM	**BCIM**	–	–	Configure the presence of the BCIM module in the circuit breaker: • **No** • **Yes**
	Coil XF	–	–	Enable control of the XF communicating closing voltage release by the BCIM module: • **No** • **Yes**
	Coil MX	–	–	Enable control of the MX communicating opening voltage release by the BCIM module: • **No** • **Yes**
	IO Settings	**IO Mode**	**Disabled**	Select this setting to disable the use of the BCIM module IO ports.
			Open/ Close	Select this setting to enable the use of the BCIM module IO ports to open and close the circuit breaker.
			ERMS	Select this setting to enable the use of the BCIM module IO ports to engage and disengage ERMS mode.

Level 3	Level 4	Level 5	Level 6	Function description	
			Alarms	Select this setting to enable the use of the BCIM module IO ports to signal the status of selected alarms.	
				IO Channel 1	When **IO Mode** = **Alarms**, select one alarm from the list, to be signaled on **IO Channel 1**.
				IO Channel 2	When **IO Mode** = **Alarms**, select one alarm from the list, to be signaled on **IO Channel 2**.
	Identification	–	–	–	Displays the hardware and firmware version of the BCIM module.

NOTE: The BCIM configuration factory settings depend on whether the BCIM module and communicating voltage releases are installed in factory or not.

Communication

The **Communication** menu presents the following data:

Level 3	Level 4	Level 5	Parameter name
Communication	**Zigbee**	**Identification**	Displays the Zigbee ID of the MicroLogic Active AP/EP control unit.
		Status	Displays the Zigbee connectivity status of the MicroLogic Active AP/EP control unit. Provides a means to connect the MicroLogic Active AP/EP control unit to a Zigbee network.
	Control Mode, page 185	**Manual**	Configure the control mode to block or allow remote control commands. **NOTE:** Configuration of the control mode is protected by the PIN code of the SecurityAdmin account.
		Auto Local	
		Auto Remote	
	Remote Settings	–	Enable or disable remote setting of the standard protection functions: • **ON** (enable) • **OFF** (disable) **NOTE:** Configuration of **Remote Settings** is protected by the PIN code of the SecurityAdmin account.

Protection Menu

Description

The **Protection** menu contains the following submenus:

Level 1	Level 2	Level 3	Function description
Tree navigation menu	**Protection**	**Standard Protection**	Display standard protection settings.
		ERMS Protection	Display ERMS protection settings.
		Neutral Protection(1)	Display neutral protection settings.
		Advanced Protection	Set and display advanced protection settings.
(1) Applies to 4-pole circuit breakers and 3-pole circuit breakers with ENCT option.			

Active Settings

The active settings used by the standard protection functions are displayed in the Quick View screens, page 51 and LSIG home screen:

- If the screens have a black background, it indicates that standard protection settings are being used.
- If the screens have a blue background, it indicates that ERMS protection settings are being used.

The settings in the **Protection** menu are the settings defined by using the Standard Protection Setting Procedure, page 60 or EcoStruxure Power Commission software. They may differ from the settings used by the protection functions when fallback settings are active.

Standard Protection

The **Standard Protection** menu displays the standard protection settings which are used when ERMS is not engaged. It is not possible to set the protection settings from this menu.

Level 3	Level 4	Parameter name
Standard Protection	**L**	Standard long-time overcurrent protection
	S	Standard short-time overcurrent protection
	I	Standard instantaneous overcurrent protection
	G	Standard ground-fault protection

To set standard protection functions, see:

- Long-Time Overcurrent Protection (L or ANSI 49RMS/51), page 91
- Short-Time Overcurrent Protection (S or ANSI 50TD/51), page 96
- Instantaneous Overcurrent Protection (I or ANSI 50), page 99
- Ground-Fault Protection (G or ANSI 50N-TD/51N), page 104

ERMS Protection

The **ERMS Protection** menu displays the standard protection settings which are used when ERMS is engaged. It is not possible to set the protection settings from this menu.

Level 3	Level 4	Parameter name
ERMS Protection	**L**	ERMS long-time overcurrent protection
	S	ERMS short-time overcurrent protection
	I	ERMS instantaneous overcurrent protection
	G	ERMS ground-fault protection

To set ERMS settings, see Energy Reduction Maintenance Settings (ERMS), page 116.

Neutral Protection

The **Neutral Protection** menu displays the neutral protection settings. It is not possible to set the protection settings from this menu.

Level 3	Level 4	Parameter name
Neutral Protection(1)	**Nb poles**	Number of poles **3P** or **4P**, for display only.
	Ir (A)	Ir long-time overcurrent protection threshold expressed in Amps, for display only.
	Protection	Set neutral protection type: • **OFF** • **N/2** (factory setting) • **N** • **OSN**
	IN (A)	RMS current on neutral, for display only.
(1) Applies to 4-pole circuit breakers and 3-pole circuit breakers with ENCT option.		

To set the neutral protection function, see Neutral Protection, page 109.

Advanced Protection

The **Advanced Protection** menu displays the protection settings for undervoltage and overvoltage protection. The protection settings can be set from this menu.

Level 3	Level 4	Level 5	Parameter name
Advanced Protection	**Undervoltage**	**Activation**	Disable, or enable and configure the undervoltage protection mode: • **OFF** (factory setting) • **Per phase** • **All phases** • **Both**
		Action	Select the action to take when undervoltage protection is activated: • **Trip** • **Alarm** (factory setting)
		Type	Select the type of voltage to monitor: • **VLL**, phase-to-phase voltages (factory setting)

Level 3	Level 4	Level 5	Parameter name
			• **VLN**, phase-to-neutral voltages
		Vmin	Threshold of undervoltage protection
		tVmin	Time delay of undervoltage protection
	Overvoltage	**Activation**	Disable, or enable and configure the overvoltage protection mode: • **OFF** (factory setting) • **Per phase** • **All phases** • **Both**
		Action	Select the action to take when overvoltage protection is activated: • **Trip** • **Alarm** (factory setting)
		Type	Select the type of voltage to monitor: • **VLL**, phase-to-phase voltages (factory setting) • **VLN**, phase-to-neutral voltages
		Vmax	Threshold of overvoltage protection
		tVmax	Time delay of overvoltage protection

To set advanced protection functions, see:

- Undervoltage Protection (ANSI 27), page 121
- Overvoltage Protection (ANSI 59), page 124

Pop-up Event Messages

Event Message Types and Priority

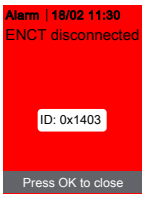
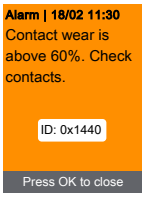
When the MicroLogic Active control unit detects any of the following events, a pop-up message is displayed, in this order of priority:

- Trip
- High severity alarm
- Medium severity alarm

An event message overrides another event message with lower priority.

An event message overrides both **Quick view** scrolling and tree navigation operating mode displays.

Pop-up Trip and Alarm Message Displays

Message type	Description	Example
Trip	When a trip occurs, the trip message is displayed on a red screen. A QR code is also displayed. Scan the QR code to access the *Instructions to Follow After a Trip* to help you to acknowledge the trip and restore the circuit breaker. For trips due to an electrical fault, press **OK** to view details about the trip event. For trips due to a MicroLogic Active self test, details are not provided about the trip. Press **OK** to close the trip message.	
High severity alarm	When a high severity alarm occurs, the high severity alarm message is displayed on a red screen. Press **OK** to close the alarm message. No details are provided for alarm events.	
Medium severity alarm	When a medium severity alarm occurs, the medium severity alarm message is displayed on an orange screen. Press **OK** to close the alarm message. No details are provided for alarm events.	

Handling Pop-up Trip and Alarm Messages

A trip or alarm message indicates that a potentially serious operating event has occurred. To address the event, take the following steps:

Step	Action
1	When the trip or alarm event message displays, press **OK**. The display screen displays a message explaining the context of the trip.
2	After reading the explanatory message, take the remedial steps necessary to resolve the underlying condition that caused the trip or alarm.

Step	Action
3	After resolving the cause of the event, press **OK** to close the alarm pop-up or trip context.
4	If the event is latched, press the button for three seconds to reset the latched event and revert the **Status** bar color to green. **NOTE:** You can bypass steps 3 and 4 by pressing the button while the pop-up is open. In this case, the pop-up is closed, the latched event is reset, and the **Status** bar color reverts to green.

You can view trip history and alarm history events by accessing **Alarm/History** in tree navigation mode.

For information about recommended action on events, refer to the description in this guide of the function generating the event, and the relevant document, page 10:

- *MasterPacT MTZ1 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide*
- *MasterPacT MTZ2/MTZ3 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide*

For information about how MicroLogic Active control units handle events, refer to Event Management, page 213.

Validating a Pop-Up Message

The following example shows how to validate a pop-up trip message.

Step	Action	Screen
1	A pop-up trip message appears on the screen.	
2	Press **OK** to close the pop-up message and view details of the trip. If a scrolling bar appears at the right side of the screen, press the down button to view more details about the trip event.	
3	Scan the QR code to access the *Instructions to Follow After a Trip*.	
4	After reading the trip context, press **OK** to close the trip context screen and return to the LSIG home screen.	–

NOTE: Steps 2 and 3 are not available for alarm events or for trips due to a MicroLogic Active self test.

Protection Functions

What's in This Part

Introduction 84
Standard Protection Functions 90
Other Protection Functions 111
Advanced Protection Functions 120
Setting Guidelines 127

Introduction

What's in This Chapter

Electrical Distribution Protection 85
Setting Protection in Accordance With UL489SE Standard 88

Electrical Distribution Protection

Presentation

MicroLogic Active control units are designed to provide protection against overcurrents and ground-fault currents.

Description

When choosing protection characteristics, take into account:

- Overcurrents (overloads and short-circuits) and potential ground-fault currents
- Conductors that need protection
- Coordination and selectivity between the devices
- The presence of harmonic currents

Protection characteristics can be represented on a trip curve that shows the circuit breaker trip time as a function of the measured current and protection settings. Protection settings are indexed on the rated current In of the MicroLogic Active control unit.

Rated Current In

The protection setting ranges depend on the rated current In, defined by the sensor plug inserted in the MicroLogic Active control unit.

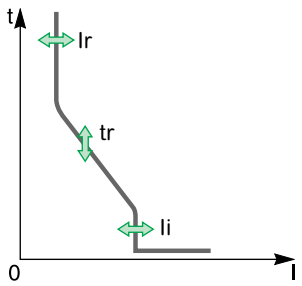
Contact your Schneider Electric Services representative to replace or modify the sensor plug. Mechanical mismatch protection prevents the installation of a sensor plug that is not compatible with the circuit breaker frame.

For IEC standard circuit breakers, the range of sensor plugs available is shown in the following table.

In	Commercial reference	Frame rated current															
		MTZ1					MTZ2								MTZ3		
		06	08	10	12	16	08	10	12	16	20	25	32	40	40	50	63
400 A	LV947053	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–	–	–	–	–
630 A	LV933091	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–	–	–	–	–
800 A	LV933092	–	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–	–	–	–	–
1,000 A	LV933093	–	–	✓	✓	✓	–	✓	✓	✓	✓	–	–	–	–	–	–
1,250 A	LV833094	–	–	–	✓	✓	–	–	✓	✓	✓	✓	✓	✓	–	–	–
1,600 A	LV933095	–	–	–	–	✓	–	–	–	✓	✓	✓	✓	✓	–	–	–
2,000 A	LV933982	–	–	–	–	–	–	–	–	–	✓	✓	✓	✓	–	–	–
2,500 A	LV933983	–	–	–	–	–	–	–	–	–	–	✓	✓	✓	–	–	–
3,200 A	LV933984	–	–	–	–	–	–	–	–	–	–	–	✓	✓	–	–	–
3,600 A	LV936390	–	–	–	–	–	–	–	–	–	–	–	–	✓	–	–	–
4,000 A	LV947820	–	–	–	–	–	–	–	–	–	–	–	–	✓	–	–	–
2,000 A	LV947821	–	–	–	–	–	–	–	–	–	–	–	–	–	✓	✓	✓
2,500 A	LV947822	–	–	–	–	–	–	–	–	–	–	–	–	–	✓	✓	✓
3,200 A	LV947823	–	–	–	–	–	–	–	–	–	–	–	–	–	✓	✓	✓
4,000 A	LV947824	–	–	–	–	–	–	–	–	–	–	–	–	–	✓	✓	✓

In	Commercial reference	Frame rated current															
		MTZ1					MTZ2								MTZ3		
		06	08	10	12	16	08	10	12	16	20	25	32	40	40	50	63
5,000 A	LV947825	–	–	–	–	–	–	–	–	–	–	–	–	–	–	✓	✓
6,300 A	LV947826	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	✓

MicroLogic Active 2.0 Control Unit

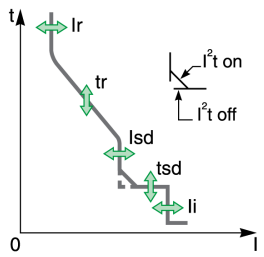


MicroLogic Active 2.0 control units for IEC standard provide:

- Long-time overcurrent protection (Ir)
- Instantaneous overcurrent protection (Ii)

The protection functions of MicroLogic Active 2.0 control units operate without an auxiliary power supply. The control unit is powered by the current flowing through the circuit breaker.

MicroLogic Active 5.0 Control Unit

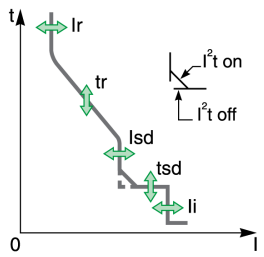


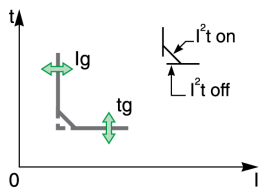
MicroLogic Active 5.0 control units for IEC standard provide:

- Long-time overcurrent protection (Ir)
- Short-time overcurrent protection (Isd)
- Instantaneous overcurrent protection (Ii)

The protection functions of MicroLogic Active 5.0 control units operate without an auxiliary power supply. The control unit is powered by the current flowing through the circuit breaker.

MicroLogic Active 6.0 Control Unit





MicroLogic Active 6.0 control units for IEC standard provide:

- Long-time overcurrent protection (Ir)
- Short-time overcurrent protection (Isd)
- Instantaneous overcurrent protection (Ii)
- Ground-fault protection (Ig)

The protection functions of MicroLogic Active 6.0 control units operate without an auxiliary power supply. The control unit is powered by the current flowing through the circuit breaker.

DIN / DINF and SELLIM Instantaneous Protections

DIN/DINF and SELLIM instantaneous protections are internal protections used when the short-circuit current reaches the withstand limit of the circuit breaker. These protections are not adjustable and are unlikely to be triggered in normal operating conditions.

The following predefined events can be generated by the DIN / DINF and SELLIM instantaneous protections.

Code	Event	History	Severity
0x4006 (16390)	**Ultimate self-protection (SELLIM) trip**	Trip	High
0x401D (16413)	**Ultimate self-protection (DIN/DINF) trip**	Trip	High

Predefined events cannot be modified by the user. For general information about events, refer to Event management, page 212.

Recommended Actions

Code	Event	Recommended actions
0x4006 (16390)	**Ultimate self-protection (SELLIM) trip**	Reset the circuit breaker. See Resetting a Trip Event, page 87.
0x401D (16413)	**Ultimate self-protection (DIN/DINF) trip**	Reset the circuit breaker. See Resetting a Trip Event, page 87.

Resetting a Trip Event

For information about resetting the circuit breaker after a trip due to an electrical fault, refer to the relevant document, page 10:

- *MasterPacT MTZ1 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide*
- *MasterPacT MTZ2/MTZ3 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide*

Setting Protection in Accordance With UL489SE Standard

Presentation

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- The circuit breaker must only be configured and set by qualified personnel, using the results of the installation protection system study.
- During commissioning of the installation and following any modification, check that the MicroLogic Active configuration and protection function settings are consistent with the results of this study.
- MicroLogic Active protection functions are set by default to the minimum value.

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

The procedure for setting a protection setting conforms to UL489SE standard. It is safeguarded by an exclusive editing session and by a two-step procedure for submitting and applying setting changes.

The exclusive editing session means that only one interface at a time can access and set protection settings. Access from other interfaces is blocked when an editing session is open.

During the editing session there is no impact on the active protection provided by the MicroLogic Active control unit until the new settings are applied. If the new settings are canceled, or the editing session times out before the new settings are applied, the active settings are maintained.

Settings for standard protection functions can be set from the following interfaces:

- On the MicroLogic Active HMI, By pressing the **Protection Settings** button (PIN code-protected), and navigating to the relevant protection area. See Standard Protection Setting Procedure, page 60.

  If the MicroLogic Active control unit power supply is interrupted, use the Mobile Power Pack to enable the protection setting procedure on the MicroLogic Active HMI.
- With EcoStruxure Power Commission software (password-protected)
- With EcoStruxure Power Device app (password-protected)
- By sending setting commands using the wired communication network (when the **Remote Settings** parameter is set to **ON**).

  For information about communication through Modbus protocol, refer to DOCA0384•• *MasterPacT, ComPacT, PowerPacT Circuit Breakers - Modbus Communication - User Guide*, page 10.

Settings for advanced protection functions can be set on the MicroLogic Active display screen, from the tree navigation menu at **Protection > Advanced Protection** (PIN code-protected).

For more information about password and PIN code management, refer to Access Management, page 41.

The protection settings displayed in Quick View are the active standard protection settings applied on the installation.

Editing Session for Selecting and Changing Protection Settings

An editing session has the following characteristics:

- Only one editing session at a time can be open. Access to protection settings from other interfaces is blocked when you open an editing session. A pop-up notice is displayed if a session is already open, page 65.
- There is a five-minute timeout for submitting and applying new settings. The session times out as follows:
  - Five minutes after the session opens, if you do not submit the new settings
  - Five minutes after submitting the new settings, if you do not apply the new settings
- After applying new settings, close the editing session by pressing the **Apply settings** on the screen.
- When changing protection settings, all protection functions can be set in one editing session. A submit step is required after making changes to each protection function, and one apply step is required to apply all the new settings. Active settings are maintained until the apply step is executed.

Two-Step Procedure for Submitting and Applying Protection Settings

The procedure for changing protection settings requires you to submit and apply the new settings in two consecutive steps:

Step	Action	
1	Submit new settings	Select new settings required and submit. The new settings are displayed so that you can check that the settings are correct before they are applied. Read the new settings to confirm that they are correct.
2	Apply new settings	Apply the new settings. The existing active protection settings are replaced by the new settings.

For more information about the procedure for changing protection settings on the MicroLogic Active display screen, refer to Protection Setting Procedure, page 60.

Setting Change Traceability

Changing the protection settings generates one of the following events, depending on the interface used to change settings:

Code	Events	History	Severity
0x1100 (4352)	**Protection changed by HMI**	Protection	Low
0x1108 (4360)	**Protection changed by communication**	Protection	Low

Predefined events cannot be modified by the user. For general information about events, refer to Event management, page 212.

Standard Protection Functions

What's in This Chapter

Long-Time Overcurrent Protection (L or ANSI 49RMS/51) 91
Short-Time Overcurrent Protection (S or ANSI 50TD/51) 96
Instantaneous Overcurrent Protection (I or ANSI 50) 99
Ground-Fault Protection (G or ANSI 50N-TD/51N) 104
Neutral Protection 109

Long-Time Overcurrent Protection (L or ANSI 49RMS/51)

Presentation

Long-time overcurrent protection helps to protect cables, busbars, and busbar trunking against overloads, based on the true RMS current. It is implemented independently for each phase and for the neutral.

This protection function is an overcurrent time-dependent protection with thermal memory. It operates as a thermal image, using the heating and cooling model of a conductor. After tripping, the protection continues to integrate the cooling of the conductor.

This protection function can be used also for transformer or generator protection thanks to the wide range of settings offered.

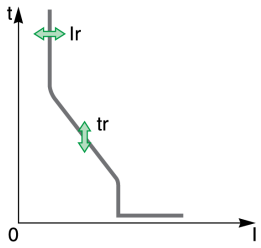
Availability

Long-time overcurrent protection is available on:

- MicroLogic Active 2.0, 5.0 and 6.0 control units for IEC standard
- 3-pole and 4-pole circuit breakers

Long-time overcurrent protection is powered by the current flowing through the internal current transformers of the circuit breaker and it does not require additional external power supply.

Operating Principle



Long-time overcurrent protection is based on the true RMS current of phases and neutral, up to harmonic 15.

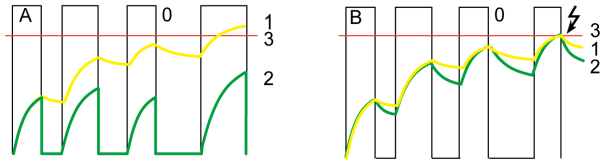
Long-time overcurrent protection is implemented independently for each phase and for neutral when present, page 109.

Thermal Image

The control unit uses the calculation of a thermal image to evaluate the conductor heat rise and precisely monitor the thermal state of the conductors.

Example:

Comparison of the heat rise calculation without thermal image (diagram **A**) and with thermal image (diagram **B**):



0 Instantaneous current (cyclical) in the load

1 Conductor temperature

2 Thermal state calculated without thermal image (diagram **A**), with thermal image (diagram **B**)

3 Long-time overcurrent protection threshold

- Control unit without thermal image: On each current pulse, the control unit only considers the thermal effect on the pulse under consideration. No tripping occurs despite the build-up in conductor heat rise.
- Control unit with thermal image: The control unit adds the thermal effect of successive current pulses. Tripping occurs based on the actual thermal state of the conductor.

The thermal image function helps to protect cables and busbars from overheating in case of low-amplitude repetitive faults. Such faults can be due to repetitive motor starts, fluctuating load, intermittent ground faults, or subsequent closing after an electrical fault.

Traditional electronic protection does not protect against repetitive faults because the duration of each overload detected above the threshold setting is too short to trigger effective tripping. However, each overload involves a temperature rise in the installation. The cumulative effect of successive overloads can overheat the system.

Thanks to its thermal memory, the thermal image function remembers and integrates thermal heating caused by each overload detected above the threshold setting:

- Before tripping, the integrated heating value reduces the associated time delay. The reaction of the control unit is closer to the real heating of the power network system.
- After tripping, the thermal function reduces the time delay when closing the circuit breaker on an overload.

The thermal memory works whatever the current value. It offers an accurate image of the cable or busbar thermal status. The time constant is the same for heating and cooling.

In the case of a control unit that is not supplied, the thermal memory is performed by a capacitor, which implies a fixed cooling time constant. The time constant is equivalent to a tr setting of 12 seconds.

Setting the Protection

The long-time overcurrent protection settings are:

- Ir: long-time overcurrent protection threshold
- tr: long-time overcurrent protection time delay

Two modes of configuring the protection settings are available:

- Quick setting mode is used to configure quick protection settings
- Fine adjustment mode is used to configure fine protection settings

NOTE: To achieve the equivalent of the long-time rating plug OFF setting (available on MicroLogic trip units for MasterPacT NT/NW circuit breakers), set the long-time protection settings as follows:

- For MasterPacT MTZ1: Ir = 1; tr = 24 s.
- For MasterPacT MTZ2/MTZ3: Ir = 1; tr = 30 s.

The OFF status of the protection can be read remotely with Modbus register 8742.

Quick Protection Settings

Quick protection settings are available:

- In quick setting mode, on the MicroLogic Active HMI, page 61
- With EcoStruxure Power Device app

Setting	Unit	Values	Factory setting
Ir	A	(0.4 / 0.5 / 0.6 / 0.7 / 0.8 / 0.9 / 0.95 / 0.98 / 1) x In	0.4 x In
tr	s	0.5 / 1 / 2 / 4 / 8 / 12 / 16 / 20 / 24(1) / 30(2)	0.5
(1) 24 s is the maximum tr setting value available when the MicroLogic Active control unit is installed in a MasterPacT MTZ1 circuit breaker. (2) 30 s is the maximum tr setting value available when the MicroLogic Active control unit is installed in a MasterPacT MTZ2/MTZ3 circuit breaker.			

The tr long-time overcurrent protection time delay is given in cold-state conditions, and for a phase or neutral current equal to 6 x Ir.

When the current is higher than Isd or Ii, only short-time overcurrent protection and instantaneous protection are operational. For more information, refer to setting guidelines, page 130.

Fine Protection Settings

Fine protection settings are available:

- In fine adjustment mode, on the MicroLogic Active HMI, page 63
- With EcoStruxure Power Commission software
- With EcoStruxure Power Device app

Setting	Unit	Range	Step	Factory setting
Ir	A	0.4–1 x In	1 A	0.4 x In
tr	s	0.5–24(1) / 30(2)	0.5	0.5
(1) 0.5–24 s tr setting range available when the MicroLogic Active control unit is installed in a MasterPacT MTZ1 circuit breaker. (2) 0.5–30 s tr setting range available when the MicroLogic Active control unit is installed in a MasterPacT MTZ2/MTZ3 circuit breaker.				

The tr long-time overcurrent protection time delay is given in cold-state conditions, and for a phase or neutral current equal to 6 x Ir.

When the current is higher than Isd or Ii, only short-time overcurrent protection and instantaneous protection are operational. For more information, refer to the setting guidelines, page 130.

Tripping Time According to tr Time Delay

The tripping time according to tr time delay is given in cold-state conditions.

tr setting (tripping time at 6 x Ir)	0.5 s	1 s	2 s	4 s	8 s	12 s	16 s	20 s	24 s	30 s
Resulting tripping time at 1.5 x Ir	12.5 s	25 s	50 s	100 s	200 s	300 s	400 s	500 s	600 s	621 s
Resulting tripping time at 7.2 x Ir	0.34 s	0.69 s	1.38 s	2.7 s	5.5 s	8.3 s	11 s	13.8 s	16.6 s	18.6 s

Protection Characteristics

The accuracy on the tr time delay is:

- -20% to 0% when tr > 2 s
- -25% to 0% when tr = 2 s
- -30% to 0% when tr < 2 s

Ir characteristics:

- I < 1.05 x Ir: no trip
- I > 1.2 x Ir: trip

Predefined Events

The function generates the following predefined events:

Code	Event	History	Severity
0x4000 (16384)	**Long Time (Ir) trip**	Trip	High
0x6200 (25088)	**Ir start (I > 105% Ir)**	Protection	High
0x03F5 (1013)	**Ir pre-alarm (I > 90% Ir)**	Protection	Medium
0x0F11 (3857)	**Thermal memory reset order**	Protection	Low

Predefined events cannot be modified by the user. For general information about events, refer to Event management, page 212.

Protection events are generated as follows:

- The start event is generated when the protection picks up.
- The trip event is generated when the circuit breaker tripping voltage release (MITOP) activates.

Recommended Actions

Code	Event	Recommended actions
0x4000 (16384)	**Long Time (Ir) trip**	Reset the circuit breaker. See Resetting a Trip Event, page 95.
0x6200 (25088)	**Ir start (I > 105% Ir)**	Check the load.
0x03F5 (1013)	**Ir pre-alarm (I > 90% Ir)**	Check the load.
0x0F11 (3857)	**Thermal memory reset order**	Make sure someone has performed a tripping test.

Resetting a Trip Event

For information about resetting the circuit breaker after a trip due to an electrical fault, refer to the relevant document, page 10:

- *MasterPacT MTZ1 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide*
- *MasterPacT MTZ2/MTZ3 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide*

Short-Time Overcurrent Protection (S or ANSI 50TD/51)

Presentation

Short-time overcurrent protection helps to protect equipment against phase-to-phase, phase-to-neutral and phase-to-ground short circuits with total selectivity. It includes two characteristics, definite time and inverse time, which depend on the status of the I²t setting.

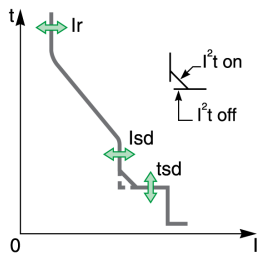
Availability

Short-time overcurrent protection is available on:

- MicroLogic Active 5.0 and 6.0 control units for IEC standard
- 3-pole and 4-pole circuit breakers

Short-time overcurrent protection is powered by the current flowing through the internal current transformers of the circuit breaker and it does not require an additional external power supply.

Operating Principle



The short-time overcurrent threshold Isd sets the level of short-circuit current at which the circuit breaker trips when reaching the short-time overcurrent time delay.

The short-time overcurrent time delay tsd sets the length of time during which the circuit breaker carries a short circuit within the short-time overcurrent threshold range.

The short-time overcurrent time delay can be adjusted to:

- Four setting values with I²t ON.
  - Up to 10 Ir, the tripping curve is an inverse time curve. The time delay decreases as the current increases.
  - Above 10 Ir, the tripping curve is a definite time curve with a constant tripping time.
- Five setting values with I²t OFF. The tripping curve is a definite time curve with a constant tripping time.

Short-time overcurrent protection is based on the true RMS current of phases and neutral, up to harmonic 15.

In order to trip on an intermittent fault, the control unit accumulates the intermittent currents in the short-time tripping range that do not last long enough to trigger a trip. This accumulation may lead to shorter tripping times than those set.

Setting the Protection

The short-time overcurrent protection settings are:

- Isd: short-time overcurrent protection threshold
- tsd: short-time overcurrent protection time delay
- I²t (tsd): short-time overcurrent protection curve (I²t ON or I²t OFF)

Two modes of configuring the protection settings are available:

- Quick setting mode is used to configure quick protection settings
- Fine adjustment mode is used to configure fine protection settings

Quick Protection Settings

Quick protection settings are available:

- In quick setting mode, on the MicroLogic Active HMI, page 61
- With EcoStruxure Power Device app

Setting	Unit	Values	Factory setting	Accuracy
Isd	A	(1.5 / 2 / 2.5 / 3 / 4 / 5 / 6 / 8 / 10) x Ir	1.5 x Ir	+/- 10%
tsd with I²t ON	s	0.1 / 0.2 / 0.3 / 0.4 / 0.6 / 0.8	I²t OFF/0	
tsd with I²t OFF	s	0 / 0.1 / 0.2 / 0.3 / 0.4 / 0.6 / 0.8		

For more information, refer to the setting guidelines, page 133.

Fine Protection Settings

Fine protection settings are available:

- In fine adjustment mode, on the MicroLogic Active HMI, page 63
- With EcoStruxure Power Commission software
- With EcoStruxure Power Device app

Setting	Unit	Values	Factory setting	Accuracy
Isd	A	1.5–10 x Ir (step 0.1 x Ir)	1.5 x Ir	+/- 10%
tsd with I²t ON	s	0.1 / 0.2 / 0.3 / 0.4 / 0.6 / 0.8	I²t OFF/0	+/- 10%
tsd with I²t OFF	s	0 / 0.1 / 0.2 / 0.3 / 0.4 / 0.6 / 0.8		

For more information, refer to the setting guidelines, page 133.

Operating Times at 10 x Ir

The operating times of short-time protection depend on the tsd time delay. They are valid for I²t ON or OFF.

tsd time delay	0 s	0.1 s	0.2 s	0.3 s	0.4 s	0.6 s	0.8 s
Non-tripping time	> 0.02 s	> 0.08 s	> 0.14 s	> 0.23 s	> 0.35 s	> 0.55 s	> 0.71 s
Maximum breaking time	< 0.08 s	< 0.14 s	< 0.20 s	< 0.32 s	< 0.50 s	< 0.63 s	< 0.80 s

Zone Selective Interlocking (ZSI)

The ZSI characteristics and external wiring of the zone selective interlocking function, are described specifically, page 112.

If ZSI IN is not set to 1 (open circuit between Z3 and Z4 terminals), the maximum breaking time is 0.08 s regardless of the tsd setting value.

When ZSI IN is set to 1 and connected to the ZSI OUT of a downstream device (or when the ZSI function is not used and there is a jumper between the Z3 and Z4 terminals), the tsd time delay is used.

The Isd threshold activates ZSI OUT (Z1 and Z2 terminals).

NOTE: MasterPacT MTZ circuit breakers are delivered with a jumper installed between Z3 and Z4.

Predefined Events

The function generates the following predefined events:

Code	Event	History	Severity
0x4001 (16385)	**Short Time (Isd) trip**	Trip	High
0x6201 (25089)	**Isd start**	Protection	Low

Predefined events cannot be modified by the user. For general information about events, refer to Event management, page 212.

Protection events are generated as follows:

- The start event is generated when the protection picks up.
- The trip event is generated when the circuit breaker tripping voltage release (MITOP) activates.

Recommended Actions

Code	Event	Recommended actions
0x4001 (16385)	**Short Time (Isd) trip**	Reset the circuit breaker. See Resetting a Trip Event, page 98.
0x6201 (25089)	**Isd start**	No action required. For information only.

Resetting a Trip Event

For information about resetting the circuit breaker after a trip due to an electrical fault, refer to the relevant document, page 10:

- *MasterPacT MTZ1 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide*
- *MasterPacT MTZ2/MTZ3 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide*

Instantaneous Overcurrent Protection (I or ANSI 50)

Presentation

Instantaneous protection helps to protect equipment against phase-to-phase, phase-to-neutral and phase-to-ground short circuits. The protection operates with a definite time characteristic. It trips without additional time delay as soon as the setting current is exceeded.

The protection offers two tripping modes, with different breaking times:

- Standard mode (when ERMS is not engaged): breaking time of 50 ms, used for applications requiring selectivity. Full selectivity can be provided with any ComPacT NSX or PowerPacT H-, J-, L-frame circuit breaker installed downstream of a MasterPacT MTZ circuit breaker (Refer to selectivity tables for details for Ue ≤ 440 Vac).
- Fast mode (when ERMS is engaged): breaking time of 30 ms, typically used for applications where the thermal constraints of the equipment need to be limited and when selectivity is not required. For more information, refer to LVPED318033EN *Complementary Technical Information*.

NOTE: On MicroLogic Active 2.0, instantaneous protection is based on short-time protection without time setting with standard breaking time of 80 ms.

Availability

Instantaneous overcurrent protection is available on:

- MicroLogic Active 2.0, 5.0 and 6.0 control units for IEC standard
- 3-pole and 4-pole circuit breakers

It is powered by the current flowing through the internal current transformers of the circuit breaker and it does not require an additional external power supply.

Operating Principle

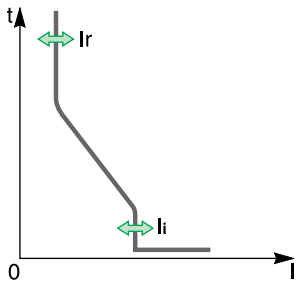
The instantaneous overcurrent protection threshold sets the level of short-circuit current at which the circuit breaker trips with no intentional time delay.

For MicroLogic Active 5.0 and 6.0 control units for IEC standard, instantaneous overcurrent protection can be disabled.

For MicroLogic Active 2.0 control units for IEC standard, instantaneous overcurrent protection cannot be disabled.

Instantaneous overcurrent protection overrides short-time overcurrent protection when the instantaneous overcurrent threshold is adjusted to the same or a lower setting than the short-time overcurrent threshold.

Setting the Protection for MicroLogic Active 2.0



The instantaneous overcurrent protection setting is Ii: instantaneous overcurrent protection threshold (corresponds to a short-time overcurrent protection threshold without time setting).

Two modes of configuring the protection settings are available:

- Quick setting mode is used to configure quick protection settings
- Fine adjustment mode is used to configure fine protection settings

Quick Protection Settings for MicroLogic Active 2.0

Quick protection settings are available:

- In quick setting mode, on the MicroLogic Active HMI, page 61
- With EcoStruxure Power Device app

Setting	Unit	Values	Factory setting
Ii	A	OFF, (1.5 / 2 / 2.5 / 3 / 4 / 5 / 6 / 8 / 10) x Ir	1.5 x Ir

For more information, refer to the setting guidelines, page 136.

Fine Protection Settings for MicroLogic Active 2.0

Fine protection settings are available:

- In fine adjustment mode, on the MicroLogic Active HMI, page 63
- With EcoStruxure Power Commission software
- With EcoStruxure Power Device app

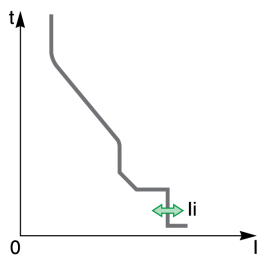
Setting	Unit	Range	Step	Factory setting
Ii	A	OFF, (1.5–10) x Ir	0.1 x Ir	1.5 x Ir

For more information, refer to the setting guidelines, page 136.

Protection Characteristics for MicroLogic Active 2.0

Characteristic	Unit	Standard value	ERMS value
Breaktime at 2 x Ii threshold	ms	≤ 80	≤ 80
Non-tripping time	ms	> 20	> 20
Accuracy on threshold	%	+/- 10	+/- 10

Setting the Protection for MicroLogic Active 5.0 and 6.0



Instantaneous overcurrent protection for MicroLogic Active 5.0 and 6.0 can be enabled or disabled with EcoStruxure Power Commission software.

The instantaneous overcurrent protection setting is Ii: instantaneous overcurrent protection threshold.

Two modes of configuring the protection settings are available:

- Quick setting mode is used to configure quick protection settings
- Fine adjustment mode is used to configure fine protection settings

Quick Protection Settings for MicroLogic Active 5.0 and 6.0

Quick protection settings are available:

- In quick setting mode, on the MicroLogic Active HMI, page 61
- With EcoStruxure Power Device app

Setting	Unit	Values	Factory setting
Ii	A	OFF, (2 / 3 / 4 /6 / 8 / 10 / 12 / 15) x In	2 x In

For more information, refer to the setting guidelines, page 136.

Fine Protection Settings for MicroLogic Active 5.0 and 6.0

Fine protection settings are available:

- In fine adjustment mode, on the MicroLogic Active HMI, page 63
- With EcoStruxure Power Commission software
- With EcoStruxure Power Device app

Setting	Unit	Range	Step	Factory setting
Ii	A	OFF, (2.0–15) x In	0.1 x In	2.0 x In

For more information, refer to the setting guidelines, page 136.

Protection Characteristics for MicroLogic Active 5.0 and 6.0

Characteristic	Unit	Standard value	ERMS value
Breaktime at 2 x threshold	ms	≤ 50	≤ 30
Non-tripping time	ms	> 20	0
Accuracy on threshold	%	+/- 10	+/- 10

Predefined Events for MicroLogic Active 2.0, 5.0 and 6.0

The protection function generates the following predefined events:

Code	Event	History	Severity
0x4002 (16386)	**Instantaneous (Ii) trip**	Trip	High

Predefined events cannot be modified by the user. For general information about events, refer to Event management, page 212.

The trip event is generated when the circuit breaker tripping voltage release (MITOP) activates.

Predefined Events for MicroLogic Active 5.0 and 6.0

When instantaneous overcurrent protection is disabled, the following event is generated:

Code	Event	History	Severity
0x0C08 (3080)	**Ii protection disabled**	Protection	Low

Recommended Actions

Code	Event	Recommended actions
0x4002 (16386)	**Instantaneous (Ii) trip**	Reset the circuit breaker. See Resetting a Trip Event, page 103.
0x0C08 (3080)	**Ii protection disabled**	No action required. For information only.

Protection Test for MicroLogic Active 2.0 and 5.0

The protection test function for MicroLogic Active 2.0 and 5.0 control units simulates a trip generated by instantaneous overcurrent protection.

Perform the protection test as follows:

Step	Action
1	Check that the circuit breaker is closed and the control unit is supplied with power (ready LED is flashing).
2	Use the MicroLogic Active HMI to perform the protection test, page 59. The **Ii test button pressed** event is generated.
3	The circuit breaker trips. The **Ii test trip** event is generated.
4	If the circuit breaker does not trip, the **Ii test - no trip** event is generated. Restart the test. If the circuit breaker does not trip again, contact your Schneider Electric Services representative.

Protection Test Events for MicroLogic Active 2.0 and 5.0

The protection test function generates the following predefined events:

Code	Event	History	Severity
0x4035 (16437)	**Ii test trip**	Trip	High
0x151B (5403)	**Ii test - no trip**	Diagnostic	High
0x151C (5404)	**Ii test button pressed**	Diagnostic	Low

Recommended Actions for MicroLogic Active 2.0 and 5.0 Protection Test

Code	Event	Recommended actions
0x4035 (16437)	**Ii test trip**	Reset the circuit breaker. See Resetting a Trip Event, page 103.
0x151B (5403)	**Ii test - no trip**	Restart the test. If the circuit breaker does not trip again, contact your Schneider Electric Services representative.
0x151C (5404)	**Ii test button pressed**	No action required. For information only.

Resetting a Trip Event

For information about resetting the circuit breaker after a trip due to an electrical fault, refer to the relevant document, page 10:

- *MasterPacT MTZ1 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide*
- *MasterPacT MTZ2/MTZ3 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide*

Ground-Fault Protection (G or ANSI 50N-TD/51N)

Presentation

Ground-fault protection provides protection against phase-to-ground fault, which is more sensitive than protection based on phase current only. It is generally used in TN-S systems but could also be used in other earthing systems.

NOTE: Ground-fault protection is also called earth-fault protection.

Ground-fault protection is based either on the summation of the phases and neutral current or on the signal delivered by an external sensor, an external neutral current transformer (ENCT), or a source ground return (SGR) current transformer through the MDGF module.

⚠ WARNING

HAZARD OF EQUIPMENT DAMAGE

With MicroLogic Active 6.0 control unit for IEC standard, when using source ground return (SGR) with MDGF module:

- Ig mode setting in OFF position is forbidden.
- Ig threshold setting must be ≤ 1,200 A.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Availability

Ground-fault protection is available on:

- MicroLogic Active 6.0 control units for IEC standard
- 3-pole and 4-pole circuit breakers

An External Neutral Current Transformer (ENCT) can be used to measure the current on neutral. For information about the installation of ENCT, consult the instruction sheet on the Schneider Electric website: NHA14388

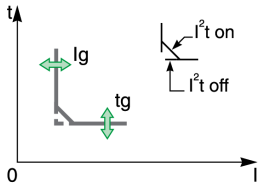
Ground-fault protection is powered by the current flowing through the internal current transformers of the circuit breaker and it does not require an additional external power supply.

NOTE: When ENCT is not used, short circuit terminals T1 and T2.

Operating Principle

The ground-fault current is calculated or measured according to the circuit breaker configuration, as shown in the following table.

Circuit breaker configuration	Ig ground-fault current
3P	Ig = I1 + I2 + I3
4P	Ig = I1 + I2 + I3 + IN
3P + ENCT	Ig = I1 + I2 + I3 + IN (ENCT)



The ground-fault protection threshold Ig sets the level of ground-fault current at which the circuit breaker trips when reaching the ground-fault protection time delay tg.

The time delay tg sets the length of time during which the circuit breaker carries a ground-fault within the ground-fault protection threshold Ig range.

The time delay tg can be adjusted to:

- Four setting values with I²t ON. In this case, the tripping curve is an inverse time curve up to 2 x Ir, meaning that the time delay decreases as the current increases. Above 2 x Ir, the tripping curve is a definite time curve with a constant tripping time.
- Five setting values with I²t OFF. In this case, the tripping curve is a definite time curve with a constant tripping time.

Ground-fault protection is based on the true RMS current of phases and neutral, up to harmonic 15.

In order to trip on an intermittent electrical fault, the control unit accumulates the intermittent currents in the ground-fault tripping range that do not last long enough to trigger a trip. This accumulation leads to shorter tripping times than those set.

Setting the Protection

Ground-fault protection can be enabled or disabled with EcoStruxure Power Commission software.

The ground-fault protection settings are:

- Ig: ground-fault protection threshold
- tg: ground-fault protection time delay
- I²t (tg): ground-fault protection curve (I²t ON or I²t OFF)

Two modes of configuring the protection settings are available:

- Quick setting mode is used to configure quick protection settings
- Fine adjustment mode is used to configure fine protection settings

Quick Protection Settings

Quick protection settings are available:

- In quick setting mode, on the MicroLogic Active HMI, page 61
- With EcoStruxure Power Device app

Ig setting for MicroLogic Active 6.0 IEC standard

Setting	Unit	Values	Factory setting	Accuracy
Ig for In ≤ 400 A	A	(0.3 / 0.4 / 0.5 / 0.6 / 0.7 / 0.8 / 0.9 / 1) x In	0.3 x In	+/– 10%
Ig for In > 400 A, excluding 1,250 A	A	(0.2 / 0.3 / 0.4 / 0.5 / 0.6 / 0.7 / 0.8 / 0.9 / 1) x In	0.2 x In	+/– 10%
Ig for In = 1,250 A	A	(0.2 / 0.32 / 0.4 / 0.48 / 0.6 / 0.72 / 0.8 / 0.88 / 1) x In	250 A	+/– 10%

tg setting for MicroLogic Active 6.0 IEC standard

Setting	Unit	Setting Value							
tg with I²t OFF	s	0	0.1	0.2	0.3	0.4	0.6	0.8	1.0
tg with I²t ON	s	–	0.1	0.2	0.3	0.4	0.6	0.8	1.0
Non-tripping time	s	> 0.02	> 0.08	> 0.14	> 0.23	> 0.36	0.55	0.71	0.9
Maximum breaking time	s	< 0.08	< 0.14	< 0.20	< 0.32	< 0.50	0.63	0.8	1.0

The default tg time delay setting value is 0 s with I²t OFF.

NOTE: When tg is set to 0 s and I²t is changed to ON, the tg time delay is automatically set to 0.1.

Fine Protection Settings

Fine protection settings are available:

- In fine adjustment mode, on the MicroLogic Active HMI, page 63
- With EcoStruxure Power Commission software
- With EcoStruxure Power Device app

Ig setting for MicroLogic Active 6.0 IEC standard

Setting	Unit	Range	Step	Factory setting	Accuracy
Ig for In ≤ 400 A	A	0.3–1 x In	1 A	0.3 x In	+/– 10%
Ig for 400 A <In ≤ 1,000 A	A	0.2–1 x In	1 A	0.3 x In	+/– 10%
Ig for In > 1,000 A	A	0.2–1 x In	10 A	0.3 x In	+/– 10%

tg setting for MicroLogic Active 6.0 IEC standard

Setting	Unit	Setting Value							
tg with I²t OFF	s	0	0.1	0.2	0.3	0.4	0.6	0.8	1.0
tg with I²t ON	s	–	0.1	0.2	0.3	0.4	0.6	0.8	1.0
Non-tripping time	s	> 0.02	> 0.08	> 0.14	> 0.23	> 0.36	0.55	0.71	0.9
Maximum breaking time	s	< 0.08	< 0.14	< 0.20	< 0.32	< 0.50	0.63	0.8	1

Zone Selective Interlocking (ZSI)

The ZSI characteristics and external wiring of the zone selective interlocking function, are described specifically, page 112.

If ZSI IN is not set to 1 (open circuit between Z3 and Z4 terminals), the maximum breaking time is 0.08 s regardless of the tg setting value.

When ZSI IN is set to 1 and connected to the ZSI OUT of a downstream device (or when ZSI is not used, there is a jumper between the Z3 and Z4 terminals), the tg time delay is used.

The Ig threshold activates ZSI OUT (Z1 and Z2 terminals).

NOTE: MasterPacT MTZ circuit breakers are delivered with a jumper installed between Z3 and Z4.

Predefined Events for MicroLogic Active 6.0

The protection function generates the following predefined events:

Code	Event	History	Severity
0x4003 (16387)	**Ground Fault (Ig) trip**	Trip	High
0x0C09 (3081)	**Ig protection disabled**	Protection	Low
0x6203 (25091)	**Ig start**	Protection	Low

Predefined events cannot be modified by the user. For general information about events, refer to Event management, page 212.

Protection events are generated as follows:

- The start event is generated when the protection picks up.
- The trip event is generated when the circuit breaker tripping voltage release (MITOP) activates.

Recommended Actions for MicroLogic Active 6.0

Code	Event	Recommended actions
0x4003 (16387)	**Ground Fault (Ig) trip**	Reset the circuit breaker. See Resetting a Trip Event, page 108.
0x0C09 (3081)	**Ig protection disabled**	No action required. For information only.
0x6203 (25091)	**Ig start**	No action required. For information only.

Protection Test for MicroLogic Active 6.0

The protection test function for MicroLogic Active 6.0 control unit simulates a trip generated by ground-fault protection.

Perform the protection test as follows:

Step	Action
1	Check that the circuit breaker is closed and the control unit is supplied with power (**Ready** LED is flashing).
2	Use the MicroLogic Active HMI to perform the protection test, page 59. The **Ig test launched** event is generated.
3	The circuit breaker trips. The **Ig test trip** event is generated.
4	If the circuit breaker does not trip, the **Ig test - no trip** event is generated. Restart the test. If the circuit breaker does not trip again, contact your Schneider Electric Services representative.

Protection Test Events for MicroLogic Active 6.0

The protection test function generates the following predefined events:

Code	Event	History	Severity
0x401E (16414)	**Ig test trip**	Trip	High
0x1413 (5139)	**Ig test - no trip**	Diagnostic	High
0x142A (5162)	**Ig test launched**	Diagnostic	Low

Recommended Actions for MicroLogic Active 6.0 Protection Test

Code	Event	Recommended actions
0x401E (16414)	**Ig test trip**	Reset the circuit breaker. See Resetting a Trip Event, page 108.
0x1413 (5139)	**Ig test - no trip**	Restart the test. If the circuit breaker does not trip again, contact your Schneider Electric Services representative.
0x142A (5162)	**Ig test launched**	No action required. For information only.

Resetting a Trip Event

For information about resetting the circuit breaker after a trip due to an electrical fault, refer to the relevant document, page 10:

- *MasterPacT MTZ1 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide*
- *MasterPacT MTZ2/MTZ3 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide*

Neutral Protection

Presentation

A long time overcurrent protection function is dedicated to the neutral protection.

Availability

Neutral protection is available on:

- MicroLogic Active 2.0, 5.0 and 6.0 control units for IEC standard
- 3-pole circuit breakers with the ENCT (External Neutral Current Transformer) option to measure the neutral current. For information about the installation of ENCT, consult the instruction sheet on the Schneider Electric website: NHA14388.
- 4-pole circuit breakers

NOTE: When ENCT is not used, short circuit terminals T1 and T2.

Description

Where the cross-sectional area of the neutral conductor is at least equivalent to that of the phase conductor, and the current in the neutral is expected not to exceed the value in the phase conductor, it is not necessary to provide overcurrent protection for the neutral conductor.

The neutral conductor must have protection against overcurrent if:

- The cross-sectional area of the neutral conductor is less than the cross-sectional area of the phase conductors
- Non-linear loads generating third order harmonics (or multiples thereof) are installed

It may be necessary to switch off the neutral for operational reasons (multiple source diagram) or safety reasons (working with power off).

To summarize, the neutral conductor can be:

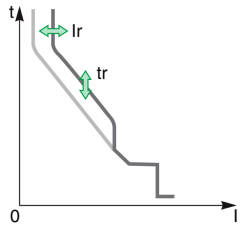
- Non-distributed (3-pole circuit breaker)
- Distributed, not switched off and not protected (3-pole circuit breaker)
- Distributed, not switched off but protected (3-pole circuit breaker with ENCT option)
- Distributed, switched off and protected (4-pole circuit breaker)

MicroLogic Active control units are suitable for all protection types. They incorporate the oversized neutral (OSN) function, which manages protection of the neutral conductor when third-order harmonic currents (and multiples thereof) are present.

Circuit Breaker	Possible Types	Neutral Protection
3-pole circuit breaker	3P, 3D	Off
3-pole circuit breaker with ENCT option	3P, 3D	Off
	3P, 3D + N/2	Half neutral
	3P, 3D + N	Full neutral
	3P, 3D + OSN	Oversized neutral
4-pole circuit breaker	4P, 3D	Off
	4P, 3D + N/2	Half neutral
	4P, 4D	Full neutral

Circuit Breaker	Possible Types	Neutral Protection
	4P, 4D + OSN	Oversized neutral
P: Pole, D: Control unit, N: Neutral protection		

Operating Principle



Neutral protection has the same characteristics as phase protection:

- Its threshold is proportional to the long-time protection threshold Ir.
- It has the same tr time delay values as long-time protection.
- Its short-time and instantaneous protections are identical.

Declaring the External Neutral Current Transformer (ENCT) on 3-Pole Circuit Breakers

On 3P circuit breakers the ENCT option must be declared in one of the following ways:

- On the MicroLogic Active display screen, from the tree navigation menu, at **Configuration > Measures > System Type > ENCT**
- With EcoStruxure Power Commission software

Setting the Neutral Protection for 3-Pole and 4-Pole Circuit Breakers

The following table shows the setting values of the neutral long-time protection and threshold for the type of neutral protection selected:

Neutral protection type		Neutral threshold value
OFF		No protection for neutral
N/2 (factory setting)		Ir/2
N		Ir
Oversized N	3-pole (ENCT)	1.6 x Ir
	4-pole	1.6 x Ir limited to In

Other Protection Functions

What's in This Chapter

Zone Selective Interlocking (ZSI) 112
Energy Reduction Maintenance Settings (ERMS) 116

Zone Selective Interlocking (ZSI)

Presentation

Zone-selective interlocking (ZSI), also called zone restraint, is a system designed to reduce the stress on electrical distribution equipment during short-circuit or ground-fault conditions.

ZSI works with a previously coordinated distribution system to limit stress on the system by reducing the time it takes to clear the electrical fault while maintaining system coordination between overcurrent and ground-fault protective devices.

ZSI allows MicroLogic Active control units to communicate with each other so that a short-circuit or ground-fault can be isolated and cleared by the nearest upstream circuit breaker with no intentional time delay. Devices in all other areas of the system (including upstream) remain closed to maintain service to unaffected loads.

Without ZSI, a coordinated system results in the circuit breaker closest to the electrical fault clearing it, usually with an intentional delay. With ZSI, the device closest to the electrical fault ignores its preset short-time and ground-fault delays and clears the electrical fault with no intentional delay.

Zone-selective interlocking eliminates intentional delay without sacrificing coordination and it results in faster tripping times. This limits stress on the system by reducing the amount of let-through energy the system is subjected to during an overcurrent.

The coordination of the system must be correctly set up for zone-selective interlocking to work.

Availability

Zone-selective interlocking is available on MicroLogic Active 5.0 and 6.0 control units for IEC standard.

For zone-selective interlocking compatibility with other ranges of circuit breakers, consult the ZSI Interface Module instruction sheet on the Schneider Electric website: NHA12883.

MasterPacT MTZ circuit breakers with ZSI capability are shipped with self-restraint jumpers installed. Self-restraint jumpers must be in place unless zone selective interlocking is activated. If jumpers are removed and zone selective interlocking is not activated, the circuit breaker ignores its programmed delay and trips with no intentional delay.

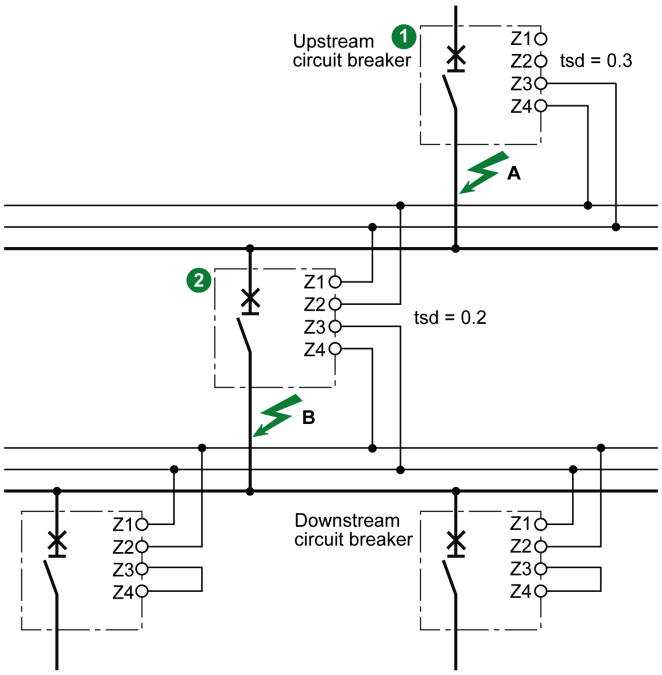
Operating Principle

A pilot wire interconnects a number of circuit breakers equipped with MicroLogic Active control units, as illustrated in the following diagram.

The control unit detecting an electrical fault sends a signal upstream and checks for a signal arriving from downstream. If there is a signal from downstream, the circuit breaker remains closed for the full duration of its tripping delay. If there is no signal from downstream, the circuit breaker opens immediately, regardless of the tripping-delay setting.

Electrical Fault in A: Only circuit breaker **1** detects the electrical fault. Because it receives no signal from downstream, it opens immediately, regardless of its tripping delay set to 0.3 s.

Electrical Fault in B: Circuit breakers **1** and **2** detect the electrical fault. Circuit breaker **1** receives a signal from circuit breaker **2** and remains closed for the full duration of its tripping delay, set to 0.3 s. Circuit breaker **2** does not receive a signal from downstream and opens immediately, in spite of its tripping delay set to 0.2 s.



NOTE: On circuit breaker **1**, the tsd and tg tripping delays must not be set to zero because this would make selectivity impossible.

Setting the Function

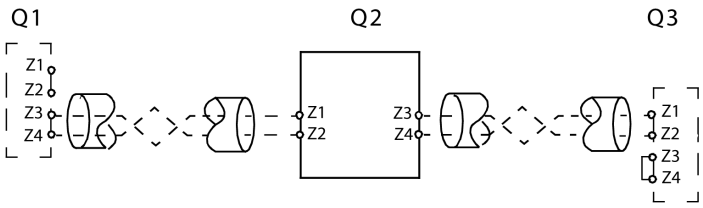
The following settings can be assigned to the ZSI input:

- Short-time overcurrent protection (MicroLogic Active 5.0 and 6.0)
- Ground-fault protection (MicroLogic Active 6.0)
- Both protections (MicroLogic Active 6.0)

Setting changes can be made with EcoStruxure Power Commission software.

Connection Principles

The following figure explains how the signal wire is connected to the MicroLogic Active control unit:



Q1 Upstream circuit breaker

Q2 Circuit breaker to be wired

Q3 Downstream circuit breaker

Z1 ZSI-OUT source

Z2 ZSI-OUT

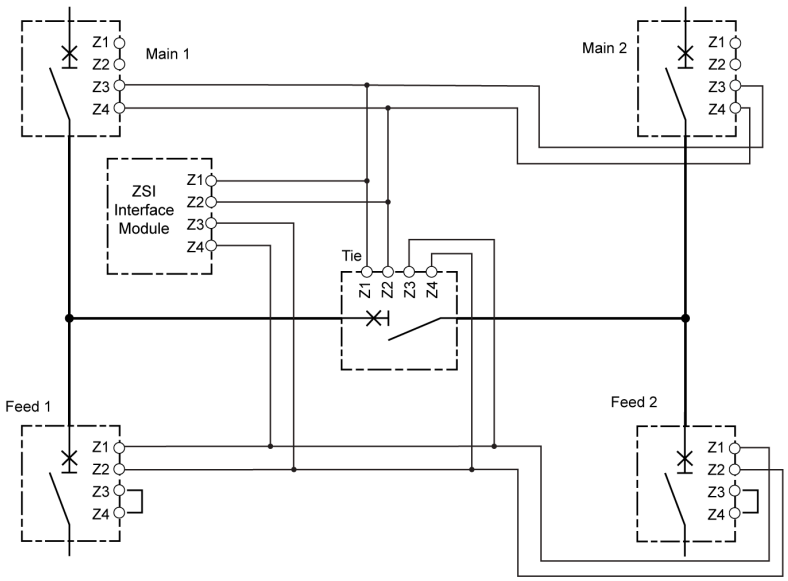
Z3 ZSI-IN source

Z4 ZSI-IN

NOTE: When ZSI is not used downstream, short circuit inputs Z3 and Z4. The setting of the short-time and ground-fault protection time delays can be inhibited if this principle is not applied.

Multi-Source Distribution

If a number of circuit breakers are installed upstream (multi-source distribution), the same principles apply.



NOTE: Management of this configuration does not require any additional relays for ZSI to be controlled for the sources used.

For information about the installation of the ZSI Interface Module, consult the instruction sheet on the Schneider Electric website: NHA12883.

Connection Wire Characteristics

The following table indicates the characteristics of the inter-device signal wire:

Characteristics	Values
Impedance	2.7 Ω per 300 m (1000 ft)
Maximum length	300 m (1000 ft)
Type of cable	Twisted pair
Permissible conductor cross-section	0.4–2.5 mm^2 (20–14 AWG)
Interconnection limit on inputs Z3 and Z4 (to downstream devices)	15 devices
Interconnection limit on outputs Z1 and Z2 (to upstream devices)	5 or 15 devices, depending on the upstream device

Energy Reduction Maintenance Settings (ERMS)

Presentation

The ERMS function is used to reduce protection settings so that the circuit breaker trips as soon as possible when a short circuit occurs. Minimizing the time between short circuit and trip helps to reduce the risk of injury when qualified electrical personnel are near energized equipment.

The ERMS function defines a separate set of protection settings for the following protection functions:

- Long-time overcurrent protection
- Short-time overcurrent protection
- Instantaneous overcurrent protection
- Ground-fault protection

When the ERMS function is engaged, the ERMS protection settings replace the standard protection settings.

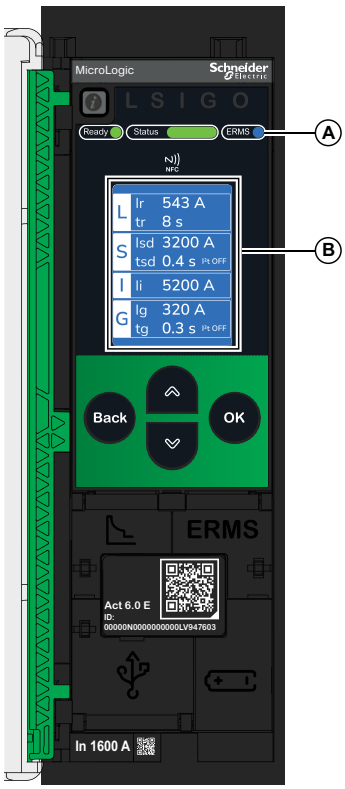
Availability

The ERMS function is available on MicroLogic Active 2.0, 5.0 and 6.0 control units for IEC standard.

To use the ERMS function with an external selector switch, the optional BCIM module must be installed in the circuit breaker and configured in ERMS mode. See BCIM Module in ERMS Mode, page 118.

Operating Principle

The ERMS function can be engaged or disengaged by using the **ERMS** button, or by using an external selector switch connected to the BCIM module.



While the ERMS function is engaged:

- The ERMS LED (A) is lit in blue.
- The LSIG home screen is blue.
- The Quick View screens are blue.
- All other screens are not blue.

Use-case Examples

The conditions of operation of electrical installations are specified by national regulations (for example, NPFA70E for USA, EN 50110 for Europe). These regulations require an assessment of electrical risk before carrying out any operation. The assessment must specify when the ERMS function should be implemented and engaged.

Whenever possible the electrical installation should be de-energized. When working in the vicinity of live parts without all doors or panels of the switchboard closed and secured, the ERMS function can be engaged to reduce the consequences of a short circuit. A risk assessment specific to each situation must be carried out, even when the ERMS function is used.

The following table gives examples of use-cases inside or close to a switchboard, where engaging the ERMS function is recommended. The recommendations are based on the assumptions that:

- The ERMS function is embedded in the upstream device on the supply side of the switchboard in question.
- The switchboard has only one supply.

Operation	Location
Addition of device in spare slot in the switchboard	Inside switchboard
Thermal inspection	Inside switchboard
Measurement reading inside switchboard, requiring opening of door or panels	Inside switchboard
Measurement with portable equipment (for example, voltage presence, phase rotation, power quality)	Inside switchboard
First energization or re-energization of the equipment	In electrical room, less than 0.3 m (12 in) from switchboard
Device unlocking with padlock or key	In electrical room, less than 0.3 m (12 in) from switchboard
Device closing	In electrical room, less than 0.3 m (12 in) from switchboard

Engaging the ERMS Function

⚠⚠DANGER

HAZARD OF INCORRECT ERMS STATUS

- Do not rely on the ERMS status signaled on the BCIM IO port.
- Use the blue ERMS LED on the MicroLogic Active control unit to check ERMS status before working on or inside the equipment.

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

IMPORTANT: The ERMS function is only engaged if ERMS protection settings are lower than the standard protection settings.

The ERMS function can be engaged:

- By using the **ERMS** button. See Engaging the ERMS Function, page 66.
- By using an external lockable selector switch connected to the optional BCIM module. See BCIM Module in ERMS Mode, page 118.

Disengaging the ERMS Function

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Prior to disengaging ERMS:

- Carefully inspect your work area, and remove any tools and objects left inside the equipment.
- Ensure that all personnel are away from the equipment, and devices, doors, and covers are in place.

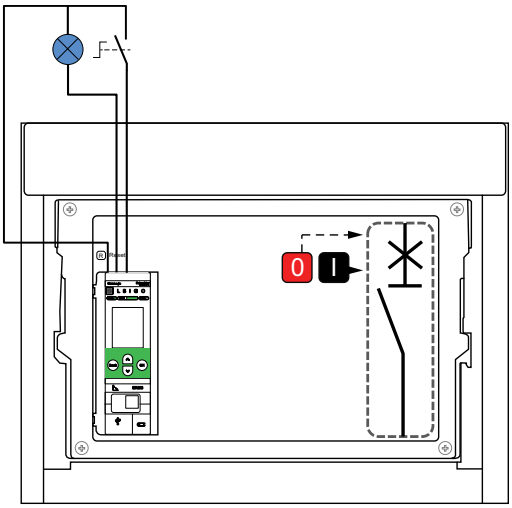
Failure to follow these instructions will result in death or serious injury.

The ERMS function must be disengaged by the interface that engaged it:

- If it is engaged by the **ERMS** button, it must be disengaged by the **ERMS** button. See Disengaging the ERMS Function, page 66.
- If it is engaged by the external selector switch connected to the BCIM module, it must be disengaged by the external selector switch.

BCIM Module in ERMS Mode

When configured in ERMS mode, the optional BCIM module can be used with an external lockable selector switch to engage or disengage the ERMS function.



The BCIM module is equipped with:

- An input connected to the ERMS selector switch, with the following characteristics:
  - When the input is energized, the ERMS function is disengaged.
  - When the input is not energized, the ERMS function is engaged.
- An output to activate an external pilot light when the ERMS function is engaged.

The ERMS function is engaged by turning the external selector switch.

IMPORTANT: The ERMS function is only engaged if ERMS protection settings are lower than the standard protection settings.

To configure the BCIM module in ERMS mode, set the BCIM parameters on the MicroLogic Active display screen, from the tree navigation menu at **Configuration > BCIM** as follows:

- **BCIM = Yes**
- **IO Settings > IO Mode = ERMS**

The other BCIM parameters have no impact on the ERMS function.

For more information, refer to BCIM configuration, page 76.

Configuring the ERMS Settings

The ERMS settings can be configured in fine adjustment mode with EcoStruxure Power Commission software.

IMPORTANT: The ERMS protection settings must be lower than the standard protection settings to enable ERMS engagement.

The following ERMS settings are available:

Protection function	Setting	Unit	Setting range	Factory setting	MicroLogic Active type
Long-time overcurrent protection	Ir	A	0.4–1 x In	0.4 x In	MicroLogic Active 2.0, 5.0, 6.0
	tr	s	0.5–24	0.5 s	MicroLogic Active 2.0, 5.0, 6.0 in a MasterPacT MTZ1 circuit breaker
			0.5–30	0.5 s	MicroLogic Active 2.0, 5.0, 6.0 in a MasterPacT MTZ2/MTZ3 circuit breaker
Short-time overcurrent protection	Isd	A	1.5–10 x Ir	1.5 x Ir	MicroLogic Active 5.0 and 6.0
	tsd	s	0–0.8	0 s	MicroLogic Active 5.0 and 6.0
Instantaneous overcurrent protection	Ii	A	1.5–10 x Ir	1.5 x Ir	MicroLogic Active 2.0
			2–15 x In	2 x In	MicroLogic Active 5.0 and 6.0
Ground-fault protection	Ig(1)	A	0.2–1 x In	0.3 x In	MicroLogic Active 6.0
	tg	s	0–1	0 s	
(1) For In ≤ 400 A, the Ig setting range is 0.3–1 x In (factory setting: 0.3 x In)					

Predefined Events

The function generates the following predefined events:

Code	Event	History	Severity
0x0C03 (3075)	**ERMS engaged**	Protection	Low

Predefined events cannot be modified by the user. For general information about events, refer to Event management, page 212.

Advanced Protection Functions

What's in This Chapter

Undervoltage Protection (ANSI 27) 121
Overvoltage Protection (ANSI 59) 124

Undervoltage Protection (ANSI 27)

Presentation

Undervoltage protection (ANSI 27) constantly monitors the system voltage. If the voltage level of an installation goes out of its acceptable limits, the information provided by undervoltage protection can be used to initiate appropriate action to restore good operating conditions in the installation.

The information provided by undervoltage protection is used to generate alarms and circuit breaker tripping when required. In addition, the constant monitoring of phase-to-phase or phase-to-neutral voltages enables appropriate action to be initiated to safeguard the operation of the installation during abnormal or critical situations, for example, load shedding, source change-over, and emergency generator starting.

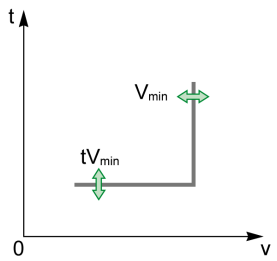
Prerequisites

Undervoltage protection requires an external 24 Vdc power supply.

Undervoltage protection is compatible with:

- MicroLogic Active E/EP/Ei control units for IEC standard.
- MicroLogic Active E/EP/Ei control units with firmware version greater than or equal to 004.004.000. Earlier firmware versions need to be updated, page 38.

Operating Principle



Undervoltage protection monitors either three phase-to-phase voltages (V12, V23, V31), or three phase-to-neutral voltages (V1N, V2N, V3N).

Undervoltage protection has two protection modes:

- Per phase: each voltage is monitored independently. The undervoltage protection function detects when one of three monitored voltages reaches the threshold Vmin.
- All phases: the three voltages are monitored together. The undervoltage protection function detects when all three monitored voltages reach the threshold Vmin.

The action performed by the undervoltage protection function is delayed by a settable time delay, tVmin.

Each undervoltage protection mode, per phase or all phases, can be enabled or disabled separately.

Voltage Measurement

For undervoltage protection set in tripping mode, the voltage must be measured on the power source side to allow closing of the circuit breaker. As standard, the MicroLogic Active E/EP/Ei voltage input is directly connected to the internal pickup voltage (PTI) on the bottom side of the circuit breaker. So:

- If the circuit breaker is bottom fed, the internal pickup voltage (PTI) is suitable for undervoltage protection and circuit breaker closing.
- If the circuit breaker is top fed, an external voltage input is required. The external voltage tap (PTE) option must be used to measure the voltage on the power source side.

Setting the Protection

The settings for undervoltage protection are:

- Activation. Disable, or enable and configure the undervoltage protection mode:
  - OFF: disable undervoltage protection
  - Per phase: undervoltage protection is activated when one of three phase voltages reaches the threshold Vmin (ANSI 27-1)
  - All phases: undervoltage protection is activated when all three phase voltages reaches the threshold Vmin (ANSI 27-2)
  - Both: undervoltage protection is activated when one or all of three phase voltages reaches the threshold Vmin
- Action. Select the action to take when undervoltage protection is activated:
  - Trip: the circuit breaker trips when both voltage threshold and time delay are exceeded
  - Alarm: alarms are generated without the circuit breaker tripping
- Type. Select the type of voltage to monitor:
  - VLL phase-to-phase voltage selection
  - VLN phase-to-neutral voltage selection (this setting should be selected only with 4-pole circuit breakers or 3-pole circuit breakers with ENVT wired and configured)
- Vmin: threshold of undervoltage protection
- tVmin: time delay of undervoltage protection

They can be set on the MicroLogic Active display screen, by navigating from the tree navigation menu to **Protection > Advanced Protection > Undervoltage** and pressing **Edit settings**.

Only the fine adjustment mode is available to configure undervoltage protection settings.

Protection Settings

Setting	Value	Factory setting
Activation	OFF / Per phase / All phases / Both	OFF
Action	Alarm / Trip	Alarm
Type	VLL / VLN	VLL

Setting	Unit	Range	Step	Factory setting
Vmin	V	100-1200	1	100
tVmin	s	1-100	1	1

Protection Characteristics

Characteristics of undervoltage protection:

- Definite time delay
- Instantaneous reset time
- Hysteresis: fixed 98%
- Maximum breaking time 140 ms with time delay set to 1 s

Predefined Events

The function generates the following predefined events:

Code	Event	History	Severity
0x4010 (16400)	**Undervoltage trip on 1 phase**	Trip	High
0x6210 (25104)	**Undervoltage on 1 phase start**	Protection	Low
0x6310 (25360)	**Undervoltage on 1 phase operate**	Protection	Medium
0x402A (16426)	**Undervoltage trip on all 3 phases**	Trip	High
0x622A (25130)	**Undervoltage on all 3 phases start**	Protection	Low
0x632A (25386)	**Undervoltage on all 3 phases operate**	Protection	Medium

Predefined events cannot be modified by the user. For general information about events, refer to Event management, page 212.

Protection events are generated as follows:

- The start event is generated when the protection is activated.
- The operate event is generated when the protection time delay elapses.
- The trip event is generated when the circuit breaker tripping voltage release (MITOP) activates. The trip event is not generated when the protection action parameter is set to Alarm.

Recommended Actions

Code	Event	Recommended actions
0x4010 (16400)	**Undervoltage trip on 1 phase**	Reset the circuit breaker.
0x402A (16426)	**Undervoltage trip on all 3 phases**	Reset the circuit breaker.

Resetting a Trip Event

For information about resetting the circuit breaker after a trip due to an electrical fault, refer to the relevant document, page 10:

- *MasterPacT MTZ1 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide*
- *MasterPacT MTZ2/MTZ3 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide*

Overvoltage Protection (ANSI 59)

Presentation

Overvoltage protection (ANSI 59) constantly monitors the system voltage. If the voltage level of an installation goes out of its acceptable limits, the information provided by overvoltage protection can be used to initiate appropriate action to restore good operating conditions in the installation.

The information provided by overvoltage protection is used to generate alarms and circuit breaker tripping when required. In addition, the constant monitoring of phase-to-phase or phase-to-neutral voltages enables appropriate action to be initiated to safeguard the operation of the installation during abnormal or critical situations, for example, load shedding, source change-over, and emergency generator starting.

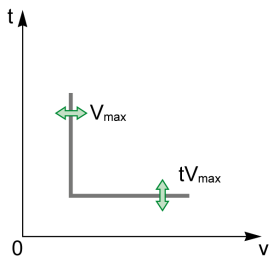
Prerequisites

Overvoltage protection requires an external 24 Vdc power supply.

Overvoltage protection is compatible with:

- MicroLogic Active E/EP/Ei control units for IEC standard.
- MicroLogic Active E/EP/Ei control units with firmware version greater than or equal to 004.004.000. Earlier firmware versions need to be updated, page 38.

Operating Principle



Overvoltage protection monitors either three phase-to-phase voltages (V12, V23, V31), or three phase-to-neutral voltages (V1N, V2N, V3N).

Overvoltage protection has two protection modes:

- Per phase: each voltage is monitored independently. The overvoltage protection function detects when one of three monitored voltages reaches the threshold Vmax.
- All phases: the three voltages are monitored together. The overvoltage protection function detects when all three monitored voltages reach the threshold Vmax.

The action performed by the overvoltage protection function is delayed by a settable time delay, tVmax.

Each overvoltage protection mode, per phase or all phases, can be enabled or disabled separately.

Setting the Protection

The settings for overvoltage protection are:

- Activation. Disable, or enable and configure the overvoltage protection mode
  - OFF: disable overvoltage protection
  - Per phase: overvoltage protection is activated when one of three phase voltages reaches the threshold Vmax (ANSI 59-1)
  - All phases: overvoltage protection is activated when all three phase voltages reaches the threshold Vmax (ANSI 59-2)
  - Both: overvoltage protection is activated when one or all of three phase voltages reaches the threshold Vmax

- Action. Select the action to take when overvoltage protection is activated:
  - Trip: the circuit breaker trips when both voltage threshold and time delay are exceeded
  - Alarm: alarms are generated without the circuit breaker tripping
- Type. Select the type of voltage to monitor:
  - VLL phase-to-phase voltage selection
  - VLN phase-to-neutral voltage selection (this setting should be selected only with 4-pole circuit breakers or 3-pole circuit breakers with ENVT wired and configured)
- Vmax: threshold of overvoltage protection
- tVmax: time delay of overvoltage protection

They can be set on the MicroLogic Active display screen, by navigating from the tree navigation menu to **Protection > Advanced Protection > Overvoltage** and pressing **Edit settings**.

Only the fine adjustment mode is available to configure overvoltage protection settings.

Protection Settings

Setting	Value	Factory setting
Activation	OFF / Per phase / All phases / Both	OFF
Action	Alarm / Trip	Alarm
Type	VLL / VLN	VLL

Setting	Unit	Range	Step	Factory setting
Vmax	V	100-1200	1	100
tVmax	s	1-100	1	1

Protection Characteristics

Characteristics of overvoltage protection:

- Definite time delay
- Instantaneous reset time
- Hysteresis: fixed 98%
- Maximum breaking time 140 ms with time delay set to 1 s

Predefined Events

The function generates the following predefined events:

Code	Event	History	Severity
0x4011 (16401)	**Overvoltage trip on 1 phase**	Trip	High
0x6211 (25105)	**Overvoltage on 1 phase start**	Protection	Low
0x6311 (25361)	**Overvoltage on 1 phase operate**	Protection	Medium
0x402B (16427)	**Overvoltage trip on all 3 phases**	Trip	High
0x622B (25131)	**Overvoltage on all 3 phases start**	Protection	Low
0x632B (25387)	**Overvoltage on all 3 phases operate**	Protection	Medium

Predefined events cannot be modified by the user. For general information about events, refer to Event management, page 212.

Protection events are generated as follows:

- The start event is generated when the protection is activated.
- The operate event is generated when the protection time delay elapses.
- The trip event is generated when the circuit breaker tripping voltage release (MITOP) activates. The trip event is not generated when the protection action parameter is set to Alarm.

Recommended Actions

Code	Event	Recommended actions
0x4011 (16401)	**Overvoltage trip on 1 phase**	Reset the circuit breaker.
0x402B (16427)	**Overvoltage trip on all 3 phases**	Reset the circuit breaker.

Resetting a Trip Event

For information about resetting the circuit breaker after a trip due to an electrical fault, refer to the relevant document, page 10:

- *MasterPacT MTZ1 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide*
- *MasterPacT MTZ2/MTZ3 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide*

Setting Guidelines

What's in This Chapter

Protection Setting Guidelines 128
Setting the Long-Time Overcurrent Protection (L or ANSI49RMS/51) 130
Setting the Short-Time Overcurrent Protection (S or ANSI50TD/51) 133
Setting the Instantaneous Overcurrent Protection (I or ANSI 50) 136
Selectivity 137

Protection Setting Guidelines

Presentation

The setting of overcurrent protection relies on installation short-circuit and electrical fault calculations. The setting guidelines cannot replace these calculations.

MasterPacT MTZ circuit breakers with MicroLogic Active control units offer flexibility to set the required overcurrent protection while maintaining selectivity and stability on transient phenomena, for example, inrush current of transformers or motors, when necessary.

For each circuit, the installation designer needs to provide the following:

- Iz: continuous current capacity of the circuit according to IEC 60364-5-52 or national wiring rules. Current carrying capacity is called ampacity in the US National Electrical Code (NFPA 70).
- Ifault min: minimum electrical fault current at the end of the circuit depending on earthing system
- Tmax short-circuit: maximum time for maximum short-circuit current

Guidelines are given for setting the following protections:

- Long-time overcurrent protection
- Short-time overcurrent protection
- Instantaneous overcurrent protection

Overcurrent Protection Setting Guidelines by Application

The following table gives the guidelines for overcurrent protection setting by application:

Application	MicroLogic Active 2.0	MicroLogic Active 5.0, 6.0(1)
Secondary side of MV/LV transformer (switchboard main incomer) with other MasterPacT MTZ, ComPacT NS, or PowerPacT P- and R-frame circuit breaker downstream as feeder	Ir = Iz tr ≤ 24 s Isd ≤ Ifault min Selectivity possible with ComPacT NSXm and ComPacT NSX feeders only.	Ir = Iz tr ≤ 24 s Isd ≤ Ifault min tsd < Tmax short-circuit tsd > tsd of downstream MasterPacT MTZ, ComPacT NS, or PowerPacT P- and R-frame circuit breaker(2) Ii mode: OFF
Secondary side of MV/LV transformer (switchboard main incomer) without other MasterPacT MTZ, ComPacT NS, or PowerPacT P- and R-frame circuit breaker downstream as feeder	Ir = Iz tr ≤ 24 s Isd ≤ Ifault min	Ir = Iz tr ≤ 24 s Isd ≤ Ifault min tsd = 0 Ii mode: ON Ii = Isd
Generator output with other MasterPacT MTZ, ComPacT NS, or PowerPacT P- and R-frame circuit breaker downstream as feeder	Ir = Iz tr ≤ 1 s Isd ≤ Ifault min Selectivity possible with ComPacT NSXm and ComPacT NSX feeders only.	Ir = Iz tr ≤ 1 s Isd ≤ Ifault min tsd > tsd of downstream MasterPacT MTZ, ComPacT NS, or PowerPacT P- and R-frame circuit breaker(2) Ii mode: OFF

Application	MicroLogic Active 2.0	MicroLogic Active 5.0, 6.0(1)
Generator output without other MasterPacT MTZ, ComPacT NS, or PowerPacT P- and R-frame circuit breaker downstream as feeder	Ir = Iz tr ≤ 1 s Isd ≤ Ifault min	Ir = Iz tr ≤ 1 s Isd ≤ Ifault min tsd = 0 Ii mode: ON Ii = Isd
Feeder with other MasterPacT MTZ, ComPacT NS, or PowerPacT P- and R-frame circuit breaker downstream	Ir = Iz tr ≤ 16 s Isd ≤ Ifault min Selectivity possible with ComPacT NSXm and ComPacT NSX feeders only.	Ir = Iz tr ≤ 16 s Isd ≤ Ifault min tsd > tsd of downstream circuit breaker(2) Ii mode: OFF
Feeder without other MasterPacT MTZ, ComPacT NS, or PowerPacT P- and R-frame circuit breaker downstream as feeder	Ir = Iz tr ≤ 16 s Isd ≤ Ifault min	Ir = Iz tr ≤ 16 s Isd ≤ Ifault min tsd = 0 Ii mode: ON Ii = Isd
Power electronic (for example, uninterruptible power supplies, variable speed drives, photovoltaic inverters) with no other circuit breaker downstream	Ir = Iz tr ≤ 8 s Isd = 1.5-2 x In ≤ Ifault min	Ir = Iz tr ≤ 16 s Isd = 1.5-2 x In ≤ Ifault min tsd = 0 Ii mode: ON Ii = 2–3 x In
ERMS settings	Ii_ERMS = 1.5 x Ir Ir_ERMS = Iz tr_ERMS ≤ 1 s Isd_ERMS = 1.5 x Ir	Ii_ERMS = 2 x In Ir_ERMS = Iz tr_ERMS ≤ 1 s Isd_ERMS = 1.5 x Ir tsd_ERMS = 0

(1) Ground-fault protection depends on the grounding system and local regulations. As a rule ground-fault sensitivity should be as low as possible without being disturbed by permanent or transient leakage current. The ground-fault time delay enables selectivity with downstream devices.

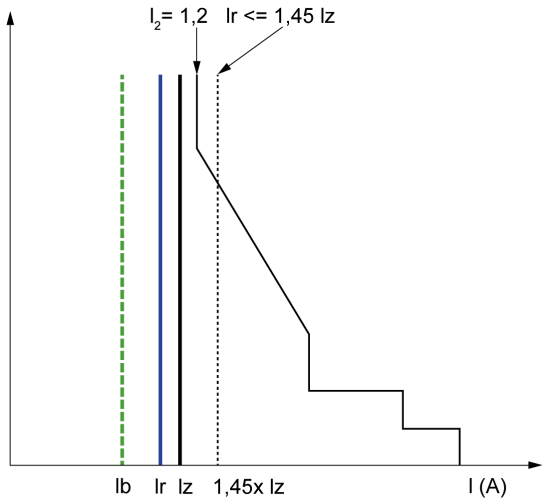
(2) When tsd > 0, a fault clearance time reduction system, such as ZSI or ERMS, is required in the USA by National Electricity Code NFPA 70 (240.87) (2011 edition). Refer to the guidelines for ERMS settings.

Setting the Long-Time Overcurrent Protection (L or ANSI 49RMS/51)

Setting Guidelines for Ir

The Ir setting depends on the maximum expected current flow through the breaker and the maximum current that can be withstood by the protected equipment (for example, cables, busbars, generators, and transformers).

The installation rules, such as IEC 60364 Chapter 4.43 or similar national standards, require overload protection for conductors as follows:



Ib Maximal load current

Ir Long time protection setting

Iz Continuous current-carrying capacity of the circuit

I_2 Conventional operating current of the circuit breaker = 1.2 x Ir for Schneider Electric electronic control unit

I(A) Current through circuit breaker (phase(s) or neutral)

Setting Guidelines for tr

The tr setting depends on the maximum duration at maximum current and the maximum current that can be withstood by the protected equipment (for example, cables, busbars, generators, and transformers).

Thermal memory: As described in long-time overcurrent protection, page 91, this protection function is an overcurrent time-dependent protection with thermal memory. It operates as a thermal image, using the heating and cooling model of a conductor. It can be considered as a first order thermal model with one heating time constant.

The following table shows the relationship between the tr setting and the thermal time constant of the first order thermal model:

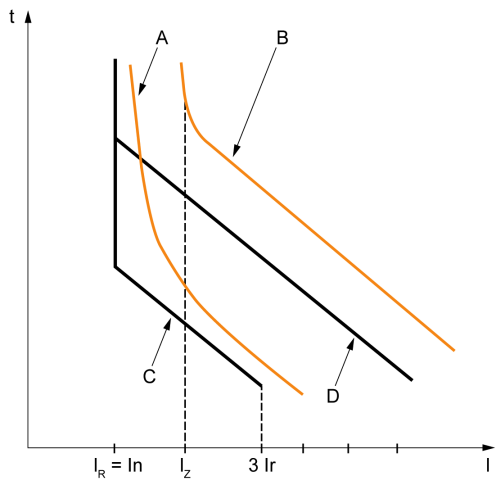
tr setting (s)	**Unit**	**0.5**	**1**	**2**	**4**	**8**	**12**	**16**	**20**	**24**
Equivalent time constant for heating and cooling when control unit is energized	seconds	14	28	56	112	224	335	447	559	671
	minutes	–	–	–	–	3.5	5.6	7.5	9.3	11.2
Time constant for cooling when control unit is not energized	minutes	5								

Summary of tr Setting Guidelines by Application

The following table gives the tr setting guidelines by application:

Application	Principle	Usual value
Secondary side of MV/LV transformer (switchboard main incomer) Tie circuit breaker between two switchboards	Tripping time according to circuit thermal withstand for busbars, busbar trunking, cable > 240 mm² (500 MCM): • Time constant > 11 min • tr = 24 s When smaller cables are used in parallel, a lower setting should be used.	tr ≤ 24 s
Generators	tr ≤ 1 s in order to achieve tripping time < 30 s for 1.5 x Ir (IEC 60034-1 Clause 9.3.2).	tr ≤ 1 s
Feeder (cable or busbar trunking protection)	Tripping time according to circuit thermal withstand for busbars, busbar trunking, cable > 240 mm² (500 MCM): • Time constant > 11 min • tr = 24 s To achieve selectivity with incomer, it can be useful to reduce tr.	• tr ≤ 24 s for busbar trunking or cable ≥ 240 mm² (500 MCM) • tr ≤ 16 s for lower cross section cables
Primary side of LV/LV transformer	According to cable or busbar trunking withstand (transformer withstand is generally higher). To achieve selectivity with incomer, it can be useful to reduce tr.	• tr ≤ 24 s for busbar trunking or cable ≥ 240 mm² (500 MCM) • tr ≤ 16 s for lower cross section cables
Power electronic (for example, uninterruptible power supplies, variable speed drives, photovoltaic inverters)	According to cable or busbar trunking supplying power electronic equipment.	• tr ≤ 24 s for busbar trunking or cable ≥ 240 mm² (500 MCM) • tr ≤ 16 s for lower cross section cables
Motors	If motor is protected against overload by a separate relay, long time setting is done according to circuit thermal withstand. If the MicroLogic control unit is also used for motor thermal overload, motor class must be taken in consideration.	• tr = 12 s for a feeder • tr ≥ 8 s for a class 10 motor • tr ≥ 12 s for a class 20 motor • tr ≥ 16 s for a class 30 motor

Example of tr setting according to the application:



A Generator thermal limit

B Cable thermal limit

C Protection setting generator t_{LT} (minimum notch)

D Protection setting cable t_{LT} (maximum notch)

Neutral Protection Setting Guidelines

Some indications for setting neutral protection are given here. For more information, refer to the neutral protection section, page 109.

The following table indicates the long-time protection settings according to the neutral cable cross section:

Cross-sectional area of neutral conductor	Harmonics expected	Neutral protection setting	Long-time protection
Less than cross-sectional area of phase conductors	No	N/2	Ir is set according to Iz of cable, Ir applied to neutral is divided by 2
Equal to cross-sectional area of phase conductors	No	OFF	No harmonics expected: the protection of neutral is not necessary
	Yes	N	Harmonics expected: the neutral must be protected by the long-time protection, set as for the phase protection
Greater than cross-sectional area of phase conductors	No	OFF	No harmonics expected: the protection of neutral is not necessary
	Yes	Oversized N	Harmonics expected: the neutral must be protected by the long-time protection, set as for the phase protection multiplied by 1.6 (Oversized neutral)

NOTE: On 3-pole circuit breakers the ENCT option must be declared.

NOTE: In IT systems, a distributed neutral conductor must be protected. Set the neutral protection to N/2, N or Oversized N.

Setting the Short-Time Overcurrent Protection (S or ANSI 50TD/51)

Setting Guidelines

The Isd and tsd settings help to ensure that the short-time withstand current of protected equipment is not exceeded.

When short-time overcurrent protection automatically disconnects the power supply in accordance with IEC 60364-4-41, the Isd setting must take into consideration the fault loop impedance of the protected circuit. For more information, refer to IEC 60364-4-41 2017 clause 411.4.4 or national low-voltage installation rules.

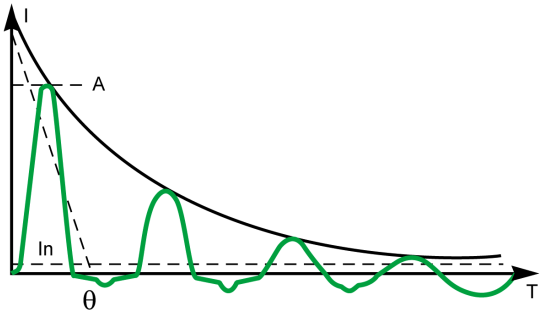
Alternatively this function can be performed by ground-fault protection.

Setting Guidelines for Isd

Application	Principle	Isd usual value
Secondary side of MV/LV transformer (switchboard main incomer or tie circuit breaker between two switchboards)	Lower than minimum short-circuit or ground-fault current at the end of the protected circuit. Selectivity with downstream circuit breakers	10 x Ir
Generators	Lower than minimum short-circuit or ground-fault current supplied by the generator. Selectivity with downstream circuit breakers	2–3 x Ir
Feeder with other MasterPacT MTZ or ComPacT NS or PowerPacT P- and R-frame circuit breaker downstream	Lower than minimum short-circuit or ground-fault current at the end of the protected circuit. Selectivity with downstream circuit breakers	10 x Ir
Feeder without other MasterPacT MTZ or ComPacT NS or PowerPacT P- and R-frame circuit breaker downstream	Lower than minimum short-circuit or ground-fault current at the end of the protected circuit. Selectivity with downstream circuit breakers	10 x Ir
Primary side of LV/LV transformer	Lower than minimum secondary short-circuit current.	10 x Ir
Power electronic (for example, uninterruptible power supplies, variable speed drives, photovoltaic inverters)	Lower than minimum short-circuit or ground-fault current at the end of the protected circuit. Lower setting possible as no selectivity or transient current is expected.	1.5–2 x Ir
Motors	Lower than minimum short-circuit or ground-fault current at the end of the protected circuit. Lower setting possible above starting current.	10 x Ir

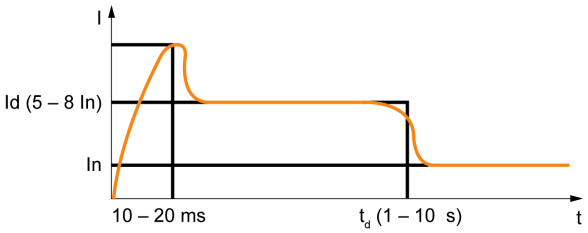
When LV/LV transformers are switched on, very high inrush currents are produced which must be taken into account when choosing overcurrent protection devices. The peak value of the first current wave often reaches 10 to 15 times the rated rms current of the transformer and may reach values of 20 to 25 times the rated current even for transformers rated less than 50 kVA.

Example of inrush current: when transformer is switched on:



A 1st peak 10 to 25 x In

Example of inrush current of direct on line motor when started:



Setting Guidelines for tsd

tsd is set according to selectivity.

Time-based selectivity is provided between two circuit breakers when the supply side circuit breaker short-time delay is at least one step higher than the load side short-time delay.

When downstream circuit breakers are ComPacT NSX or PowerPacT H-, J-, or L-frame circuit breakers, selectivity is always provided with MasterPacT MTZ circuit breakers with MicroLogic Active control units, for all values of tsd.

Short-time tripping time can be definite time type (tripping time is independent of current level) or time dependent with I^2t = constant curve. This function allows the curve to be smoothed for low-level overcurrent, providing fast trip at high current. This is recommended for selectivity with fuses.

Application	Principle	tsd usual value
Secondary side of MV/LV transformer (switchboard main incomer or tie circuit breaker between two switchboards)	Selectivity with downstream circuit breakers	tsd > tsd of downstream power circuit breaker (tsd = 0.2 s if installation includes three levels of power circuit breaker)
Feeder **with** selectivity with other MasterPacT MTZ, ComPacT NS or PowerPacT P- and R-frame circuit breaker downstream	Selectivity with downstream circuit breakers	tsd > tsd of downstream power circuit breaker (tsd = 0.1 s if installation includes three levels of power circuit breaker)
Feeder **without** selectivity with other MasterPacT MTZ, ComPacT NS or PowerPacT P- and R-frame circuit breaker downstream	No need for delayed short-time protection	tsd = 0 s
Primary side of LV/LV transformer	Stability during inrush. Selectivity with downstream circuit breakers	tsd = 0.1 s or tsd > tsd of downstream power circuit breaker, if any

Application	Principle	tsd usual value
Power electronic (Uninterrupted power supplies, variable speed drives, photovoltaic inverters, etc.)	No need for delayed short-time protection	tsd = 0 s
Motors	Stability during inrush	tsd = 0 s or 0.1 s

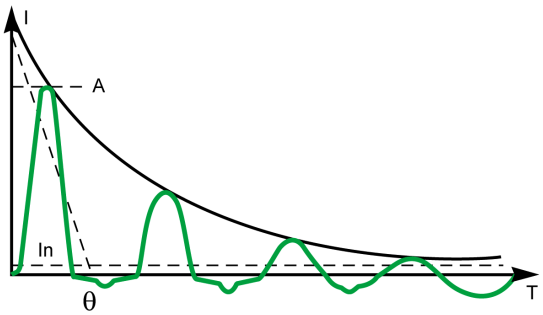
Setting the Instantaneous Overcurrent Protection (I or ANSI 50)

Settings Guideline

Rules for Isd also apply to the Ii threshold.

Application	Principle	Usual value
Secondary side of MV/LV transformer (switchboard main incomer)	Selectivity with downstream circuit breakers	Ii mode: OFF if other MasterPacT MTZ circuit breaker downstream (MicroLogic Active 5.0 and 6.0 only) Ii = 15 x In if ComPacT NSXm, ComPacT NSX, or PowerPacT P- and R-frame circuit breaker only downstream
Feeder **with** selectivity with other MasterPacT MTZ, ComPacT NS or PowerPacT P- and R-frame circuit breaker downstream	Same rule as for Isd	Ii mode: OFF (MicroLogic Active 5.0 and 6.0 only)
Feeder **without** selectivity with other MasterPacT MTZ, ComPacT NS or PowerPacT P- and R-frame circuit breaker downstream	–	Ii mode: ON Ii = 10-15 x In
Primary side of LV/LV transformer	–	Ii mode: OFF (MicroLogic Active 5.0 and 6.0 only)
Generators	–	Ii mode: OFF (MicroLogic Active 5.0 and 6.0 only)
Power electronic (for example, uninterruptible power supplies, variable speed drives, photovoltaic inverters)	Lower than minimum short-circuit or ground-fault at the end of the protected circuit. Lower setting possible as no selectivity or transient current is expected.	Ii mode: ON Ii = 2 x In (MicroLogic Active 5.0 and 6.0) Ii = 1.5 x In (MicroLogic Active 2.0)
Motor	Lower than minimum short-circuit or ground-fault at the end of the cable. Lower setting possible above starting current.	Ii mode: ON Ii ≥ 13 x Full load current of motor

Ii setting allows normal transient overcurrent inrush current for transformers:



A 1st peak 10 to 25 x In

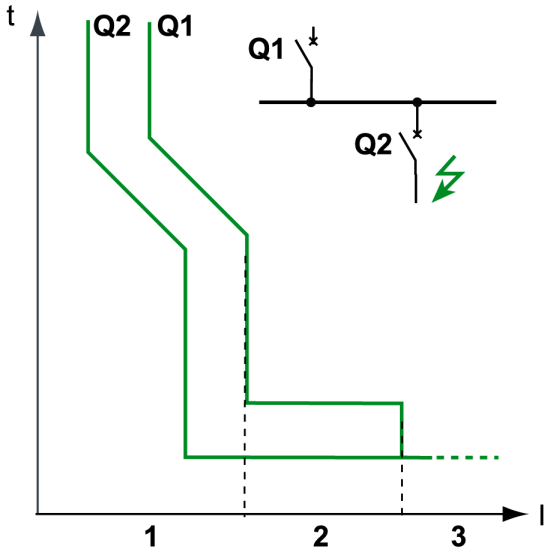
Selectivity

Coordination Between Devices

Coordination between the upstream and downstream devices, especially selectivity, is essential to optimize continuity of service. The large number of options for setting the protection functions on MicroLogic Active control units improves the natural coordination between circuit breakers.

Three selectivity techniques can be used:

- Current selectivity, which corresponds to staging of the long-time overcurrent protection threshold.
- Time selectivity, which corresponds to staging of the short-time overcurrent protection threshold.
- Energy selectivity, which corresponds to staging of the circuit breaker energy levels: this applies for high intensity short-circuit currents.



Selectivity Rules

The selectivity rules depend on:

- The type of control unit on the circuit breakers installed upstream and downstream: electronic or thermal-magnetic.
- The accuracy of the settings.

Selectivity of Overcurrent Protection

For overcurrent protection, the selectivity rules between electronic control units are as follows:

- Current and time selectivity:
  - A ratio of Ir Q1/Ir Q2 greater than or equal to 1.3 is sufficient between the Ir threshold for long-time protection of the control unit on the upstream circuit breaker **Q1** and that of the control unit on the downstream circuit breaker **Q2**.
  - The tr time delay for long-time protection of the control unit on the upstream circuit breaker **Q1** is identical or greater than that of the control unit on the downstream circuit breaker **Q2**.
  - A ratio of 1.5 is sufficient between the Isd threshold for short-time protection of the control unit on the upstream circuit breaker **Q1** and that of the control unit on the downstream circuit breaker **Q2**.
  - The tsd time delay for short-time protection of the control unit on the upstream circuit breaker **Q1** is greater than that of the control unit on the downstream circuit breaker **Q2**.
  - If the upstream circuit breaker is in the I^2t off position, the downstream circuit breakers must not be in the I^2t on position.
- Energy selectivity is provided by the circuit breaker design and build characteristics. The selectivity limit can only be specified by the manufacturer.

Ground-Fault Protection Selectivity

For ground-fault protection, only the rules for time selectivity should be applied to the Ig protection threshold and tg time delay:

- A ratio of 1.3 is sufficient between the Ig threshold for ground-fault protection of the control unit on the upstream circuit breaker **Q1** and that of the control unit on the downstream circuit breaker **Q2**.
- The tg time delay for ground-fault protection of the control unit on the upstream circuit breaker **Q1** is greater than that of the control unit on the downstream circuit breaker **Q2**.
- If the upstream circuit breaker is in theI^2t off position, the downstream circuit breakers must not be in the I^2t on position.

Selectivity Limit

Depending on the staging of circuit breaker ratings and protection parameter settings, selectivity can be:

- Limited (partial selectivity) up to a value lower than the maximum expected short-circuit current.
- Total (total selectivity), performed irrespective of the value of the short-circuit current.

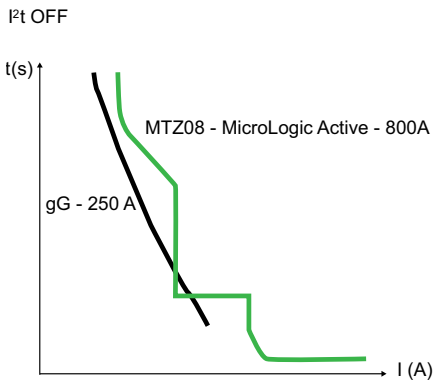
Selectivity Table

Schneider Electric provides selectivity tables showing the type of selectivity (partial or total) between each circuit breaker for its entire range of circuit breakers. For more information, refer to LVPED318033EN *Complementary Technical Information*.

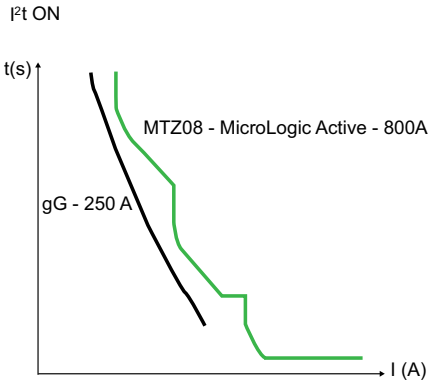
I^2t ON/OFF Function

Use the I^2t inverse time curve function to improve circuit breaker coordination. Use it when a protection device using inverse time only is installed upstream or downstream, for example a fuse protection device.

I²t OFF



I²t ON



Metering Functions

What’s in This Part

MicroLogic Active Measurement Availability and Display 141
MicroLogic Active Measurement Characteristics 145
MicroLogic Active Real-Time Measurements 149
MicroLogic Active E/EP/Ei Demand Value Calculation 152
MicroLogic Active Network Settings 154
MicroLogic Active E/EP/Ei Power Metering 155
MicroLogic Active E/EP/Ei Power Calculation Algorithm 158
MicroLogic Active E/EP/Ei Energy Metering 160
MicroLogic Active E/EP/Ei Power Factor PF and cos φ Measurement 162

MicroLogic Active Measurement Availability and Display

Presentation

The available measurements depend on the type of MicroLogic Active control unit:

- MicroLogic Active A/AP control unit measures currents only.
- MicroLogic Active E/EP/Ei control unit measures currents and voltages.

The measurements can be displayed :

- On the MicroLogic Active display screen
- On the FDM121 display
- With Panel Server Zigbee connectivity: on Panel Server webpages and on remote controllers connected to Panel Server, through Zigbee wireless communication (MicroLogic Active AP/EP control unit only)
- On a server or remote controller using the wired communication network
- On IFE/EIFE webpages

The following tables indicate which measurements are available on each type of display option.

Current

Measurement	MicroLogic Active HMI	FDM121	Panel Server Zigbee connectivity	Wired communica-tion network	IFE/EIFE webpages
Real-time phase current values I1, I2, I3	✓	✓	✓	✓	–
Maximum phase current values I1 Max, I2 Max, I3 Max	✓	✓	–	✓	–
Minimum phase current values I1 Min, I2 Min, I3 Min	–	–	–	✓	–
Real-time neutral current value IN(1)	✓	–	✓	✓	–
Maximum neutral current value IN Max(1)	✓	–	–	✓	–
Minimum neutral current value IN Min(1)	–	–	–	✓	–
Real-time average current value I Avg(2)	✓	✓	✓	✓	–
Minimum average current value Iavg Min	–	–	–	✓	–
Real-time ground-fault current value Ig	✓	✓	✓	✓	✓
Maximum value of the ground-fault current Ig Max	✓	✓	–	✓	✓
Minimum value of the ground-fault current Ig Min	–	–	–	✓	–
(1) Applies to 4-pole circuit breakers or 3-pole circuit breakers with ENCT wired and configured. (2) Applies to MicroLogic Active E/EP/Ei control unit only.					

Current Unbalance (MicroLogic Active E/EP/Ei)

Measurement	MicroLogic Active HMI	FDM121	Panel Server Zigbee connectivity	Wired communica-tion network	IFE/EIFE webpages
Real-time maximum of 3 phase current unbalances I Unb	✓	✓	✓	✓	–
Maximum of maximum of 3 phase current unbalances I Unb Max	✓	✓	✓	✓	–

Current Demand (MicroLogic Active E/EP/Ei)

Measurement	MicroLogic Active HMI	FDM121	Panel Server Zigbee connectivity	Wired communication network	IFE/EIFE webpages
Phase (I1, I2, I3) current demand values	–	✓	✓	✓	–
Phase (Iavg) current demand values	–	–	✓	–	–
Phase (I1, I2, I3) peak current demand values	–	✓	✓	✓	✓
Phase (Iavg) peak current demand values	–	–	✓	–	✓
Neutral (IN) current demand value(1)	–	–	✓	✓	–
Neutral (IN) peak current demand value(1)	–	–	✓	✓	✓
(1) Applies to 4-pole circuit breakers or 3-pole circuit breakers with ENVT wired and configured.					

Operating Indicators (MicroLogic Active E/EP/Ei)

Measurement	MicroLogic Active HMI	FDM121	Panel Server Zigbee connectivity	Wired communication network	IFE/EIFE webpages
Phase rotation	✓	–	–	–	–
Type of load	✓	–	–	–	–

Voltage (MicroLogic Active E/EP/Ei)

Measurement	MicroLogic Active HMI	FDM121	Panel Server Zigbee connectivity	Wired communication network	IFE/EIFE webpages
Real-time phase-to-phase voltage values V12, V23, V31	✓	✓	✓	✓	–
Maximum values of phase-to-phase voltages V12 MAX, V23 MAX, V31 MAX	✓	✓	–	✓	–
Minimum values of phase-to-phase voltages V12 MIN, V23 MIN, V31 MIN	✓	✓	–	✓	–
Real-time phase-to-neutral voltages V1N, V2N, V3N(1)	✓	✓	✓	✓	–
Maximum values of phase-to-neutral voltages V1N MAX, V2N MAX, V3N MAX(1)	✓	✓	–	✓	–
Minimum values of phase-to-neutral voltages V1N MIN, V2N MIN, V3N MIN(1)	✓	✓	–	✓	–
Real-time average phase-to-phase voltage Vavg LL	✓	✓	–	✓	–
Real-time average phase-to-neutral voltage Vavg LN(1)	✓	✓	–	✓	–
(1) Applies to 4-pole circuit breakers or 3-pole circuit breakers with ENVT wired and configured.					

Voltage Unbalance (MicroLogic Active E/EP/Ei)

Measurement	MicroLogic Active HMI	FDM121	Panel Server Zigbee connectivity	Wired communication network	IFE/EIFE webpages
Real-time maximum of 3 phase-to-phase voltage unbalances VLL Unb	✓	✓	✓	✓	–
Real-time maximum of 3 phase-to-neutral voltage unbalances VLN Unb(1)	✓	✓	✓	✓	–
Maximum of maximum of 3 phase-to-phase voltage unbalances VLL Unb Max	✓	✓	✓	✓	–

Measurement	MicroLogic Active HMI	FDM121	Panel Server Zigbee connectivity	Wired communication network	IFE/EIFE webpages
Maximum of maximum of 3 phase-to-neutral voltage unbalances VLN Unb Max(1)	✓	✓	✓	✓	–
Real-time phase-to-phase voltage unbalances V12unbal, V23unbal, V31unbal	–	–	✓	✓	–
Real-time phase-to-neutral voltage unbalances V1Nunbal, V2Nunbal, V3Nunbal(1)	–	–	✓	✓	–
(1) Applies to 4-pole circuit breakers or 3-pole circuit breakers with ENVT wired and configured.					

Power (MicroLogic Active E/EP/Ei)

Measurement	MicroLogic Active HMI	FDM121	Panel Server Zigbee connectivity	Wired communication network	IFE/EIFE webpages
Real-time active power for each phase P1, P2, P3(1)	✓	✓	✓	✓	–
Maximum values of active power for each phase P1 MAX, P2 MAX, P3 MAX(1)	✓	✓	–	✓	–
Real-time total active power Ptot	✓	✓	✓	✓	–
Maximum value of total active power Ptot MAX	✓	✓	–	✓	–
Real-time reactive power for each phase Q1, Q2, Q3(1)	✓	✓	✓	✓	–
Maximum values of reactive powers for each phase Q1 MAX, Q2 MAX, Q3 MAX(1)	–	✓	–	✓	–
Real-time total reactive power Qtot	✓	✓	✓	✓	–
Maximum value of total reactive power Qtot MAX	✓	✓	–	✓	–
Real-time apparent power for each phase S1, S2, S3(1)	✓	✓	✓	✓	–
Maximum values of apparent powers for each phase S1 MAX, S2 MAX, S3 MAX(1)	✓	✓	–	✓	–
Real-time total apparent power Stot	✓	✓	✓	✓	–
Maximum value of total apparent power Stot MAX	✓	✓	–	✓	–
(1) Applies to 4-pole circuit breakers or 3-pole circuit breakers with ENVT wired and configured.					

Power Demand (MicroLogic Active E/EP/Ei)

Measurement	MicroLogic Active HMI	FDM121	Panel Server Zigbee connectivity	Wired communication network	IFE/EIFE webpages
Total active power demand value	–	✓	✓	✓	–
Total peak active power demand value	–	✓	✓	✓	✓
Total reactive power demand value	–	✓	–	✓	–
Total peak reactive power demand value	–	✓	–	✓	✓
Total apparent power demand value	–	✓	–	✓	–
Total peak apparent power demand value	–	✓	–	✓	✓

Power Factor PF and cos φ (MicroLogic Active E/EP/Ei)

Measurement	MicroLogic Active HMI	FDM121	Panel Server Zigbee connectivity	Wired communication network	IFE/EIFE webpages
Real-time total power factor PF	✓	✓	✓	✓	–
• Maximum value of the total power factor PF Max • Minimum value of the total power factor PF Min	–	✓	–	✓	–
Real-time total cos φ	✓	✓	–	–	–
• Maximum cos φ Max • Minimum cos φ Min	–	✓	–	✓	–
Real-time power factors for each phase PF1, PF2, PF3(1)	–	✓	✓	✓	–
• Maximum power factor for each phase PF1 Max, PF2 Max, PF3 Max(1) • Minimum power factor for each phase PF1 Min, PF2 Min, PF3 Min(1)	–	✓	–	✓	–
(1) Applies to 4-pole circuit breakers or 3-pole circuit breakers with ENVT wired and configured.					

Frequency (MicroLogic Active E/EP/Ei)

Measurement	MicroLogic Active HMI	FDM121	Panel Server Zigbee connectivity	Wired communication network	IFE/EIFE webpages
Frequency	✓	✓	✓	✓	–
Maximum frequency	✓	–	✓	✓	–
Minimum frequency	✓	–	✓	✓	–

Resettable Energy Meters (MicroLogic Active E/EP/Ei)

Measurement	MicroLogic Active HMI	FDM121	Panel Server Zigbee connectivity	Wired communication network	IFE/EIFE webpages
Total active energy value Ep	✓	✓	–	✓	–
Total active energy values: Ep delivered, and Ep received	✓	–	✓	✓	–
Active energy values for each phase: Ep1 delivered, Ep2 delivered, Ep3 delivered, Ep1 received, Ep2 received, Ep3 received	–	–	✓	✓	✓
Total reactive energy value Eq	✓	✓	–	✓	–
Total reactive energy values: Eq delivered, and Eq received	✓	–	✓	✓	–
Reactive energy values for each phase: Eq1 delivered, Eq2 delivered, Eq3 delivered, Eq1 received, Eq2 received, Eq3 received	–	–	✓	✓	✓
Total apparent energy value Es	✓	✓	✓	✓	–
Apparent energy value for each phase Es1, Es2, Es3	–	–	✓	✓	–

MicroLogic Active Measurement Characteristics

Presentation

The following tables indicate the measurements available in MicroLogic Active control units and specify the following information for each measurement:

- Unit
- Measurement range

Current

Measurement	Unit	Range
• Real-time phase current values I1, I2, I3 • Maximum phase current values I1 Max, I2 Max, I3 Max • Minimum phase current values I1 Min, I2 Min, I3 Min	A	0(1)–20 In
• Real-time neutral current value IN(2) • Maximum neutral current value IN Max(2) • Minimum neutral current value IN Min(2)	A	0(1)–20 In
• Real-time average current value I Avg(3) • Minimum average current value Iavg Min	A	0(1)–20 In
• Real-time ground-fault current value Ig • Maximum value of the ground-fault current Ig Max • Minimum value of the ground-fault current Ig Min	A	0–20 In

(1) If the current falls below the lowest measurable current, the measurement reverts to 0 A.

- For MasterPacT MTZ1/MTZ2 circuit breaker, the lowest measurable current is:
  - 15 A when In ≥ 400 A.
  - 5 A when In < 400 A.
- For MasterPacT MTZ3 circuit breaker, the lowest measurable current is 30 A.

(2) Applies to 4-pole circuit breakers or 3-pole circuit breakers with ENCT wired and configured.

(3) Applies to MicroLogic Active E/EP/Ei control unit only.

Current Unbalance (MicroLogic Active E/EP/Ei)

Measurement	Range
• Real-time maximum of 3 phase current unbalances • Maximum of maximum of 3 phase current unbalances	0–100%

Current Demand (MicroLogic Active E/EP/Ei)

Measurement	Unit	Range
• Phase (I1, I2, I3, Iavg) current demand values • Phase (I1, I2, I3, Iavg) peak current demand values	A	0–20 In
• Neutral (IN) current demand value(1) • Neutral (IN) peak current demand value(1)	A	0–20 In
(1) Applies to 4-pole circuit breakers or 3-pole circuit breakers with ENCT wired and configured.		

Operating Indicators

Measurement	Range
Phase rotation	123 or 132
Type of load	**Leading** or **Lagging** (**IEEE**)
	Capacitive or **Inductive** (**IEC**)

Voltage (MicroLogic Active E/EP/Ei)

Measurement	Range
• Real-time phase-to-phase voltage values V12, V23, V31 • Maximum values of phase-to-phase voltages V12 MAX, V23 MAX, V31 MAX • Minimum values of phase-to-phase voltages V12 MIN, V23 MIN, V31 MIN	0(1)–1,150 V
• Real-time phase-to-neutral voltages V1N, V2N, V3N(2) • Maximum values of phase-to-neutral voltages V1N MAX, V2N MAX, V3N MAX(2) • Minimum values of phase-to-neutral voltages V1N MIN, V2N MIN, V3N MIN(2)	0(1)–660 V
• Real-time average phase-to-phase voltage Vavg LL	0(1)–1,150 V
• Real-time average phase-to-neutral voltage Vavg LN(2)	0(1)–600 V
(1) If the voltage falls below the lowest measurable voltage (10 V), the measurement reverts to 0 V. (2) Applies to 4-pole circuit breakers or 3-pole circuit breakers with ENVT wired and configured.	

Voltage Unbalance (MicroLogic Active E/EP/Ei)

Measurement	Range
• Real-time maximum of 3 phase-to-phase voltage unbalances VLL Unb	0–100%
• Real-time maximum of 3 phase-to-neutral voltage unbalances VLN Unb(1)	0–100%
• Maximum of maximum of 3 phase-to-phase voltage unbalances VLL Unb Max	0–100%
• Maximum of maximum of 3 phase-to-neutral voltage unbalances VLN Unb Max(1)	0–100%
(1) Applies to 4-pole circuit breakers or 3-pole circuit breakers with ENVT wired and configured.	

Power (MicroLogic Active E/EP/Ei)

Measurement	Range
• Real-time active power for each phase P1, P2, P3(1) • Maximum values of active power for each phase P1 MAX, P2 MAX, P3 MAX(1)	-16,000– +16,000 kW
• Real-time total active power Ptot • Maximum value of total active power Ptot MAX	-16,000– +16,000 kW
• Real-time reactive power for each phase Q1, Q2, Q3(1) • Maximum values of reactive power for each phase Q1 MAX, Q2 MAX, Q3 MAX(1)	-16,000– +16,000 kvar
• Real-time total reactive power Qtot • Maximum value of total reactive power Qtot MAX	-16,000– +16,000 kvar
• Real-time apparent power for each phase S1, S2, S3(1) • Maximum values of apparent powers for each phase S1 MAX, S2 MAX, S3 MAX(1)	-16,000– +16,000 kVA
• Real-time total apparent power Stot • Maximum value of total apparent power Stot MAX	-16,000– +16,000 kVA
(1) Applies to 4-pole circuit breakers or 3-pole circuit breakers with ENVT wired and configured.	

Power Demand (MicroLogic Active E/EP/Ei)

Measurement	Range
• Total active power demand value • Total peak active power demand value	-16,000– +16,000 kW
• Total reactive power demand value • Total peak reactive power demand value	-16,000– +16,000 kvar
• Total apparent power demand value • Total peak apparent power demand value	-16,000– +16,000 kVA

Power Factor PF and cos φ (MicroLogic Active E/EP/Ei)

Measurement	Range
• Real-time total power factor PF • Maximum value of the total power factor PF Max • Minimum value of the total power factor PF Min	-1.00–+1.00
• Real-time total cos φ • Maximum cos φ Max • Minimum cos φ Min	-1.00–+1.00
Real-time power factors for each phase PF1, PF2, PF3(1)	-1.00–+1.00
• Maximum power factor for each phase PF1 Max, PF2 Max, PF3 Max(1) • Minimum power factor for each phase PF1 Min, PF2 Min, PF3 Min(1)	-1.00–+1.00
(1) Applies to 4-pole circuit breakers or 3-pole circuit breakers with ENVT wired and configured.	

Frequency (MicroLogic Active E/EP/Ei)

Measurement	Range
• Frequency • Maximum frequency • Minimum frequency	40–70 Hz

Resettable Energy Meters (MicroLogic Active E/EP/Ei)

Measurement	Range
Total active energy value Ep	-10,000,000 to +10,000,000 kWh
Total active energy values Ep delivered and Ep received	-10,000,000 to +10,000,000 kWh
Total reactive energy value Eq	-10,000,000 to +10,000,000 kvarh
Total reactive energy values Eq delivered and Eq received	-10,000,000 to +10,000,000 kvarh
Apparent energy Es	-10,000,000 to +10,000,000 kVAh

MicroLogic Active Real-Time Measurements

Presentation

MicroLogic Active control units measure or calculate in real time the electrical quantities described in MicroLogic Active Measurement Availability and Display, page 141.

The values of the electrical quantities, whether measured or calculated in real time, update once a second at rated frequency.

Measuring the Neutral Current

MicroLogic Active control units in 4-pole circuit breakers or 3-pole circuit breakers with the ENCT wired and configured, measure the neutral current:

- For a 3-pole circuit breaker, the neutral current is measured by adding a current transformer on the neutral conductor for the transformer information. For more information, refer to *MasterPacT MTZ with MicroLogic Active Control Unit - Catalog*.
- For a 4-pole circuit breaker, the neutral current is measured systematically.

The neutral current is measured in the same way as the phase currents.

Measuring the Ground-Fault Current

MicroLogic Active control units calculate or measure the ground-fault current in the same way as the phase currents, according to the circuit breaker configuration, as shown in the following table.

Circuit breaker configuration	Ig ground-fault current
3P	Ig = I1 + I2 + I3
4P	Ig = I1 + I2 + I3 + IN
3P + ENCT	Ig = I1 + I2 + I3 + IN (ENCT)

Measuring the Phase-to-Neutral Voltages (MicroLogic Active E/EP/Ei)

MicroLogic Active control units in 4-pole circuit breakers, or 3-pole circuit breakers with the ENVT wired and configured, measure the phase-to-neutral (or line-to-neutral) voltages V1N, V2N, and V3N:

- For a 3-pole circuit breaker, it is necessary to:
  - Connect the wire from the ENVT to the neutral conductor
  - Declare the ENVT in the system type setting
- For 4-pole circuit breakers, the phase-to-neutral voltages are measured systematically.

The phase-to-neutral voltages are measured in the same way as the phase-to-phase voltages.

Calculating the Average Current

MicroLogic Active control units calculate the average current Iavg, the arithmetic mean of the 3 phase currents:

Iavg=(I1+I2+I3)/3

Calculating the Average Voltage (MicroLogic Active E/EP/Ei)

MicroLogic Active E/EP/Ei control units calculate the average voltages:

- Phase-to-phase Vavg, the arithmetic mean of the 3 phase-to-phase voltages:

  Vavg=(V12+V23+V31)/3

- Phase-to-neutral Vavg, the arithmetic mean of the 3 phase-to-neutral voltages (4-pole circuit breakers or 3-pole circuit breakers wired and configured with the ENVT):

  Vavg=(V1N+V2N+V3N)/3

Measuring the Current Phase Unbalance (MicroLogic Active E/EP/Ei)

MicroLogic Active E/EP/Ei control units calculate the current unbalance for each phase (3 values) and the maximum current unbalance.

The current unbalance is a percentage of the average current:

$$I_k \text{ unbalance } (\%) = \frac{|I_k - I_{avg}|}{I_{avg}} \times 100 \quad \text{where } k = 1, 2, 3$$

Measuring the Voltage Phase Unbalance (MicroLogic Active E/EP/Ei)

MicroLogic Active E/EP/Ei control units calculate:

- The phase-to-phase voltage unbalance for each phase (3 values) and the maximum of 3 phase-to-phase voltage unbalances.
- For 4-pole circuit breakers or 3-pole circuit breakers wired and configured with the ENVT: the phase-to-neutral (if present) voltage unbalance for each phase (3 values) and the maximum of 3 phase-to-neutral voltage unbalances.

The voltage unbalance is expressed as a percentage compared to the average value of the electrical quantity (Vavg):

$$V_{jk} \text{ unbalance } (\%) = \frac{|V_{jk} - V_{avg}|}{V_{avg}} \times 100 \quad \text{where jk = 12, 23, 31 or 1N, 2N, 3N}$$

Maximum/Minimum Values

The MicroLogic Active control unit determines the maximum (MAX) and minimum (MIN) value reached by some electrical quantities for the period from the last reset to the present time. The maximum and minimum values available are described in MicroLogic Active Measurement Availability and Display, page 141.

Resetting Maximum/Minimum Values

Maximum and minimum values can be reset

- On the MicroLogic Active display screen from the tree navigation menu at :
  - **Measures > Current**
  - **Measures > Power** (MicroLogic Active E/EP/Ei)
  - **Measures > Voltage** (MicroLogic Active E/EP/Ei)
  - **Measures > Frequency** (MicroLogic Active E/EP/Ei)
- By sending a command using the wired communication network.

All maximum and minimum values for the group of electrical quantity selected are reset.

MicroLogic Active E/EP/Ei Demand Value Calculation

Presentation

The MicroLogic Active E/EP/Ei control unit calculates the demand values of phase and average currents.

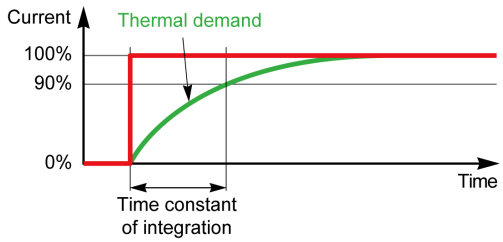
Each maximum demand value (peak) is stored in memory.

Definition

The demand value is the average value of a quantity over a specified period of time (interval).

Current Demand Value Calculation

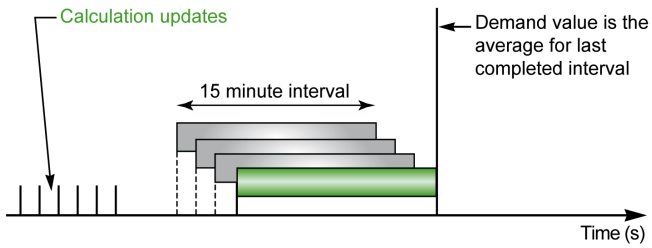
The current demand is calculated using the thermal method. The thermal current demand calculates the demand based on a thermal response which mimics the analog thermal demand meters, as shown in the following illustration:



The time constant of integration (current demand calculation interval) is fixed and set at 15 minutes.

Power Demand Value Calculation

The power demand value is calculated using arithmetical integration of power RMS values over a period of time, divided by the length of the period. The result is equivalent to the energy accumulated during the period of time divided by the length of the period. In the MicroLogic Active control unit the power demand is calculated according to the sliding block method.



The power demand calculation interval is fixed and set at 15 minutes.

At the end of the power demand calculation interval, and then every one tenth of the interval, that is every 1 minute 30 seconds:

- The demand value over the interval is calculated and updated.

- Calculation of a new demand value is initialized on a new interval:
  - By eliminating the contribution of the first tenth of the previous interval
  - By adding the contribution of the latest tenth

MicroLogic Active Network Settings

Presentation

The following settings are related to the characteristics of the local network. They are used by the measurement functions of the MicroLogic Active control unit. These settings have no effect on protections.

System Type Setting

On 3-pole circuit breakers, the system type setting allows the activation of:

- The ENCT (external neutral current transformer)
- The ENVT (external neutral voltage tap, MicroLogic Active E/EP/Ei control units only)

The system type can be set on the MicroLogic Active display screen, from the tree navigation menu, at **Configuration > Measures > System Type**.

Rated Phase-to-Phase Voltage (MicroLogic Active E/EP/Ei)

Available settings include: 208 V / 220 V / 230 V / 240 V / 380 V / 400 V / 415 V / 440 V / 480 V / 500 V / 525 V / 550 V / 575 V / 600 V / 660 V / 690 V

Default = 400 V.

The rated voltage can be set on the MicroLogic Active E/EP/Ei display screen, from the tree navigation menu, at **Configuration > Network > Voltage**.

Rated Frequency (MicroLogic Active E/EP/Ei)

Available settings are:

- 50 Hz
- 60 Hz

The rated frequency can be set on the MicroLogic Active E/EP/Ei display screen, from the tree navigation menu, at **Configuration > Network > Frequency**.

After changing the rated frequency setting, the MicroLogic Active E/EP/Ei control unit must be restarted for the new setting to be taken into account, page 40.

VT Ratio (MicroLogic Active E/EP/Ei)

The VT ratio is the ratio between the primary and the secondary rated voltages as measured by a voltage transformer (VT).

The value range for the primary voltage (VT in) is from 100–1,250 in increments of 1 (factory setting: 690).

The value range for the secondary voltage (VT out) is from 100–690 in increments of 1 (factory setting: 690).

The primary and secondary voltages can be set on the MicroLogic Active E/EP/Ei display screen, from the tree navigation menu, at **Configuration > Network > VT Ratio**.

MicroLogic Active E/EP/Ei Power Metering

Presentation

The MicroLogic Active E/EP/Ei control unit calculates the electrical quantities required for power management:

- The real-time values of the:
  - Active powers (total Ptot and per phase) in kW
  - Reactive powers (total Qtot and per phase) in kvar
  - Apparent powers (total Stot and per phase) in kVA

    NOTE: Per phase powers are calculated in 4-pole or 3-pole circuit breakers with ENVT wired and configured.
- The maximum values for each of these powers
- The cos φ and power factor (PF) indicators
- The type of load (leading or lagging)

All these electrical quantities are continuously calculated and their value is updated once a second at rated frequency.

Principle of Power Metering

The MicroLogic Active E/EP/Ei control unit calculates the power values from the current and voltage samples.

The calculation principle is based on:

- Definition of the powers
- Algorithms for the 3-wattmeter calculation method, page 158
- Set value of the power sign (circuit breaker powered from upstream (top) or downstream (bottom))

Total Power Calculation Method

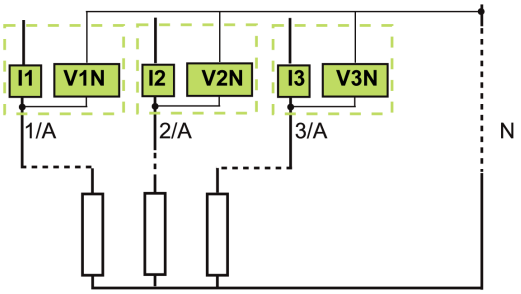
The total reactive and apparent power can be calculated by one of the two following methods:

- Vector
- Arithmetic (factory setting)

The calculation method can be set on the MicroLogic Active E/EP/Ei display screen, from the tree navigation menu, at **Configuration > Measures > P Calc**.

3-Pole Circuit Breaker, 4-Pole Circuit Breaker

The calculation algorithm is based on the 3-wattmeter method:



When there is voltage measurement on the neutral (4-pole or 3-pole circuit breaker with ENVT wired and configured), the control unit measures the power by using 3 single-phase loads downstream.

When there is no voltage measurement on the neutral (3-pole circuit breaker on power system without neutral) an internal voltage floating reference is used to measure power.

3-Pole Circuit Breaker, Distributed Neutral

Declare the ENVT in the system type setting, page 154.

NOTE: Declaration of the ENVT alone does not result in correct calculation of the powers. It is essential to connect the wire from the ENVT to the neutral conductor.

Power Sign and Operating Quadrant

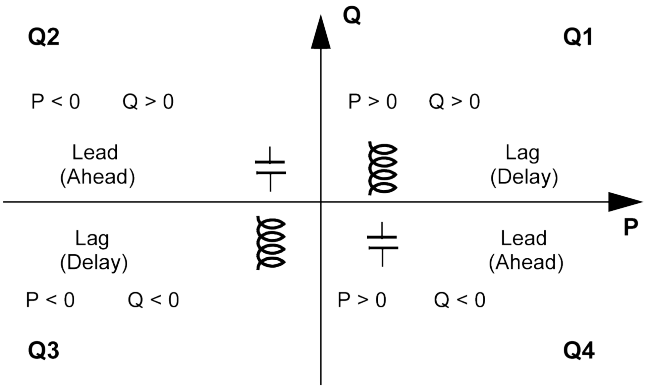
By definition, the active powers are:

- Signed + when they are received by the user, that is, when the device is acting as a receiver.
- Signed - when they are delivered by the user, that is, when the device is acting as a generator.

By definition, the reactive powers have:

- The same sign as the active energies and powers when the current lags behind the voltage, that is, when the device is inductive (lagging).
- The opposite sign to the active energies and powers when the current is ahead of the voltage, that is, when the device is capacitive (leading).

These definitions therefore determine 4 operating quadrants (Q1, Q2, Q3, and Q4):



Power Sign Convention

The sign for the power running through the circuit breaker depends on the type of connection:

- Circuit breakers with the active power flowing from upstream (top) to downstream (bottom) should be set with the power sign P+
- Circuit breakers with the active power flowing from downstream (bottom) to upstream (top) should be set with the power sign P-

Set the power sign convention on the MicroLogic Active E/EP/Ei display screen, from the tree navigation menu, at **Configuration > Network > Power sign**.

MicroLogic Active E/EP/Ei Power Calculation Algorithm

Presentation

The algorithms are given for the 3-wattmeter calculation method. The power definitions and calculation are given for a network with harmonics.

Active Powers

The active power for each phase is calculated as follows:

$$P_p = \frac{1}{T}\int_T V_p(t) I_p(t) dt \quad \text{where p=1, 2, 3 (phase)}$$

The total active power is calculated as follows:

$$Ptot = P1 + P2 + P3$$

Reactive Power

The reactive power with harmonics for each phase is calculated as follows:

$$Qp = \pm\sqrt{Sp^2 - Pp^2} \quad \text{where p=1, 2, 3 (phase)}$$

The total reactive power is calculated as follows:

- With vector method:

  $$Qtot_V = Q1 + Q2 + Q3$$

- With arithmetic method:

  $$Qtot_A = \pm\sqrt{Stot_A^2 - Ptot^2}$$

Apparent Power

The apparent power for each phase and total apparent power is calculated as follows:

Sp = (Vp x Ip) where p = 1, 2, 3 (phase)

The apparent power for each phase and total apparent power is calculated as follows:

- With vector method:

  $$Stot_V = \sqrt{Ptot^2 + Qtot_V^2}$$

- With arithmetic method:

  $$Stot_A = S1 + S2 + S3$$

ENVT Wiring and Configuration on 3-Pole Circuit Breaker

When installed on a system with distributed neutral, correct ENVT wiring and configuration are necessary to calculate and display correct values per phase, page 149.

When installed on a system without distributed neutral, if ENVT is configured to Yes, power values per phase are not relevant.

The following table indicates the displayed and calculated values for each configuration:

Power system	MTZ	ENVT wired	ENVT config-ured	Ptot	Pp	Qtot	Qp	Stot	PFtot	PFp	VLL	Vavg LL	VLN	Vavg LN
3-phase + neutral	4P	NA	NA	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	3P	Yes	Yes	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	3P	Yes	No	✓	NR	✓	NR	✓	✓	NR	✓	✓	NR	NR
	3P	No	Yes	✓	ND	✓	ND	✓	✓	ND	✓	✓	ND	ND
	3P	No	No	✓	ND	✓	ND	✓	✓	ND	✓	✓	ND	ND
3-phase	3P	Yes	NA	✓	NR	✓	NR	✓	✓	NR	✓	✓	NR	NR
	3P	No	NA	✓	ND	✓	ND	✓	✓	ND	✓	✓	ND	ND

✓ Value is calculated and displayed

NA Not applicable

NR Value displayed is not relevant

ND Value is not displayed

MicroLogic Active E/EP/Ei Energy Metering

Presentation

The MicroLogic Active E/EP/Ei control unit calculates the different types of energy using energy meters and provides the values of:

- The total active energy Ep, the active energy delivered (into the load) Ep delivered, and the active energy received (out of the load) Ep received
- The active energy for each phase delivered (into the load): Ep1 delivered, Ep2 delivered and Ep3 delivered
- The active energy for each phase received (out of the load): Ep1 received, Ep2 received and Ep3 received
- The total reactive energy Eq, the reactive energy delivered (into the load) Eq delivered, and the reactive energy received (out of the load) Eq received
- The reactive energy for each phase delivered (into the load): Eq1 delivered, Eq2 delivered and Eq3 delivered
- The reactive energy for each phase received (out of the load): Eq1 received, Eq2 received and Eq3 received
- The total apparent energy Es
- The apparent energy for each phase Es1, Es2 and Es3

The energy values are calculated every second, and shown as an hourly consumption. Values are stored in non-volatile memory every hour.

A resettable counter is available for each energy meter.

NOTE: To perform reliable energy measurement across the current range the control unit must be powered by an external 24 Vdc power supply, page 35.

Principle of Energy Calculation

By definition energy is the integration of the real-time power over a period T. The integration period T lasts for a number of cycles equal to the rated frequency.

$$E = \int_T G\delta(t) \quad \text{where } G = P, Q \text{ or } S$$

Partial Energy Meters

For each type of energy, active or reactive, a partial received energy meter and a partial delivered energy meter calculate the accumulated energy by incrementing once a second:

- Delivered energy is always counted positively.

  Edelivered(t) = Edelivered(t - 1) + (Gdelivered(t))/3600

  where Gdelivered = Ptot or Qtot > 0
- Received energy is always counted negatively.

  Ereceived(t) = Ereceived(t - 1) + (|Greceived(t)|)/3600

  where Greceived = Ptot or Qtot < 0

Energy Meters

From the partial energy meters and for each type of energy, active or reactive, an energy meter provides either of the following measurements once a second:

- The absolute energy, by adding the received and delivered energies together. The energy accumulation mode is absolute.

  E(t)absolute = Edelivered(t) + Ereceived(t)

- The signed energy, by differentiating between received and delivered energies. The energy accumulation mode is signed.

  E(t)signed = Edelivered(t) - Ereceived(t)

The apparent energy Es is always counted positively.

Selecting Energy Calculation

The information sought determines calculation selection:

- The absolute value of the energy that has crossed the poles of a circuit breaker or the cables of an item of electrical equipment is relevant for maintenance of an installation.
- The signed values of the energy delivered and the energy received are required to calculate the economic cost of an item of equipment.

By default, absolute energy accumulation mode is configured.

Select the energy calculation mode on the MicroLogic Active E/EP/Ei display screen, from the tree navigation menu, at **Configuration > Measures > E calcul**.

Resetting Energy Meters

The energy meters can be reset as follows:

- On the MicroLogic Active E/EP/Ei display screen, from the tree navigation menu, at **Measures > Energy > Reset Counters**.
- By sending a command using the wired communication network.

MicroLogic Active E/EP/Ei Power Factor PF and cos φ Measurement

Power Factor PF

The MicroLogic Active E/EP/Ei control unit calculates the total power factor PF from the total active power Ptot and the total apparent power Stot:

$$PF = \frac{Ptot}{Stot}$$

NOTE: Stot is the vector or arithmetic total apparent power, depending on the setting, page 158.

This indicator qualifies:

- The oversizing necessary for the installation power supply when harmonic currents are present.
- The presence of harmonic currents by comparison with the value of the cos φ (see below).

cos φ

The MicroLogic Active E/EP/Ei control unit calculates the cos φ from the total fundamental active power Pfundtot and the total fundamental apparent power Sfundtot:

$$\cos\varphi = \frac{Pfundtot}{Sfundtot}$$

This indicator qualifies the usage of the fundamental energy and defines the quadrant of operation. The cos φ is also called the Displacement Power Factor (DPF).

Sign for the Power Factor PF and cos φ

Two sign conventions can be applied for these indicators:

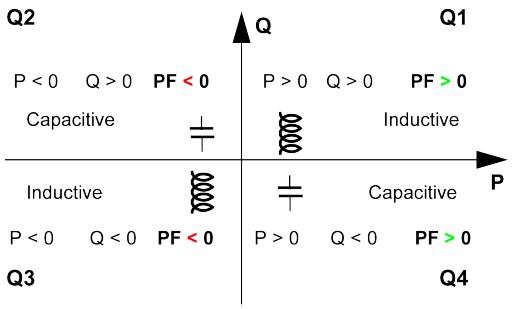
- IEC convention: The sign for these indicators complies strictly with the signed calculations of the powers (that is, Ptot, Stot, Pfundtot, and Sfundtot).
- IEEE convention: The indicators are calculated in accordance with the following formula:

$$PF = \frac{Ptot}{Stot} x(-\ sign(Q)) \quad \text{and} \quad \cos\varphi = \frac{Pfundtot}{Sfundtot} x(-\ sign(Q))$$

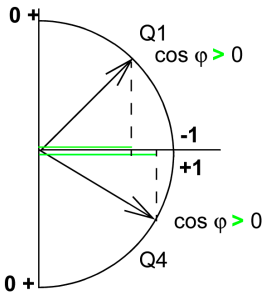
The following figures define the sign for the power factor PF and cos φ by quadrant (Q1, Q2, Q3 and Q4) for both conventions:

IEC Convention

Operation in all quadrants (Q1, Q2, Q3, Q4)

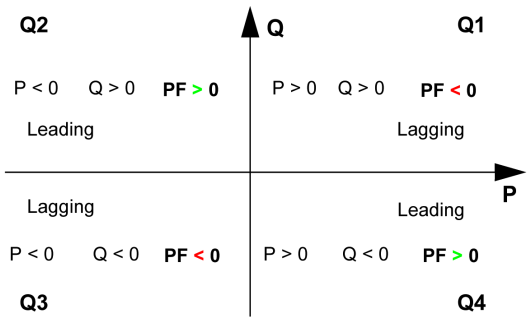


Values of cos φ in receiver operation (Q1, Q4)

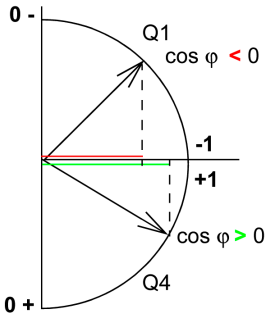


IEEE Convention

Operation in all quadrants (Q1, Q2, Q3, Q4)



Values of cos φ in receiver operation (Q1, Q4)



NOTE: For a device, a part of an installation which is only a receiver (or generator), the advantage of the IEEE convention is that it adds the type of reactive component to the PF and cos φ indicators:

- Lead: positive sign for the PF and cos φ indicators.
- Lag: negative sign for the PF and cos φ indicators.

Monitoring the cos φ and Power Factor PF Indicators

According to the IEEE convention, critical situations in receiver mode on a capacitive or inductive load are detected and differentiated (two values).

The following table indicates the direction in which the indicators vary and their value in receiver mode:

IEEE Convention		
Operating quadrant	Q1	Q4
Direction in which the cos φ (or PFs) vary over the operating range		
Value of the cos φ (or PFs) over the operating range	0...-0.3...-0.8...-1	+1...+0.8...+0.4...0

According to the IEC convention, critical situations in receiver mode on a capacitive or inductive load are detected but not differentiated (one value).

The following table indicates the direction in which the indicators vary and their value in receiver mode:

IEC Convention		
Operating quadrant	Q1	Q4
Direction in which the cos φ (or PFs) vary over the operating range		
Value of the cos φ (or PFs) over the operating range	0...+0.3...+0.8...+1	+1...+0.8...+0.4...0

Selecting the Sign Convention for the cos φ and Power Factor PF

Set the sign convention for the cos φ and PF indicators on the MicroLogic Active E/EP/Ei display screen, from the tree navigation menu, at **Configuration > Measures > PF / Var**

The factory setting of the sign convention is IEC.

Maintenance and Diagnostic Functions

What's in This Part

Maintenance Tools 166
Assistance 167
Maintenance Schedule 168
Health State 169
Monitoring the Circuit Breaker 171
Monitoring the Tripping Circuit 172
Monitoring the Internal Functioning of the MicroLogic Active Control Unit 175
Monitoring the Communicating Voltage Releases 179
Monitoring the Contact Wear 181
Monitoring the Load Profile 183

Maintenance Tools

Presentation

The following tools are available to support maintenance and diagnostic functions:

- MySchneider app, page 33
- EcoStruxure Power Device app, page 30

Assistance

Presentation

The assistance menu on the MicroLogic Active display screen gives information about the firmware version of the microprocessors installed in the MicroLogic Active control unit. Firmware updates are managed with EcoStruxure Power Commission software.

Data Availability

The firmware version is available as follows:

- On the MicroLogic Active display screen, from the tree navigation menu, at: **Maintenance > Assistance > Firmware version**
- With EcoStruxure Power Commission software
- With EcoStruxure Power Device app
- On a server or remote controller using the wired communication network

Maintenance Schedule

Overview

The MicroLogic Active control unit provides information to help with scheduling preventive maintenance operations.

It monitors maintenance programs performed and generates an event to indicate that Manufacturer maintenance is due.

Operating Principle

The MicroLogic Active control unit generates an event to indicate that Manufacturer maintenance is due.

Manufacturer maintenance schedule events are calculated from the assembly date of the circuit breaker.

Predefined Events

The maintenance schedule function generates the following events:

Code	Event	History	Severity
0x1482 (5250)	**Sched. Manufact. maintenance within 3 months**	Diagnostic	Medium

Recommended Actions

Code	Event	Recommended actions
0x1482 (5250)	**Sched. Manufact. maintenance within 3 months**	Plan to schedule the Manufacturer preventive maintenance program within three months. To plan, edit report and track maintenance intervention, you may use EcoStruxure Facility Expert app.

Health State

Presentation

The health state of the circuit breaker is determined from the following functions:

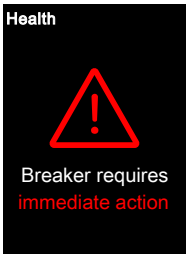
- Circuit breaker monitoring, page 171
- Contact wear monitoring, page 181

The health state of the circuit breaker is displayed on the **Health** screen and the **Status** bar.

For more information, refer to the list of events, page 225.

Health Screen

The **Health** screen displays one of the following screens:

	Good health state (green)
	Medium-severity detected alarm that requires non-urgent action (orange)
	High-severity detected alarm that requires immediate corrective action (red)

Status Bar

The **Status** bar:

- Is lit in green under normal operating conditions.
- Is lit in orange in the case of a medium severity alarm which requires user attention or non-urgent maintenance action.
- Is lit in red in the case of a high severity alarm which requires immediate maintenance action.
- Blinks red in the case of a trip event.

Data Availability

The health state is available:

- On the MicroLogic Active HMI **Health** screen during Quick View scrolling.
- With the Zigbee wireless communication network for MicroLogic Active AP/EP control units.
- On a server or remote controller using the wired communication network

When a high or medium severity event is detected a pop-up screen is displayed, page 81. If the pop-up is acknowledged by pressing **OK**, the display returns to Quick View scrolling, and the **Health** screen is displayed again.

Monitoring the Circuit Breaker

Presentation

The monitoring of the circuit breaker consists in monitoring its ability to establish or interrupt a circuit and to provide protection against electrical faults. The MicroLogic Active control unit therefore monitors:

- The tripping circuit, page 172.
- The internal functioning of the MicroLogic Active control unit, page 175.
- Contact wear of the circuit breaker, page 181.

When the MicroLogic Active control unit detects an incident in one of the monitored functions listed, an event is generated with an orange or red pop-up screen and corresponding event message.

Monitoring the Tripping Circuit

Presentation

When the MicroLogic Active control unit is energized, it provides constant monitoring of the following:

- The internal tripping circuit
- The connection of the internal sensors (internal current transformers, sensor plug, performer plug)
- The connection of the circuit breaker tripping voltage release (MITOP) to the MicroLogic Active control unit
- The connection of the ENCT (External Neutral Current Transformer)

NOTE: The mechanism is not monitored. It is recommended to perform preventive maintenance as proposed by Schneider Electric. For more information, refer to DOCA0305•• *MasterPacT MTZ IEC Circuit Breakers with MicroLogic Active Control Unit - Maintenance Guide*, page 10.

Operating Principle: Ready LED

A. **Ready** LED

The result of the monitoring is indicated by the **Ready** LED on the front face of the MicroLogic Active control unit, as follows:

- The **Ready** LED is flashing green: the internal tripping circuit of the circuit breaker is functioning correctly.
- The **Ready** LED is off, which indicates one of two scenarios:
  - The MicroLogic Active control unit is not energized. In this case, provide power to the control unit with a Mobile Power Pack. If the **Ready** LED is still off, consult the history of active events on the MicroLogic Active display screen, from the tree navigation menu, at **Alarms/History > Active Alarms** to diagnose the situation.
  - There is a detected incident in the tripping circuit. Consult the history of active events on the MicroLogic Active display screen, from the tree navigation menu, at **Alarms/History > Active Alarms** to diagnose the situation.

Circuit Breaker Status

Following the detection of an incident in the tripping circuit the circuit breaker may be tripped or not, depending on the type of incident detected.

Unable to Read Sensor Plug

When the MicroLogic Active control unit is unable to read the rated current In from the sensor plug, the event **Unable to read sensor plug** is generated and the value of the rated current In is forced:

- In = 400 A for MasterPacT MTZ1/MTZ2 circuit breaker
- In = 800 A for MasterPacT MTZ3 circuit breaker

The protection settings based on the value of In are modified accordingly.

Tripping Data and Availability

The following data about the tripping function is logged by the MicroLogic Active control unit:

- Total number of trips
- The name and date of the most recent trip

The tripping data is available:

- With EcoStruxure Power Commission software.
- With EcoStruxure Power Device app through NFC and USB OTG connection.
- With the Zigbee wireless communication network for MicroLogic Active AP/EP control units.
- On a server or remote controller using the wired communication network

Predefined Events

The monitoring of the tripping circuit generates the following events:

Code	Event	History	Severity
0x4007 (16391)	**Self diagnostic trip. Replace control unit**	Trip	High with trip
0x400A (16394)	**ENCT Disconnected trip**	Trip	High with trip
0x4033 (16435)	**Current sensor loss. Replace Circuit Breaker**	Trip	High with trip
0x1400 (5120)	**Self test 1. Replace control unit**	Diagnostic	High with trip
0x1404 (5124)	**Control unit over temperature**	Diagnostic	High with trip
0x1405 (5125)	**Self test 3. Replace control unit**	Diagnostic	High with trip
0x1406 (5126)	**Self test 4. Replace control unit**	Diagnostic	High with trip
0x1416 (5142)	**Mitop disconnected. Call Schneider Electric support**	Diagnostic	High with trip
0x1402 (5122)	**Current sensor loss. Replace circuit breaker.**	Diagnostic	High with trip
0x1403 (5123)	**ENCT disconnected**	Diagnostic	High with trip
0x1430 (5168)	**Protection settings reset to factory values**	Diagnostic	High
0x1409 (5129)	**Unable to read sensor plug**	Diagnostic	High
0x1518 (5400)	**Self-test 6. Replace control unit.**	Diagnostic	High

Recommended Actions

Code	Event	Recommended actions
0x4007 (16391)	**Self diagnostic trip. Replace control unit**	Replace the MicroLogic Active control unit. Contact Schneider Electric Support.
0x400A (16394)	**ENCT Disconnected trip**	Check internal/external wiring of External Neutral Current Transformer (ENCT).
0x4033 (16435)	**Current sensor loss. Replace Circuit Breaker**	Replace the circuit breaker. Contact Schneider Electric Support.
0x1400 (5120)	**Self test 1. Replace control unit**	Replace the MicroLogic Active control unit. Contact Schneider Electric Support.
0x1404 (5124)	**Control unit over temperature**	Decrease ambient temperature near the circuit breaker. If the problem persists, replace the MicroLogic Active control unit.
0x1405 (5125)	**Self test 3. Replace control unit**	Replace the MicroLogic Active control unit. Contact Schneider Electric Support.
0x1406 (5126)	**Self test 4. Replace control unit**	Replace the MicroLogic Active control unit. Contact Schneider Electric Support.
0x1416 (5142)	**Mitop disconnected. Call Schneider Electric support**	Contact Schneider Electric Support.
0x1402 (5122)	**Current sensor loss. Replace circuit breaker.**	Replace the circuit breaker. Contact Schneider Electric Support.
0x1403 (5123)	**ENCT disconnected**	Check internal/external wiring of External Neutral Current Transformer (ENCT).
0x1430 (5168)	**Protection settings reset to factory values**	Update the MicroLogic Active control unit firmware with EcoStruxure Power Commission software. Otherwise, plan to replace the MicroLogic Active control unit.
0x1409 (5129)	**Unable to read sensor plug**	Check connection of the sensor plug and performer plugs. If the connection is good but the event recurs, replace the sensor plug or the MicroLogic Active control unit.
0x1518 (5400)	**Self-test 6. Replace control unit.**	Replace the MicroLogic Active control unit. Contact Schneider Electric Support.

Contact Schneider Electric Support or your Schneider Electric Services representative for more information about who can carry out the recommended actions.

Resetting a Trip Event

For information about resetting the circuit breaker after a trip due to an incident detected by the MicroLogic Active self-tests, refer to the relevant document, page 10:

- *MasterPacT MTZ1 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide*
- *MasterPacT MTZ2/MTZ3 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide*

Monitoring the Internal Functioning of the MicroLogic Active Control Unit

Presentation

The MicroLogic Active control unit carries out a series of self tests to monitor:

- Correct internal functioning
- The presence and state of the internal battery
- The presence of the 24 Vdc power supply
- The presence of the internal current power supply sensors
- The temperature inside the control unit
- Wireless communication
- The ULP modules:
  - EIFE Ethernet interface
  - IFE Ethernet interface
  - IFM Ethernet interface

Operating Principle

The **Ready** LED, **Status** bar, and trip cause LEDs provide visual information about the health state of the MicroLogic Active control unit. The detection of an invalid result in the self tests generates an event (logged in the Diagnostic history) which can be classified as high, medium, or low severity:

- Low severity event indicates the detection of an invalid result which has no operational impact. The standard (LSIG) protection functions are unaffected.
- Medium severity event indicates the detection of an invalid result which has a minor operational impact. The standard (LSIG) protection functions are unaffected. A check must be performed at next maintenance.
  - The **Ready** LED is flashing
  - The **Status** bar is lit in orange if the event requires non-urgent maintenance
  - All trip cause LEDs are off
  - An orange pop-up screen is displayed
- High severity event indicates the detection of an invalid result which can have a major operational impact. The standard (LSIG) protection functions can be affected. The control unit must be replaced without delay.
  - The **Ready** LED is off
  - The **Status** bar is lit in red if the event requires immediate maintenance
  - All trip cause LEDs are lit
  - A red pop-up screen is displayed

When monitoring of the internal functioning of MicroLogic Active control unit detects an invalid result with medium or high severity, an event is generated with an orange or red pop-up screen and corresponding event message.

Setting Change Not Applied

The MicroLogic Active control unit monitors progress when protection settings are changed, and generates the **Last protection settings have not been applied** event if the new protection settings are unable to be applied.

Data Availability

Monitoring data is available as follows:

- On the MicroLogic Active display screen.
- With EcoStruxure Power Commission software for all severities
- With EcoStruxure Power Device app through USB OTG connection for medium and high severities.
- With the Zigbee wireless communication network for MicroLogic Active AP/EP control units.
- On a server or remote controller using the wired communication network

Restarting MicroLogic Active Control Unit

If the display screen of the MicroLogic Active control unit no longer displays menus for protection, alarms, or measures screens, it is recommended to restart the MicroLogic Active control unit, page 40.

Predefined Events

The function generates the following events:

Code	Event	History	Severity
0x4005 (16389)	**Control unit over temperature trip**	Trip	High
0x1404 (5124)	**Control unit over temperature**	Diagnostic	High
0x142F (5167)	**Last protection settings have not been applied.**	Diagnostic	Medium
0x140F (5135)	**Protection settings not accessible 1**	Diagnostic	Medium
0x1474 (5236)	**Protection settings not accessible 2**	Diagnostic	Medium
0x1473 (5235)	**Internal access loss. Reboot control unit**	Diagnostic	Medium
0x1436 (5174)	**Control unit memory degradation**	Diagnostic	Low
0x0D00 (3328)	**Critical hardware modules discrepancy**	Diagnostic	Medium
0x0D01 (3329)	**Critical firmware modules discrepancy**	Diagnostic	Medium
0x0D02 (3330)	**Non-critical hardware modules discrepancy**	Diagnostic	Medium
0x0D03 (3331)	**Non-critical firmware modules discrepancy**	Diagnostic	Medium
0x0D09 (3337)	**Firmware discrepancy within control unit.**	Diagnostic	Medium
0x1433 (5171)	**Replace internal battery**	Diagnostic	Low
0x1437 (5175)	**Internal battery not detected**	Diagnostic	Low
0x150F (5391)	**Iron CT loss. Replace circuit breaker.**	Diagnostic	High
0x0D0A (3338)	**Invalid CU factory config. 1**	Diagnostic	Medium
0x1122 (4386)	**Communication lost with EIFE or IFE module**	Diagnostic	Medium
0x1123 (4387)	**Communication lost with IFM module**	Diagnostic	Medium

Recommended Actions

Code	Event	Recommended actions
0x4005 (16389)	**Control unit over temperature trip**	Decrease ambient temperature near the circuit breaker. If the problem persists, replace the MicroLogic Active control unit.
0x1404 (5124)	**Control unit over temperature**	Decrease ambient temperature near the circuit breaker. If the problem persists, replace the MicroLogic Active control unit.
0x142F (5167)	**Last protection settings have not been applied.**	Apply again the protection settings.
0x140F (5135)	**Protection settings not accessible 1**	Plan to replace the MicroLogic Active control unit.
0x1474 (5236)	**Protection settings not accessible 2**	Reboot control unit by simultaneously pressing the 5 buttons, **OK**, **Back**, **Up**, **Down**. If the event recurs, plan to replace the MicroLogic Active control unit.
0x1473 (5235)	**Internal access loss. Reboot control unit**	Internal access loss. Reboot control unit by simultaneously pressing the 5 buttons, **OK**, **Back**, **Up**, **Down**.
0x1436 (5174)	**Control unit memory degradation**	Plan to replace the MicroLogic Active control unit.
0x0D00 (3328)	**Critical hardware modules discrepancy**	Check which module is in critical hardware discrepancy with the EcoStruxure Power Commission software Firmware menu. Replace the module.
0x0D01 (3329)	**Critical firmware modules discrepancy**	Check which module is in critical firmware discrepancy with the EcoStruxure Power Commission software. Update the module.
0x0D02 (3330)	**Non-critical hardware modules discrepancy**	Check which module is in non-critical hardware discrepancy with the EcoStruxure Power Commission software Firmware menu. Plan to replace the module.
0x0D03 (3331)	**Non-critical firmware modules discrepancy**	Check which module is in non-critical firmware discrepancy with the EcoStruxure Power Commission software. Plan to update the module.
0x0D09 (3337)	**Firmware discrepancy within control unit.**	Check the firmware version of the MicroLogic Active control unit with EcoStruxure Power Commission software. If not latest, update the firmware of the MicroLogic Active control unit.
0x1433 (5171)	**Replace internal battery**	Replace internal battery. Connect a Mobile Power Pack to the USB-C port during internal battery replacement, to avoid losing date and time information.
0x1437 (5175)	**Internal battery not detected**	Install internal battery.
0x150F (5391)	**Iron CT loss. Replace circuit breaker.**	Replace the circuit breaker.
0x0D0A (3338)	**Invalid CU factory config. 1**	Plan to replace the MicroLogic Active control unit.
0x1122 (4386)	**Communication lost with EIFE or IFE module**	Check the power supply of the EIFE or IFE module. Check the ULP cable connection.
0x1123 (4387)	**Communication lost with IFM module**	Check the power supply of the IFM module. Check the ULP cable connection.

Contact Schneider Electric Support or your Schneider Electric Services representative for more information about who can carry out the recommended actions.

Internal Battery Replacement

The internal battery of the MicroLogic Active control unit can be replaced on site when discharged. The replacement can be made with the circuit breaker in the open or closed position, and the control unit supplied with power. A test of the internal battery, page 21 must be carried out immediately after the replacement of the internal battery to check the correct functioning of the new battery.

For information about internal battery replacement and installation, consult the instruction sheet on the Schneider Electric website: PKR4244002 *MicroLogic Active - Spare Battery - Instruction Sheet*

Monitoring the Communicating Voltage Releases

Presentation

The voltage releases undergo wear due to the number of opening/closing operations. It is recommended to check them at periodic intervals to decide whether they must be changed or not.

In order to assist with the maintenance of the communicating voltage releases the MicroLogic Active control unit monitors:

- The diagnostic and communicating MX1 opening voltage release (MX1 diag&com).
- The diagnostic and communicating XF closing voltage release (XF diag&com).

For more information about the maintenance of voltage releases, refer to DOCA0305•• *MasterPacT MTZ IEC Circuit Breakers with MicroLogic Active Control Unit - Maintenance Guide*, page 10.

Prerequisites

The prerequisites for monitoring the MX1 and XF communicating voltage releases are the same as the prerequisites for using the ULP wired communication, page 199.

Operating Principle

The MicroLogic Active control unit:

- Checks the presence of voltage releases.
- Counts the number of operations performed by the voltage releases.
- Monitors the state of the internal circuit of the voltage releases.
- Generates events when it detects incorrect operation of the voltage releases or cannot detect the presence of the voltage releases.

Data Availability

The communicating voltage release operation counters are available on a server or remote controller using the wired communication network.

Predefined Events

The monitoring of the communication voltage releases generates the following events:

Code	Event	History	Severity
0x1460 (5216)	**Invalid self test - MX1 voltage release**	Diagnostic	Medium
0x1461 (5217)	**MX voltage release not detected**	Diagnostic	Medium
0x1462 (5218)	**Invalid self test - XF voltage release**	Diagnostic	Medium
0x1463 (5219)	**XF voltage release not detected**	Diagnostic	Medium

Recommended Actions

Code	Event	Recommended actions
0x1460 (5216)	**Invalid self test - MX1 voltage release**	Plan to replace the MX1 voltage release.
0x1461 (5217)	**MX voltage release not detected**	Check the connection of the MX voltage release.
0x1462 (5218)	**Invalid self test - XF voltage release**	Plan to replace the XF voltage release.
0x1463 (5219)	**XF voltage release not detected**	Check the connection of the XF voltage release.

Contact Schneider Electric Support or your Schneider Electric Services representative for more information about who can carry out the recommended actions.

Monitoring the Contact Wear

Presentation

The pole contacts undergo wear due to the number of operating cycles with current and interrupted current during short circuits. It is recommended to check them at periodic intervals to decide whether the contacts must be changed or not. In order to reduce systematic visual inspections of the contacts and the arc chute, the contact wear estimate helps with the planning of visual inspections based on the estimated wear (from 0% - new contact - to 100% - totally worn contact).

Operating Principle

Each time the circuit breaker operates (performs an open and close cycle with or without current), the corresponding mechanical and electrical operation counters are incremented. Based on these counters, the MicroLogic Active control unit calculates the contact wear.

When the MicroLogic Active control unit contact wear algorithm calculates a value which is above one of the predefined thresholds (60%, 95%, and 100%) an event is generated with an orange pop-up screen and corresponding event message.

Data Availability

Contact wear monitoring data is available:

- On the MicroLogic Active display screen, from the tree navigation menu, at **Maintenance > Health > Contact wear**
- With the Zigbee wireless communication network for MicroLogic Active AP/EP control units.
- On a server or remote controller using the wired communication network

Circuit breaker operation counters are available on a server or remote controller using the wired communication network.

Predefined Events

The function generates the following events:

Code	Event	History	Severity
0x1440 (5184)	**Contact wear > 60%. Check contacts.**	Diagnostic	Medium
0x1441 (5185)	**Contact wear > 95%. Plan circuit breaker replacement.**	Diagnostic	Medium
0x1442 (5186)	**Contact wear > 100%. Replace circuit breaker.**	Diagnostic	Medium

Recommended Actions

Code	Event	Recommended actions
0x1440 (5184)	**Contact wear > 60%. Check contacts.**	Inspect visually the arc chute and main contacts at the next scheduled maintenance.
0x1441 (5185)	**Contact wear > 95%. Plan circuit breaker replacement.**	Plan to replace the circuit breaker.
0x1442 (5186)	**Contact wear > 100%. Replace circuit breaker.**	Replace the circuit breaker.

Contact Schneider Electric Support or your Schneider Electric Services representative for more information about who can carry out the recommended actions.

Monitoring the Load Profile

Presentation

Seven load profile counters report the number of hours during which the MicroLogic Active control unit has measured current flowing through the circuit breaker, in the following In ratio ranges:

- Number of hours with current measured below 15 % of the rated current In
- Number of hours with current measured between 15 and 25% of the rated current In
- Number of hours with current measured between 26 and 35% of the rated current In
- Number of hours with current measured between 36 and 50% of the rated current In
- Number of hours with current measured between 51 and 79% of the rated current In
- Number of hours with current measured between 80 and 89% of the rated current In
- Number of hours with current measured at 90% of the rated current In or above

Data Availability

Load profile monitoring data is available with EcoStruxure Power Device app through NFC connection.

Operation Functions

What's in This Part

Control Modes 185
Opening Function..... 191
Closing Function 194

Control Modes

Presentation

The circuit breaker control mode is a MicroLogic Active setting which defines the source of orders to control circuit breaker operations.

Three control modes are available: Manual, Auto Local and Auto Remote control mode. The control mode is configured on the MicroLogic Active display screen, from the tree navigation menu, at **Configuration > Communication**.

In Manual control mode operation orders are only accepted from one of the following:

- The mechanical buttons on the front of the circuit breaker.
- The external pushbuttons connected to the MN/MX/XF voltage releases.

In Auto Local control mode the operator needs to be close to the circuit breaker to establish communication. In addition to the sources accepted in Manual control mode, the following sources of operation orders are accepted in Auto Local control mode:

- FDM121 display
- BCIM IO channels

In Auto Remote control mode the operator does not need to be next to the circuit breaker to establish communication, and orders are accepted when sent from a remote source through the wired communication network.

In addition to the sources accepted in Manual control mode, the following sources of operation orders are accepted in Auto Remote control mode:

- IFE, EIFE or IFM interfaces
- IFE/EIFE webpages

The control mode factory setting is Manual control mode.

Enabling Operation Orders Through Communication

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Do not use MX1 and XF communicating voltage releases of power supply above 250 Vac/dc, with the BCIM module.
- Do not use MicroLogic Active remote control functions in a safety chain.

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

In order to enable operation orders through wired communication:

- The prerequisites for using ULP wired connection must be met, page 199.
- The MicroLogic Active control unit must be in Auto Local control mode or Auto Remote control mode.
- Control of the MX/XF communicating voltage releases by the BCIM module must be enabled. This is done on the MicroLogic Active display screen, from the tree navigation menu, at **Configuration > BCIM**.

Enabling Operation Orders Through BCIM IO Channels

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Do not use MX1 and XF communicating voltage releases of power supply above 250 Vac/dc, with the BCIM module.
- Do not use MicroLogic Active remote control functions in a safety chain.

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

In order to enable operation orders through BCIM IO channels:

- The MicroLogic Active control unit must be in Auto Local control mode.
- The BCIM module must be correctly configured:
  - Control of the MX/XF voltage releases by the BCIM module must be enabled.
  - The BCIM module must be in **Open/Close** IO mode

  Configuration of the BCIM module is done on the MicroLogic Active display screen, from the tree navigation menu, at **Configuration > BCIM**.

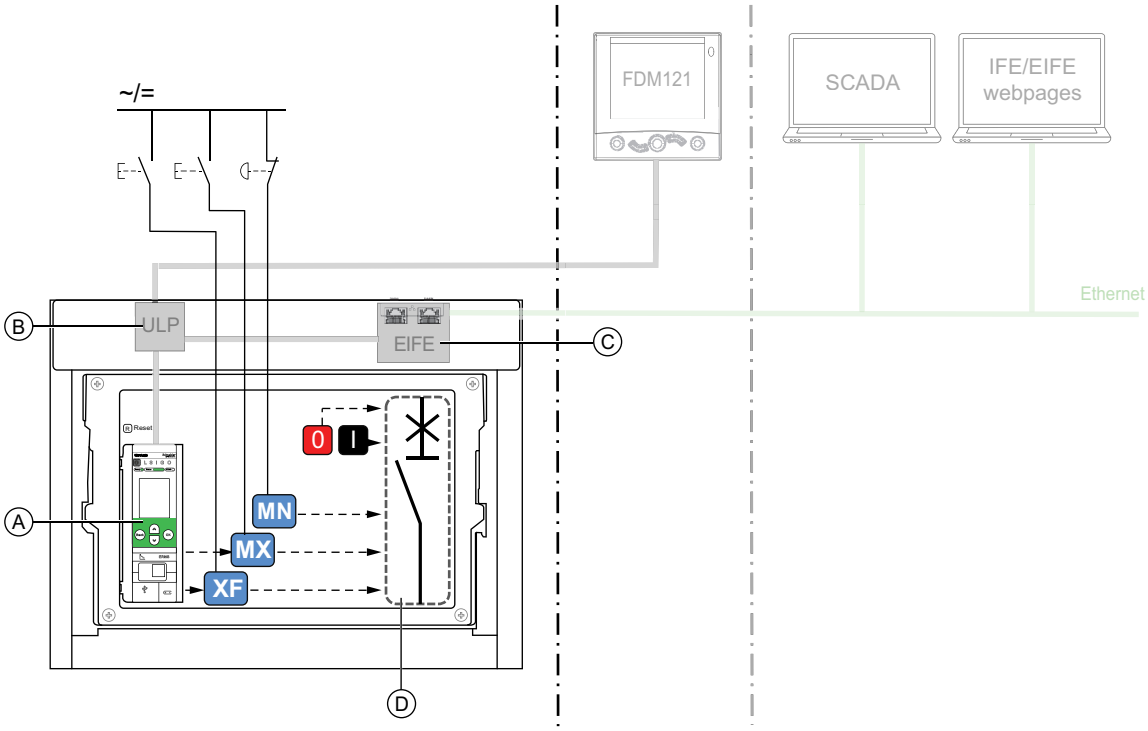
Source of Operation Orders According to Control Mode

The following table summarizes the available sources of operation orders, depending on the control mode:

Control mode	Type of order and delivery method					
	Mechanical	Electrical		Through wired communication		
	Pushbutton	Point to point (voltage release)	BCIM IO	FDM121 display	Communication network	IFE/EIFE Webpages
Manual	✓	✓	–	–	–	–
Auto Local	✓	✓	✓	✓	–	–
Auto Remote	✓	✓	–	–	✓	✓

Operation in Manual Control Mode

The following example shows available control paths in Manual control mode in a system consisting of a MicroLogic Active control unit, ULP port module and EIFE interface.



A MicroLogic Active control unit

B ULP port module

C EIFE embedded Ethernet interface

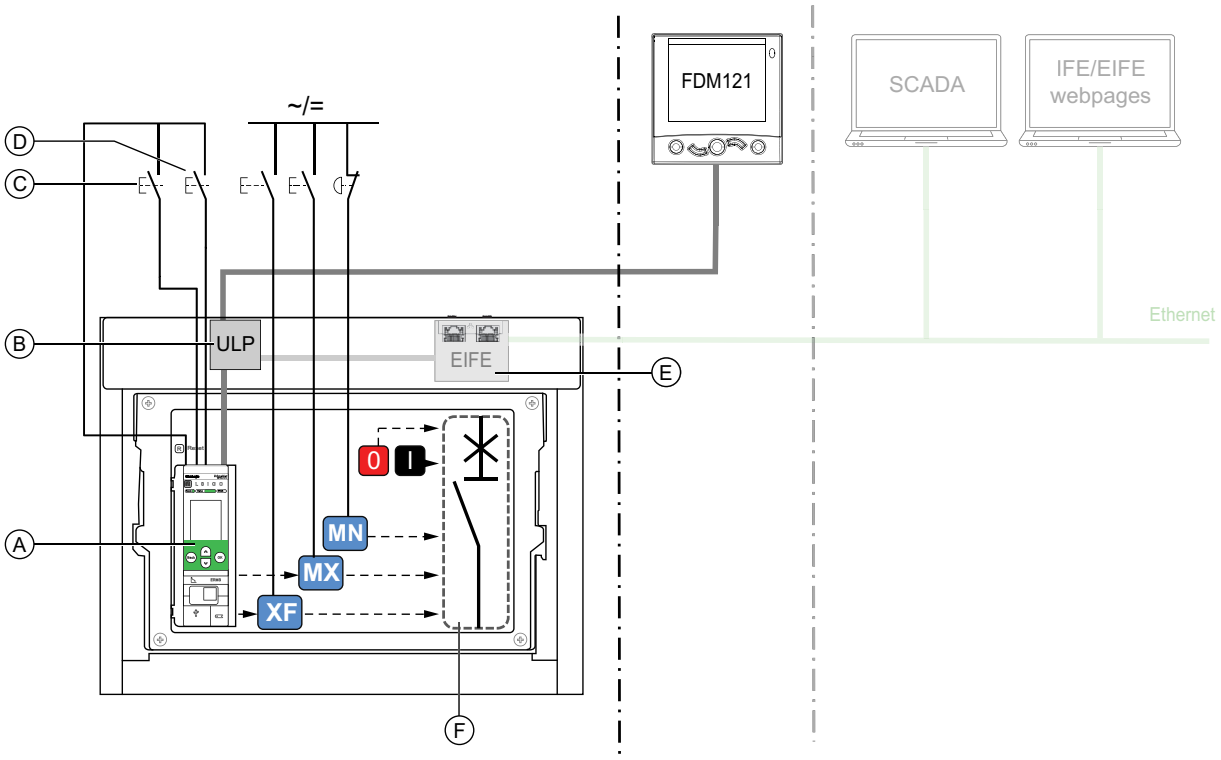
D Circuit breaker mechanism

Opening and closing operations available in Manual control mode:

- 0: mechanical opening pushbutton
- 1: mechanical closing pushbutton
- External pushbuttons wired by customer, and connected to:
  - XF: standard, reinforced, or communicating closing voltage release
  - MX: standard, reinforced, or communicating opening voltage release
  - MN: standard or reinforced undervoltage release

Operation in Auto Local Control Mode

The following example shows available control paths in Auto Local control mode in a system consisting of a MicroLogic Active control unit, ULP port module and EIFE interface.



A MicroLogic Active control unit with BCIM module

B ULP port module

C External pushbutton connected to BCIM IO channel 1

D External pushbutton connected to BCIM IO channel 2

E EIFE embedded Ethernet interface

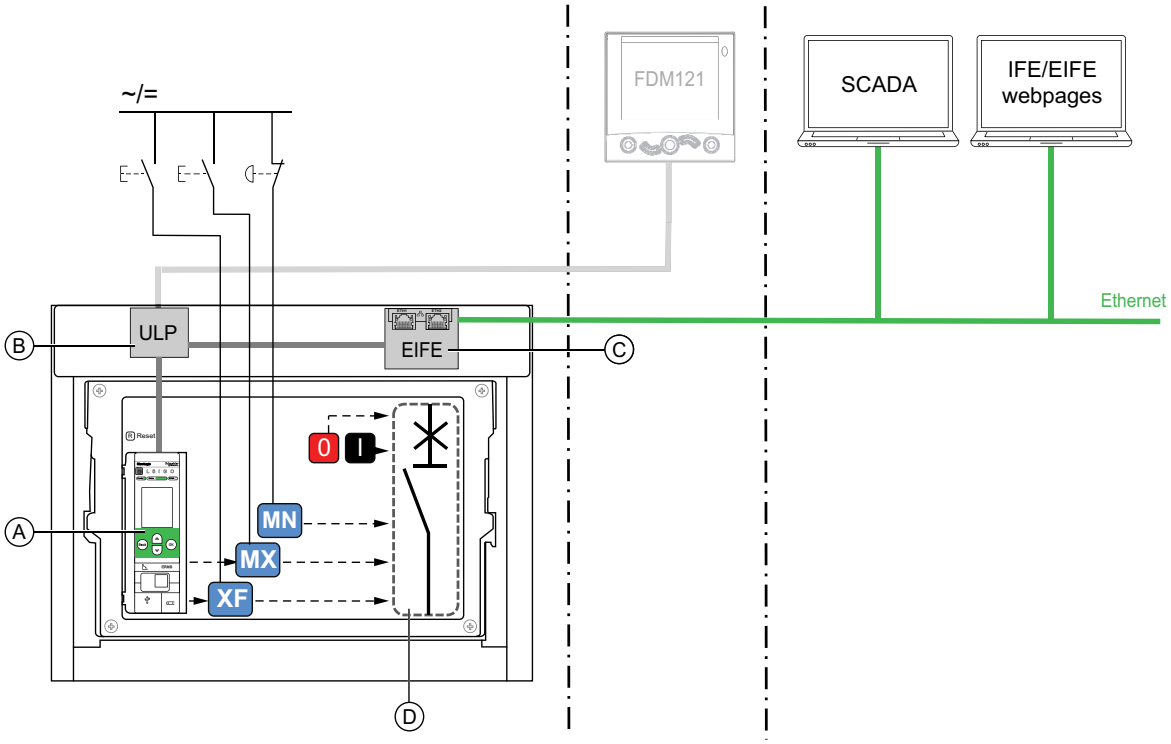
F Circuit breaker mechanism

Opening and closing operations available in Auto Local control mode:

- 0: mechanical opening pushbutton
- 1: mechanical closing pushbutton
- External pushbuttons wired by customer, and directly connected to:
  - XF: communicating closing voltage release
  - MX: communicating opening voltage release
  - MN: standard or reinforced undervoltage release
- External pushbuttons wired by customer, and indirectly connected to:
  - MX communicating opening voltage release via BCIM IO channel 1
  - XF communicating closing voltage release via BCIM IO channel 2
- FDM121 display

Operation in Auto Remote Control Mode

The following example shows available control paths in Auto Remote control mode in a system consisting of a MicroLogic Active control unit, ULP port module and EIFE interface.



A MicroLogic Active control unit with BCIM module

B ULP port module

C EIFE embedded Ethernet interface

D Circuit breaker mechanism

Opening and closing operations available in Auto Remote control mode:

- 0: mechanical opening pushbutton
- 1: mechanical closing pushbutton
- External pushbuttons wired by customer, and connected to:
  - XF: communicating closing voltage release
  - MX: communicating opening voltage release
  - MN: standard or reinforced undervoltage release
- Wired communication network
- Remote command through IFE/EIFE Webpages

Setting and Displaying the Control Mode

The control mode is set and displayed on the MicroLogic Active display screen from the tree navigation menu, at **Configuration** > **Communication** > **Control Mode**, page 77.

Predefined Events

Changing the control mode settings generates the following events:

Code	Event	History	Severity
0x1002 (4098)	**Manual mode enabled**	Operation	Low
0x1004 (4100)	**Local mode enabled**	Operation	Low

Opening Function

Presentation

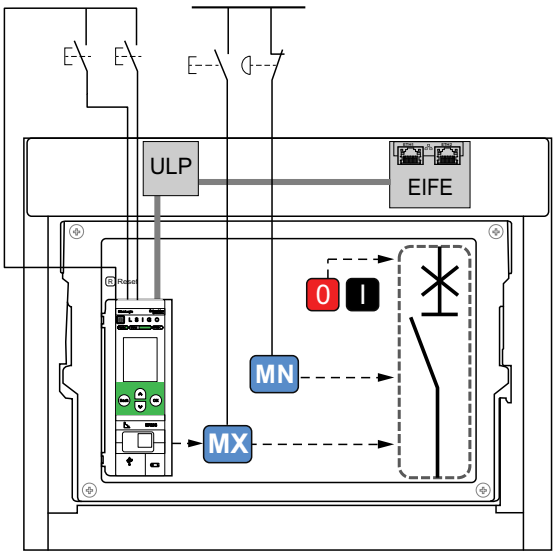
MicroLogic Active control units receive and process electrical opening orders. An event is generated on opening.

Operating Principle

Opening orders can be sent as follows:

- Directly through a mechanical opening pushbutton.
- Locally through an external opening pushbutton, connected directly or via the BCIM module to the MX communicating opening voltage release
- Remotely through a remote order which is managed by the MicroLogic Active control unit.

Opening orders have priority over closing orders. No closing orders are taken into account as long as an open order is active.



The open orders on MN or MX voltage releases by external pushbutton can be maintained to force the circuit breaker in open position and reject any close order. The MicroLogic Active open orders are not maintained.

Management of Opening Function

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

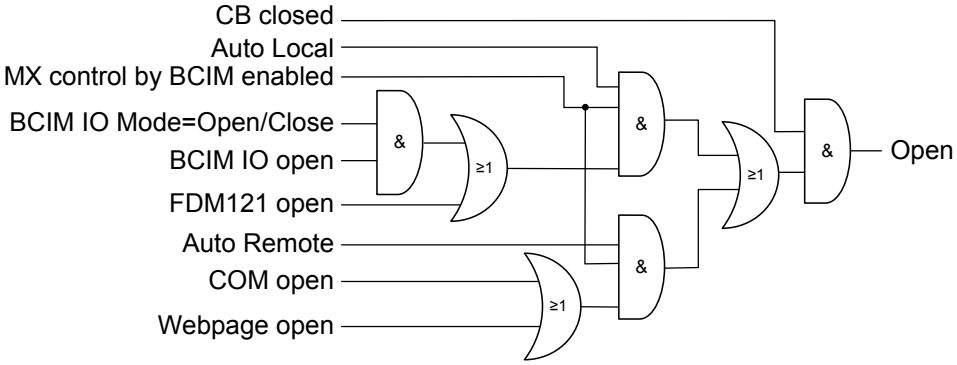
- Do not operate the circuit breaker without confirming that doing so will not create a hazardous situation.
- Do not use MicroLogic Active remote control functions in a safety chain.
- Do not allow any person to work on the electrical network without physically validating the successful execution of the local or remote software actions for opening the circuit breaker or switching off the electrical circuit.

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

The MicroLogic Active control unit manages opening orders issued by the following means:

- Server or remote controller connected to the communication network through Modbus protocol. For information about communication through Modbus protocol, refer to DOCA0384•• *MasterPacT, ComPacT, PowerPacT Circuit Breakers - Modbus Communication - User Guide*, page 10.
- IFE/EIFE webpages. Refer to the relevant document, page 10:
  - DOCA0106•• *Enerlin'X EIFE - Embedded Ethernet Interface for One MasterPacT MTZ Drawout Circuit Breaker - User Guide*
  - DOCA0142•• *Enerlin'X IFE - Ethernet Interface for One Circuit Breaker - User Guide*
  - DOCA0084•• *Enerlin'X IFE - Ethernet Switchboard Server - User Guide*
- FDM121 display connected to the ULP system. Refer to DOCA0088•• *Enerlin'X FDM121 - Front Display Module for One Circuit Breaker - User Guide*, page 10.

The control logic for managing opening orders is summarized in the following graphic and table:



CB closed	Circuit breaker is closed
Auto Local	Control mode is Auto Local
MX control by BCIM enabled	Control of the MX voltage release by the BCIM module is enabled.
BCIM IO mode=Open/Close	The BCIM IO mode parameter is set to **Open/Close**.
BCIM IO open	Open order from the opening pushbutton connected to the BCIM module
FDM121 open	Open order from FDM121 display
Auto Remote	Control mode is Auto Remote
COM open	Open order from a server or remote controller
Webpage open	Open order from IFE/EIFE webpage
Open	MicroLogic Active open order to the MX communicating opening voltage release

Predefined Events

The function generates the following predefined events:

Code	Event	History	Severity
0x1000 (4096)	**Circuit breaker opened**	Operation	Low
0x0410 (1040)	**Opening order sent to MX voltage release**	Operation	Low

Closing Function

Presentation

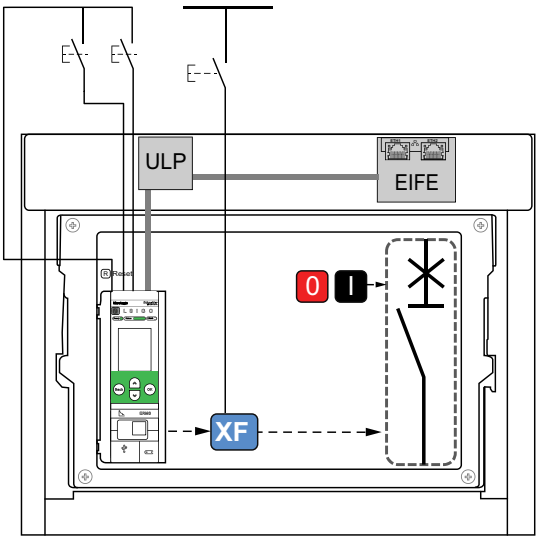
MicroLogic Active control units receive and process electrical closing orders. An event is generated on closure.

Operating Principle

Closing orders can be sent as follows:

- Directly through a mechanical closing pushbutton.
- Locally through an external opening pushbutton, connected directly or via the BCIM module to the XF communicating closing voltage release
- Remotely through a remote order which is managed by the MicroLogic Active control unit.

Opening orders have priority over closing orders. No closing orders are taken into account as long as an open order is active.



Management of Closing Function

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Do not operate the circuit breaker without confirming that doing so will not create a hazardous situation.
- Do not allow any person to work on the electrical network without physically validating the successful execution of the local or remote software actions for closing the circuit breaker or switching on the electrical circuit.

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

WARNING

HAZARD OF CLOSING ON ELECTRICAL FAULT

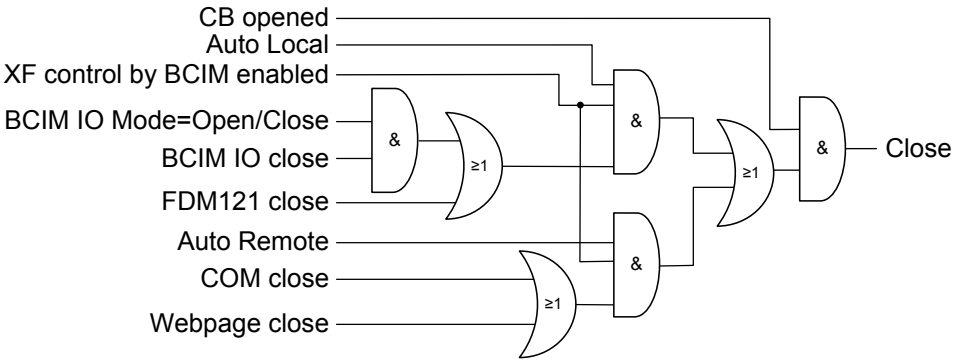
Do not close the circuit breaker again without first inspecting and, if necessary, repairing the downstream electrical equipment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The MicroLogic Active control unit manages closing orders issued by the following means:

- Server or remote controller connected to the communication network through Modbus protocol. For information about communication through Modbus protocol, refer to DOCA0384•• *MasterPacT, ComPacT, PowerPacT Circuit Breakers - Modbus Communication - User Guide*, page 10.
- IFE/EIFE webpages. Refer to the relevant document, page 10:
  - DOCA0106•• *Enerlin'X EIFE - Embedded Ethernet Interface for One MasterPacT MTZ Drawout Circuit Breaker - User Guide*
  - DOCA0142•• *Enerlin'X IFE - Ethernet Interface for One Circuit Breaker - User Guide*
  - DOCA0084•• *Enerlin'X IFE - Ethernet Switchboard Server - User Guide*
- FDM121 display connected to the ULP system. Refer to DOCA0088•• *Enerlin'X FDM121 - Front Display Module for One Circuit Breaker - User Guide*, page 10.

The control logic for managing closing orders is summarized in the following graphic and table:



CB opened	Circuit breaker is open
Auto Local	Control mode is Auto Local
XF control by BCIM enabled	Control of the XF voltage release by the BCIM module is enabled.
BCIM IO mode=Open/Close	The BCIM IO mode parameter is set to **Open/Close**.
BCIM IO close	Close order from the closing pushbutton connected to the BCIM module
FDM121 close	Close order from FDM121 display
Auto Remote	Control mode is Auto Remote
COM close	Close order from a server or remote controller
Webpage close	Close order from IFE/EIFE webpage
Close	MicroLogic Active close order to the XF communicating closing voltage release

Predefined Events

The function generates the following predefined events:

Code	Event	History	Severity
0x1001 (4097)	**Circuit breaker closed**	Operation	Low
0x0411 (1041)	**Closing order sent to XF voltage release**	Operation	Low

Communication Functions

What's in This Part

ULP Wired Communication 198
NFC Communication 200
USB On-The-Go (OTG) Connection 202
USB Connection 203
Zigbee Wireless Communication 205
Cybersecurity Recommendations 209

ULP Wired Communication

Description

The ULP wired communication option enables the MicroLogic Active control unit to share its dataset with an IFM, IFE or EIFE interface, and expose it to any supervisor with a client Modbus communication channel.

The ULP wired communication option is available for MicroLogic Active control units equipped with a BCIM module.

The MicroLogic Active control unit can be connected to:

- An RS-485 serial line network with Modbus protocol using the IFM Modbus-SL interface for one circuit breaker with part number LV434000.
- An Ethernet network with Modbus TCP/IP protocol using:
  - The IFE Ethernet interface for one circuit breaker.
  - The IFE Ethernet switchboard server.
  - The EIFE embedded Ethernet interface for MasterPacT MTZ drawout circuit breaker.

For more information:

- On the ULP system and its components, refer to DOCA0093•• *ULP (Universal Logic Plug) System - User Guide*, page 10.
- On communication through Modbus protocol, refer to DOCA0384•• *MasterPacT, ComPacT, PowerPacT Circuit Breakers - Modbus Communication - User Guide*, page 10.
- On the BCIM module, refer to DOCA0387•• *Breaker Communication and Isolation Module (BCIM) for MicroLogic Active Control Unit - User Guide*, page 10.

Available Data

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Do not only rely on the circuit breaker status provided by ULP wired communication before working on or inside the equipment.
- Do not only rely on the ERMS status provided by ULP wired communication. Use the blue ERMS LED to check ERMS status before working on or inside the equipment.

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

The following MicroLogic Active control unit data is available through ULP wired communication:

- Device identification information for the MicroLogic Active control unit
- Electrical network settings
- Circuit breaker status
- Circuit breaker trip cause
- Circuit breaker ERMS status
- Circuit breaker alarm status
- Circuit breaker health state
- Metering information

Prerequisites for Using ULP Wired Communication

The prerequisites to using ULP wired communication are:

- The MicroLogic Active control unit hardware version must be greater than or equal to 002.000.000. Earlier hardware versions are not compatible and the MicroLogic Active control unit must be replaced, page 231.
- The MicroLogic Active control unit firmware version must be greater than or equal to 004.000.000. Earlier firmware versions are not compatible.
- The BCIM module must be installed on the back of the MicroLogic Active control unit.
- The presence of the BCIM module must be configured, page 76. This configuration is done automatically when the BCIM module is embedded in a new circuit breaker. If the MicroLogic Active control unit is replaced, a manual configuration must be done on the MicroLogic Active HMI.
- The MicroLogic Active control unit must be supplied by a non-SELV 24 Vdc power supply.
- The BCIM module must be supplied by an SELV 24 Vdc power supply.

For more information:

- About firmware update, refer to Firmware Update, page 38.
- About power supply, refer to Power Supply, page 35.
- About BCIM configuration, refer to BCIM configuration, page 76.

Predefined Events

The function generates the following events:

Code	Event	History	Severity
0x1800 (6144)	**Communication lost with BCIM**	Diagnostic	Medium
0x1801 (6145)	**BCIM update unsuccessful**	Operation	Low
0x1802 (6146)	**BCIM in Critical Status**	Diagnostic	Medium
0x1803 (6147)	**BCIM in non-Critical Status**	Diagnostic	Medium

Recommended Actions

Code	Event	Recommended actions
0x1800 (6144)	**Communication lost with BCIM**	Check the power supply of the BCIM module. Check the ULP cable connection.
0x1801 (6145)	**BCIM update unsuccessful**	Restart the firmware update procedure. If the message is displayed again, plan to replace the BCIM module.
0x1802 (6146)	**BCIM in Critical Status**	Replace the BCIM module.
0x1803 (6147)	**BCIM in non-Critical Status**	Disconnect and connect again the BCIM 24 Vdc power supply.

NFC Communication

Description

A. NFC wireless communication zone

Using Near Field Communication (NFC), you can access the MicroLogic Active control unit from a smartphone running EcoStruxure Power Device app, page 30, and download data to your smartphone, even when the control unit is not powered. Accessible data is read-only. It is not possible to write data into the MicroLogic Active control unit from a smartphone.

NFC communication is always enabled and cannot be disabled.

You can establish an NFC connection with only one MicroLogic Active control unit at the same time and only one smartphone at a time can connect to a control unit.

MicroLogic Active control units use a passive NFC tag, which does not have a power source. It draws power from the smartphone that reads it, and therefore does not emit any electromagnetic waves when NFC communication is not in use.

NOTE: NFC communication is not available with MicroLogic Active 6.0 Ei control unit.

Prerequisites for Using NFC

The prerequisites for establishing an NFC connection are:

- You must have a smartphone running the EcoStruxure Power Device app.
- The smartphone must support NFC.
- For Android, the smartphone must support version 7 or above.
- For iOS, iPhone 7 with iOS 13 is the minimum requirement.
- You must have physical access to the MicroLogic Active control unit. The smartphone must be held within 20 mm (0.8 in) of the display screen of the control unit.

Establishing an NFC Connection

Follow the steps below to establish an NFC connection from your smartphone to the MicroLogic Active control unit.

Step	Action
1	Start EcoStruxure Power Device app on your smartphone.
2	Select **Connect to device through NFC**.

Step	Action
3	Place your smartphone against the MicroLogic Active display screen at a maximum distance of 20 mm (0.8 in), in the wireless NFC communication zone. **NOTE:** The NFC antenna of the control unit is located around the MicroLogic Active display screen. The position of the NFC antenna on the smartphone depends on the model used. If communication is not established, check where the NFC antenna is located on your smartphone and repeat the procedure. The first beep indicates that the communication is established. The EcoStruxure Power Device app then starts downloading data. The second beep indicates that the data download is complete. If the operation fails, a message is displayed on the smartphone. Start the procedure again. **NOTE:** You must not remove your smartphone from the MicroLogic Active display screen while the data download is in progress. If you do, the download is incomplete (you lose the NFC connection).
4	Remove your smartphone from the MicroLogic Active display screen.

NFC data downloaded from the MicroLogic Active control unit is not automatically refreshed. To get updates, you must establish a new NFC connection. Be aware that each new set of data downloaded overwrites the previous data. You can use the EcoStruxure Power Device app to consult downloaded data.

Troubleshooting NFC Communication Issues

The following table lists common problems when establishing an NFC connection to the MicroLogic Active control unit.

Problem description	Probable causes	Solutions
The NFC connection is not established. (No beep)	The smartphone is out of the NFC wireless communication zone.	Move your smartphone so that its antenna is in the NFC wireless communication zone and repeat the connection procedure.
	Your smartphone has a reinforced case (for example, metallic) which is blocking the signal.	Remove the case of your smartphone and repeat the connection procedure.
	Your smartphone does not have NFC capability.	–
	NFC communication is not activated on your smartphone.	Make sure NFC communication is activated on your smartphone.
The NFC connection was established but the signal is lost. (No second beep)	The smartphone was moved out of NFC wireless communication zone before the data transmission finished.	Move your smartphone into the NFC wireless communication zone and repeat the connection procedure. Keep the smartphone in the zone until you hear the second beep.
The data is not transmitted. The message **Memory fail. Please try again.** is displayed on the smartphone.		
Information not available, or limited.	The internal battery charge is too low to record the information.	Replace the internal battery for information to be recorded in future.

USB On-The-Go (OTG) Connection

Description

Using a USB OTG connection, you can access the MicroLogic Active control unit from an Android smartphone running the EcoStruxure Power Device app, page 30. This application offers a task-oriented interface with the control unit.

NOTE: USB OTG is only accessible from an Android smartphone.

Prerequisites for Using a USB OTG Connection

The prerequisites for establishing a USB OTG connection are:

- You must have an Android smartphone running the EcoStruxure Power Device app.
- The smartphone must support Android 4.4 or above.
- You must have physical access to the MicroLogic Active control unit to connect the cable directly to the USB-C port of the control unit.
- You must have a USB OTG adaptor (not supplied) and a USB-A to USB-C cable (RS PRO, reference 251-3298) to connect the USB port of the smartphone to the USB-C port of the MicroLogic Active control unit.

NOTE: If you do not have a USB OTG adaptor, you can use a USB-C to USB-C cable (RS PRO, reference 236-8998) to connect the USB port of the smartphone to the USB-C port of the MicroLogic Active control unit. In this case, the MicroLogic Active control unit is not supplied by the smartphone.

Connecting a Smartphone with EcoStruxure Power Device App to USB-C Port

Follow the steps below to connect to the MicroLogic Active control unit using the USB-C port.

Step	Action
1	Connect your smartphone to the USB-C port of the MicroLogic Active control unit using a USB OTG adaptor and USB-A to USB-C cable. The smartphone provides power to the MicroLogic Active control unit if necessary.
2	Start EcoStruxure Power Device app on your smartphone.

Predefined Events

The function generates the following events:

Code	Event	History	Severity
0x1301 (4865)	**Connection on USB port**	Operation	Low

USB Connection

Description

From a PC running EcoStruxure Power Commission software, you can access all of the monitoring and control functions of the MicroLogic Active control unit by connecting a PC directly to the USB-C port of the control unit.

Prerequisites for Using a USB Connection

The prerequisites for establishing a USB connection are:

- You must have the USB driver installed on the PC.
- You must have physical access to the MicroLogic Active control unit to connect the cable directly to the USB-C port of the control unit.
- You must have a USB-A to USB-C cable (RS PRO, reference 251-3298) to connect the USB port of the PC to the USB-C port of the MicroLogic Active control unit.

Connecting a PC Running EcoStruxure Power Commission Software to USB-C Port

Follow the steps below to connect to the MicroLogic Active control unit using the mini USB port.

Step	Action
1	Connect your PC to the USB-C port of the MicroLogic Active control unit using a USB-A to USB-C cable. The PC provides power to the MicroLogic Active control unit if necessary.
2	Start EcoStruxure Power Commission software on the PC and log in.
3	On the EcoStruxure Power Commission home page, connect to the MicroLogic Active control unit. There are different ways to connect EcoStruxure Power Commission software to the MicroLogic Active control unit, depending on whether it is the first connection and how the device was discovered. For more information, refer to *EcoStruxure Power Commission Online Help*.
4	With EcoStruxure Power Commission software connected to the MicroLogic Active control unit you have access to all functions of the software.

Control Unit Test Mode

The test mode is available when EcoStruxure Power Commission software is connected to the device through a PC connected to the USB-C port on the MicroLogic Active control unit. For more information, refer to *EcoStruxure Power Commission Online Help*.

Predefined Events

The function generates the following events:

Code	Event	History	Severity
0x1301 (4865)	**Connection on USB port**	Operation	Low
0x1302 (4866)	**Control Unit in test mode**	Diagnostic	Low
0x1303 (4867)	**Injection test in progress**	Diagnostic	Low
0x1304 (4868)	**Test aborted by user**	Diagnostic	Low

Recommended Actions

Code	Event	Recommended actions
0x1301 (4865)	**Connection on USB port**	Do not unplug USB port before closing EcoStruxure Power Commission software.
0x1302 (4866)	**Control Unit in test mode**	Exit the test mode after test.
0x1303 (4867)	**Injection test in progress**	Wait until the test is completed.

Zigbee Wireless Communication

Description

Zigbee is a low-power, wireless communication protocol, based on the IEEE 802.15.4 standard.

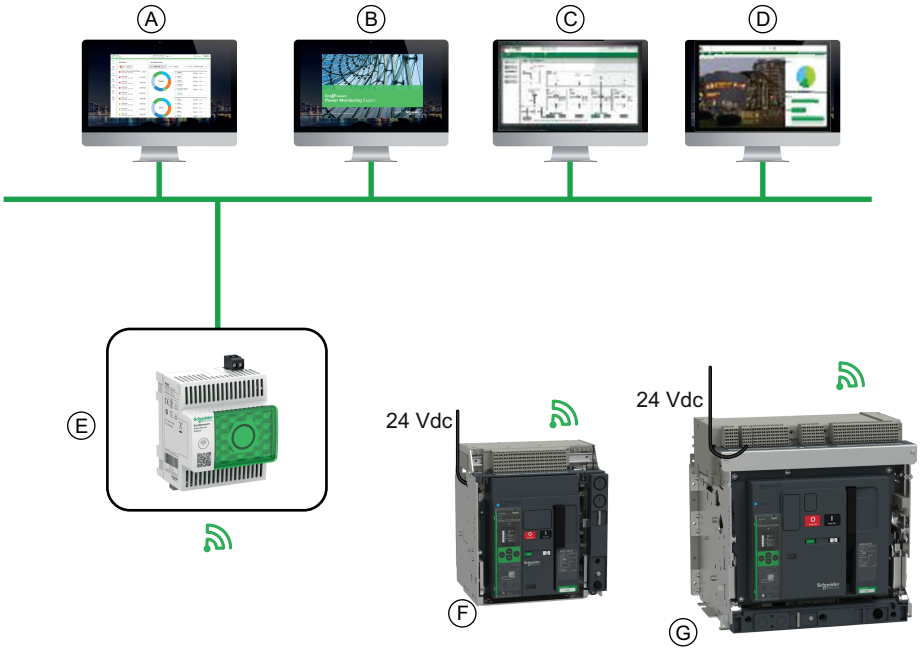
Zigbee wireless communication is available on MicroLogic Active AP/EP control units only.

MicroLogic Active AP/EP control units are certified for Zigbee 3.0.

Using Zigbee wireless communication, you can access the MicroLogic Active AP/EP control unit from a Panel Server Advanced (PAS800), Panel Server Universal (PAS600) or Panel Server Entry (PAS400).

Data transferred over Zigbee wireless technology is encrypted using the AES 128-bit encryption algorithm.

The following illustration shows an example of a Zigbee wireless communication architecture including MicroLogic Active control units and Panel Server.



Ethernet

Zigbee wireless communication

A Panel Server webpages

B EcoStruxure Power Monitoring Expert (PME) software

C EcoStruxure Power Operation (PO) software

D POI Plus industrial workstation with energy management software

E Panel Server

F MasterPacT MTZ1 circuit breaker with MicroLogic Active control unit

G MasterPacT MTZ2 circuit breaker with MicroLogic Active control unit

Available Data

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Do not only rely on the circuit breaker status provided by Zigbee wireless communication before working on or inside the equipment.
- Do not only rely on the ERMS status provided by Zigbee wireless communication. Use the blue ERMS LED to check ERMS status before working on or inside the equipment.

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

The following MicroLogic Active AP/EP control unit data is available through Zigbee wireless communication:

- Device identification information for the MicroLogic Active control unit
- Electrical network settings
- Circuit breaker status
- Circuit breaker trip cause
- Circuit breaker ERMS status
- Circuit breaker alarm status
- Circuit breaker health state
- Metering information
- Zigbee connectivity quality

Prerequisites for Using Zigbee Wireless Communication

The prerequisites to establishing a Zigbee wireless communication are:

- The Panel Server must be turned on.
- The MicroLogic Active AP/EP control unit and Panel Server must be in close proximity.
- The Zigbee ID is mandatory to establish a Zigbee wireless communication if selective discovery is being used. Obtain the Zigbee ID by either of the following methods:
  - Scan the QR code on the MicroLogic Active AP/EP control unit to go to the Go2SE landing page, which displays the Zigbee ID and installation code, page 32.
  - Read the Zigbee ID on the MicroLogic Active display screen, from the tree navigation menu, at **Configuration > Communication > Zigbee > Identification**

  NOTE: It is recommended that the MicroLogic Active AP/EP control unit is powered by an external 24 Vdc power supply, to avoid communication loss if the load falls below 20% of the rated current In.

Discovering the MicroLogic Active Control Unit

Discovery of the MicroLogic Active AP/EP control unit is done with EcoStruxure Power Commission software on the Panel Server. See the Commissioning chapter of the *MasterPacT MTZ Circuit Breaker with MicroLogic Active Control Unit User Guides*, page 10.

Removing the MicroLogic Active Control Unit

Remove the MicroLogic Active AP/EP control unit from Panel Server webpages.
Refer to DOCA0172•• *EcoStruxure Panel Server - User Guide*, page 10.

Troubleshooting Zigbee Wireless Communication Issues

Problem description	Probable cause	Solution
Unable to discover the MicroLogic Active AP/EP control unit.	MicroLogic Active AP/EP control unit may already be connected to another Panel Server.	Remove the MicroLogic Active AP/EP control unit from the network.
	Panel Server has not begun discovery process.	Verify discovery and the allowlist on the Panel Server.
MicroLogic Active AP/EP control unit is not connected.	Panel Server is using selective discovery, and the MicroLogic Active AP/EP control unit is not on the selective list.	Check that the RF-id in the selective list of the Panel Server is the same as the Zigbee ID read from the Go2SE landing page of the MicroLogic Active AP/EP control unit
	The MicroLogic Active AP/EP control unit is already connected to the Panel Server, which causes the key to be changed.	Reset the Panel Server to factory settings and rescan.
MicroLogic Active AP/EP control unit is connected, but the Zigbee signal is lost.	Malfunction in MicroLogic Active AP/EP control unit.	Restart the MicroLogic Active AP/EP control unit, page 40.
	The Zigbee signal is too low due to the distance from the Panel Server.	Try to reduce the distance between the MicroLogic Active AP/EP control unit and the Panel Server.
Information is not available, or limited.	Too many devices connected to the same channel.	Use the Panel Server to change channel for some devices.
Unable to remove the MicroLogic Active AP/EP control unit	The Panel Server may be scanning the MicroLogic Active AP/EP control unit.	Send a leave request from the Panel Server.
	The MicroLogic Active AP/EP control unit may have reconnected after being removed.	Send a leave request from the Panel Server.

Predefined Events

The function generates the following events:

Code	Event	History	Severity
0x1421 (5153)	**Invalid PowerTag communication**	Diagnostic	Medium
0x1423 (5155)	**Loss of Zigbee communication with Gateway**	Diagnostic	Low

Recommended Actions

Code	Event	Recommended actions
0x1421 (5153)	**Invalid PowerTag communication**	Reboot control unit by simultaneously pressing the 5 buttons i, **OK**, **Back**, **Up**, **Down**. If this does not work, contact Schneider Electric Support.
0x1423 (5155)	**Loss of Zigbee communication with Gateway**	Check the communication through the gateway, and by inspecting your switchboard.

Cybersecurity Recommendations

Overview

The MasterPacT MTZ circuit breaker with its MicroLogic Active control unit is a key component of your installation. It offers multiple communication features that bring greater efficiency and flexibility in managing your installation. However the features also make it potentially vulnerable to cyber attacks.

This section lists some of the elementary precautions that you must take to protect the communications paths that give access to information about your installation, and control over it.

The communication paths to protect include:

- Local access communication paths
  - FDM121 display
  - Wireless NFC communication
  - The USB-C port
  - MicroLogic Active HMI
  - Zigbee wireless communication paths for MicroLogic Active AP/EP control units
- Remote access communication paths
  - The Ethernet network when the IFE or EIFE interface is present
  - The Modbus-SL network when the IFM interface is present

For more detailed information about cybersecurity for the MasterPacT MTZ circuit breakers, refer to DOCA0122•• *MasterPacT, ComPacT, PowerPacT - Cybersecurity Guide*, page 10.

General Cybersecurity Recommendations

⚠WARNING

POTENTIAL COMPROMISE OF SYSTEM AVAILABILITY, INTEGRITY, AND CONFIDENTIALITY

- Change default passwords and PIN codes at first use to help prevent unauthorized access to device settings, controls, and information.
- Disable unused ports/services and default accounts to help minimize pathways for malicious attackers.
- Place networked devices behind multiple layers of cyber defenses (such as firewalls, network segmentation, and network intrusion detection and protection).
- Use cybersecurity best practices (for example, least privilege, separation of duties) to help prevent unauthorized exposure, loss, modification of data and logs, or interruption of services.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

For a general introduction to cybersecurity threats and how to address them, refer to *How Can I Reduce Vulnerability to Cyber Attacks?*.

Cybersecurity Recommendations for Local Access Communication Paths

To help protect local access communication paths, it is recommended to:

- Keep locked the enclosure where the MasterPacT MTZ circuit breaker is located so that no unauthorized person can access the MicroLogic Active control unit.

Specific Cybersecurity Recommendations for Wireless NFC Communication

To protect access to data accessible through NFC, it is recommended to make sure that the smartphones running the EcoStruxure Power Device app are password-protected and for professional use only.

Specific Cybersecurity Recommendations for USB Connection

To protect access to functions accessible through a USB connection on the MicroLogic Active control unit, it is recommended that:

- The PCs running the monitoring software are hardened following the guidelines provided in DOCA0122•• *MasterPacT, ComPacT, PowerPacT - Cybersecurity Guide*, page 10.
- The most up-to-date hardening methods for the operating system are running on your PCs.

Specific Cybersecurity Recommendations for USB OTG Connection

To protect access to functions accessible through a USB OTG connection on the MicroLogic Active control unit, it is recommended that:

- The smartphones running the EcoStruxure Power Device app are hardened following the guidelines provided in DOCA0122•• *MasterPacT, ComPacT, PowerPacT - Cybersecurity Guide*, page 10.
- The most up-to-date hardening methods for the operating system are running on your smartphones.

Specific Cybersecurity Recommendations for Zigbee Wireless Communication

Zigbee wireless communication is vulnerable to disruption by unauthorized radio emissions in the operating environment. To protect access to functions accessible through Zigbee wireless communication, it is recommended that:

- The MicroLogic Active AP/EP control unit is not connected to malicious networks.
- The Zigbee network is checked regularly to ensure that all devices are valid.
- All devices on the Zigbee network are rediscovered if any device is invalid.
- The commissioning of Zigbee wireless devices is done in a place secure from rogue radio transmitters, such as an administrator room.

Cybersecurity Recommendations for Remote Access Communication Paths Through a Communication Network

When the MasterPacT MTZ circuit breaker is connected to a communication network through the IFE, EIFE or IFM interface, it is recommended to:

- Follow general security rules to protect your network.
- Only activate Auto Remote control mode when required.
- Make sure that the PCs running the monitoring software are hardened following the guidelines provided in DOCA0122•• *MasterPacT, ComPacT, PowerPacT - Cybersecurity Guide*, page 10, and with the most up-to-date hardening methods for the operating system running on your PCs.

Event Management

What's in This Part

Event Definition 213
Event Type 215
Event Notifications 220
Event Display 222
Event History 223
Event List 225

Event Definition

Definition

An event is a change in state of digital data, or any incident detected by the MicroLogic Active control unit or EIFE Ethernet interface.

Events are time stamped and logged in the event history of each module.

Events are categorized according to a level of severity:

- High: urgent corrective action is required.
- Medium: corrective action needs to be scheduled.
- Low: for information only.

All high and medium severity events generate an alarm and a pop-up notification screen, page 220 on the MicroLogic Active control unit display screen.

Low severity events are information-type events. They can be consulted with EcoStruxure Power Commission software.

Alarms and trips are events that require specific attention from the user:

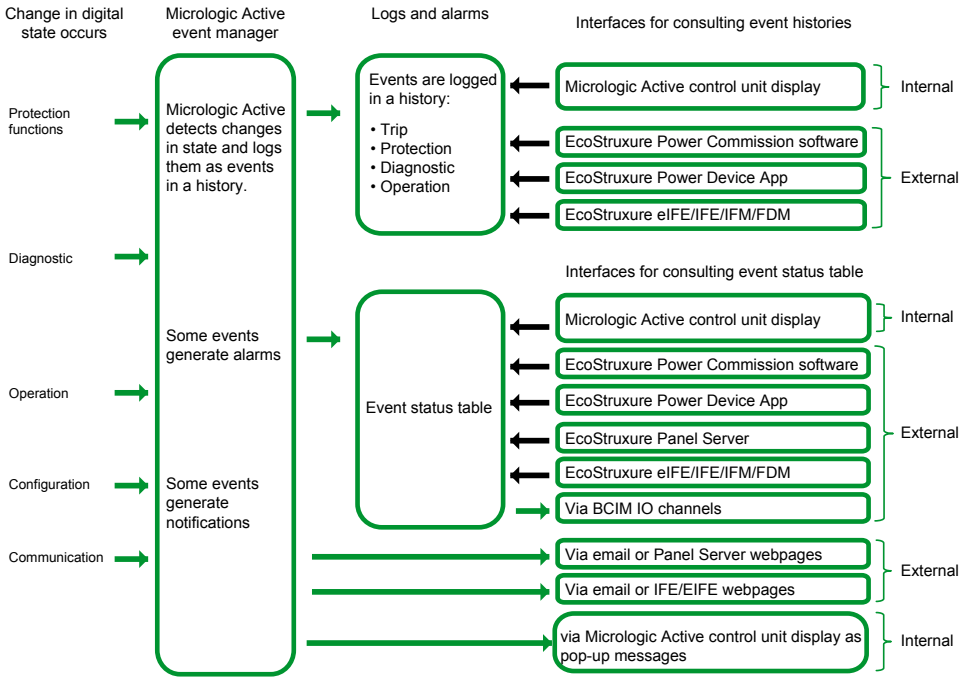
- A trip is a high severity event generated when the circuit breaker trips.
- An alarm is an event with medium or high severity.

The information in this part is valid for events detected by the MicroLogic Active control unit.

For information about EIFE events, refer to DOCA0106•• *Enerlin'X EIFE - Embedded Ethernet Interface for One MasterPacT MTZ Drawout Circuit Breaker - User Guide*, page 10.

Management of Events by MicroLogic Active Control Unit

The following diagram gives an overview of how events are managed by the MicroLogic Active control unit.



Event Time Stamping

Each event is time stamped with the date and time of the MicroLogic Active internal clock, page 34.

Event Type

Overview

Events can be the following types:

- **Occurrence/completion** (Entry/Exit): Events which have a defined beginning and end, representing the beginning or end of a system state. The occurrence and completion are both time-stamped and logged in a history. For example, **Manual mode enabled** is an occurrence/completion event.
- **Instantaneous** (Pulse): Events with no duration. Only the occurrence of the event is time-stamped and logged in a history. For example, the reception of an opening order, a change to settings, or a circuit breaker trip are instantaneous events.

The event type cannot be customized.

Event Status Definition

The status of an event is active, inactive, or held. It depends on the event type and latch mode. The status of all events can be consulted at any time, page 222.

Latch Mode

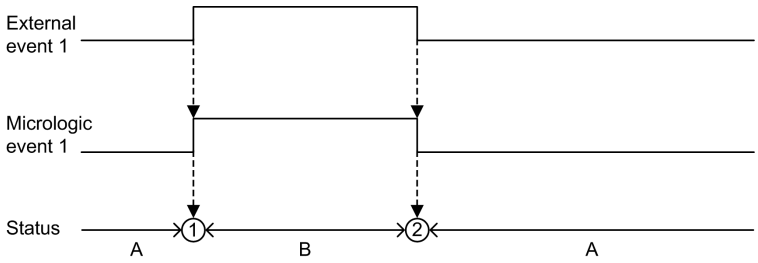
An event can be unlatched or latched:

- **Unlatched**: The event status is active while the cause of the event is present. It automatically returns to inactive when the cause of the event disappears or is resolved.
- **Latched**: The event status does not automatically return to inactive when the cause of the event disappears or is resolved. It stays in the held state until it is reset by the user.

The latch mode of certain events, page 225 can be customized through EcoStruxure Power Commission software.

Unlatched Occurrence/Completion Events

The following graph shows the event status for an unlatched occurrence/ completion event:



A Event inactive

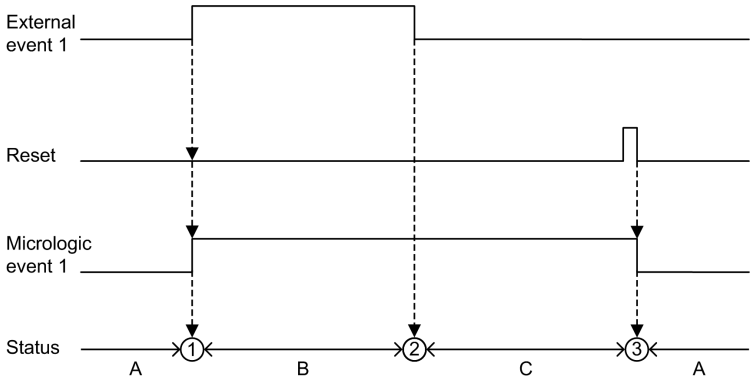
B Event active

1 Event occurrence: event is time stamped, logged in a history and notified, depending on severity

2 Event completion: event is time stamped and logged in a history

Latched Occurrence/Completion Events

The following graph shows the event status for a latched occurrence/completion event:



A Event inactive

B Event active

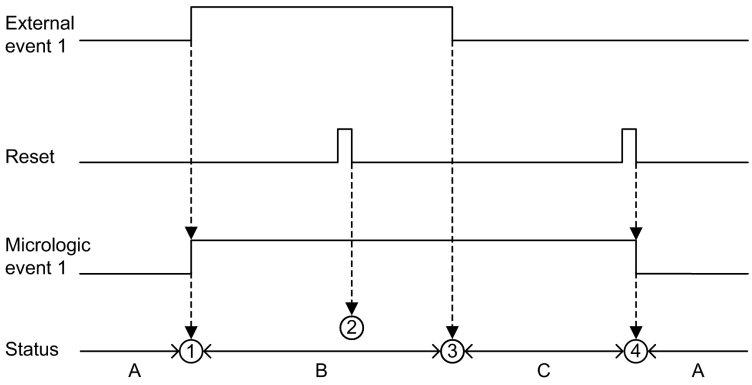
C Event held

1 Event occurrence: event is time stamped, logged in a history and notified, depending on severity

2 Event completion: event is time stamped and logged in a history

3 Event reset: reset command is time stamped and logged in operation history. All held events are reset.

The following graph shows the event status for a latched event where a reset is attempted before completion of the event:



A Event inactive

B Event active

C Event held

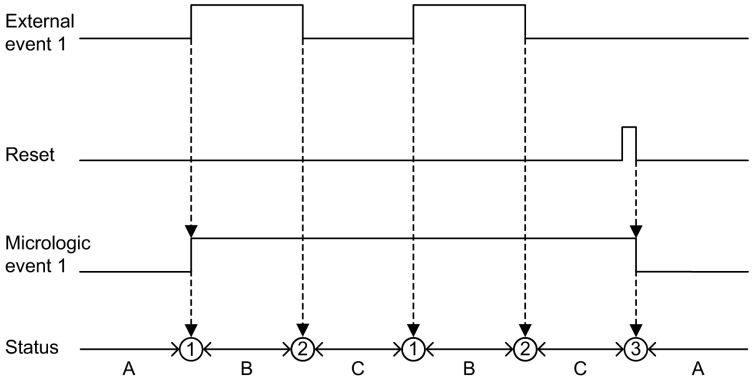
1 Event occurrence: event is time stamped, logged in a history and notified, depending on severity

2 Event reset: reset command is time-stamped and logged in the operation history but has no effect on MicroLogic Active event 1 as external event is not completed

3 Event completion: event is time stamped and logged in a history

4 Event reset: reset command is time stamped and logged in the operation history. All held events are reset.

The following graph shows the event status for a latched, recurring occurrence/ completion event:



A Event inactive

B Event active

C Event held

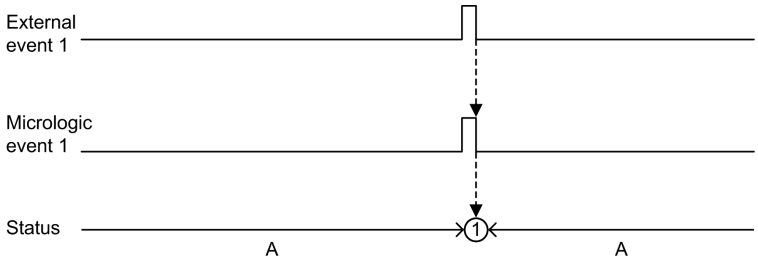
1 Event occurrence: event is time stamped, logged in a history and notified, depending on severity

2 Event completion: event is time stamped and logged in a history

3 Event reset: reset command is time stamped and logged in the operation history. All held events are reset.

Unlatched Instantaneous Events

The following graph shows the event status for an unlatched instantaneous event:

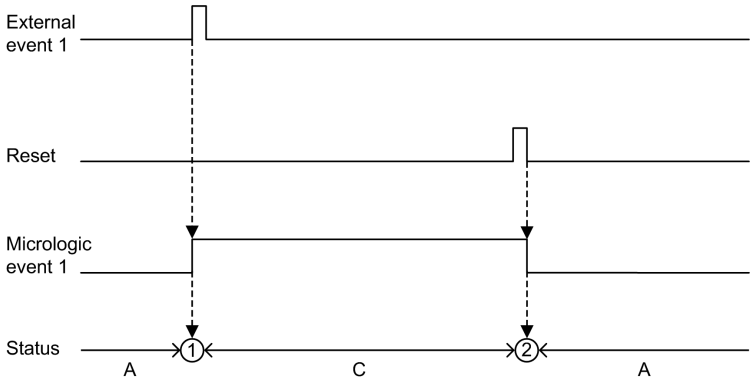


A Event inactive

1 Event occurrence: event is time stamped, logged in a history and notified, depending on severity

Latched Instantaneous Events

The following graph shows the event status for a latched instantaneous event:



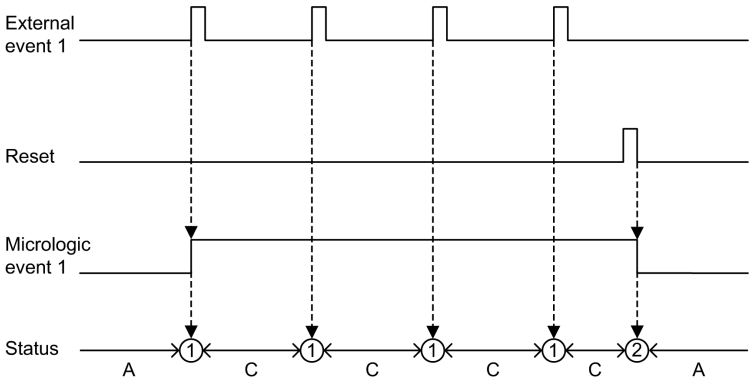
A Event inactive

C Event held

1 Event occurrence: event is time stamped, logged in a history and notified, depending on severity

2 Event reset: reset command is time stamped and logged in the operation history. All held events are reset.

The following graph shows the event status for a latched, recurring instantaneous event:



A Event inactive

C Event held

1 Event occurrence: event is time stamped, logged in a history and notified, depending on severity

2 Event reset: reset command is time stamped and logged in the operation history. All held events are reset.

Resetting Latched Trip Events

Latched trip events can be reset by pressing the button on the front of the MicroLogic Active control unit for 3–15 seconds, and then releasing the button.

Reset commands do not target specific trip events. All held trip event states managed by the MicroLogic Active control unit are reset, and all trip cause LEDs are cleared.

The reset command generates the following event:

Code	Event	History	Severity
0x1307 (4871)	**Alarm reset**	Operation	Low

Event Notifications

Presentation

High severity events (including trips) and medium severity events are notified by a pop-up screen on the MicroLogic Active control unit.

Trip events are notified by SDE1 standard fault-trip indication contact and SDE2 optional fault-trip indication contact.

In addition, events can be configured to be notified in the following ways:

- By optional BCIM module.
- By email from IFE or EIFE Ethernet interface.
- By email from Panel Server.

Pop-up Screen

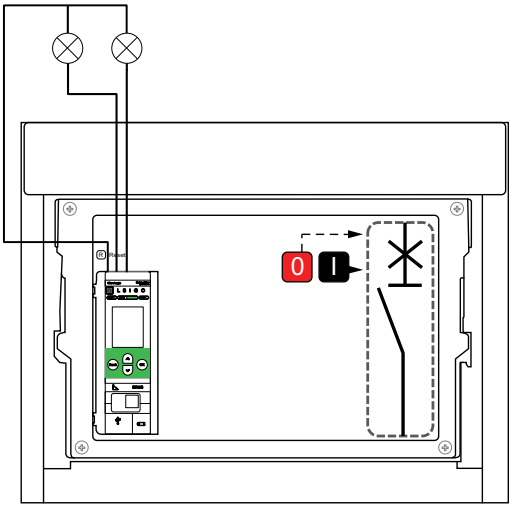
All high and medium severity events generate a pop-up screen on the MicroLogic Active display screen, page 81:

- A red pop-up screen indicates a trip or high severity event, needing immediate attention.
- An orange pop-up screen indicates a medium severity event, recommending action.

BCIM Module Notification

When configured in **Alarm** mode, the optional BCIM module can be used to signal the status of alarms.

The BCIM module is equipped with two outputs to activate external pilot lights when the alarms are active.



To configure the BCIM module in **Alarm** mode, set the BCIM parameters on the MicroLogic Active display screen, at **Configuration > BCIM** as follows:

- **BCIM = Yes**
- **IO Settings > IO Mode = Alarm**
- Select one event to be signaled on each **IO Channel**, from the following:

BCIM channel	IO channel alarm	Event	Code
IO channel 1	**Long Time (Start)**	**Ir start (I > 105% Ir)**	0x6200 (25088)
	Short Time (Start)	**Isd start**	0x6201 (25089)
	Ground Fault (Start)	**Ig start**	0x6203 (25091)
IO channel 2	**Long Time (Trip)**	**Long Time (Ir) trip**	0x4000 (16384)
	Short Time (Trip)	**Short Time (Isd) trip**	0x4001 (16385)
	Instantaneous (Trip)	**Instantaneous (Ii) trip**	0x4002 (16386)
	Ground Fault (Trip)	**Ground Fault (Ig) trip**	0x4003 (16387)

Email Notification from IFE/EIFE Interfaces

IFE or EIFE webpages allow events to be selected for notification by email. The notification by email is not configured by default.

For more information, refer to the relevant document, page 10:

- *Enerlin'X EIFE - Embedded Ethernet Interface for One MasterPacT MTZ Drawout Circuit Breaker - User Guide*
- *Enerlin'X IFE – Ethernet Interface for One IEC Circuit Breaker – User Guide*
- *Enerlin'X IFE - Ethernet Switchboard Server - User Guide*

Email Notification from Panel Server

For MicroLogic Active AP/EP control unit, the last event can be configured to be notified by email from Panel Server. The notification by email is not configured by default. For more information, refer to DOCA0172•• *EcoStruxure Panel Server - User Guide*, page 10.

Event Display

Introduction

The event status table contains the status of all events at the time of consultation. The status can be inactive, active, or held.

Events which are in the active and held state are displayed on the following interfaces:

- MicroLogic Active display screen.
- EcoStruxure Power Commission software.
- EcoStruxure Power Device app.

The status of an event can be checked using the wired or Zigbee communication network.

Displaying Events on the MicroLogic Active Display Screen

Display the active and held alarm events on the MicroLogic Active display screen from the tree navigation menu, at **Alarms/History > Active Alarms**.

High and medium severity active and held events are displayed.

If the event is completed, it is moved to **Alarms/History > Alarms History**.

Displaying Events on EcoStruxure Power Commission Software

High and medium severity, active and held events are displayed.

Events can be sorted by:

- Date
- Severity:
  - High severity events
  - Medium severity events
- History
- Type

Displaying Events on EcoStruxure Power Device App

By default, events are sorted chronologically. They can be sorted by other parameters such as date, severity, type or history.

Event History

Overview

All events are logged in one of the histories of the MicroLogic Active control unit:

- Trip
- Protection
- Diagnostic
- Operation

Events of all severity are logged, including low-severity events.

Event histories are encrypted by using the AES-256 encryption algorithm.

Events logged in histories are displayed as follows:

- On the MicroLogic Active display screen
- With EcoStruxure Power Commission software
- With EcoStruxure Power Device app

The trip history can be downloaded by using the wired communication network.

The following information is logged in a history for each event:

- Event ID: event code
- Time stamp: date and time of occurrence and completion

The trip history on the MicroLogic Active display screen additionally includes context data (protection settings, interrupted currents).

NOTE: The MicroLogic Active HMI displays the date and time of occurrence of events. The date and time of completion of events can be consulted by extracting MicroLogic Active control unit histories:

- Through EcoStruxure Power Commission software.
- Through EcoStruxure Power Device app.

Maximum Number of Events in Each History

Each history has a predefined maximum size. When a history is full, each new event overwrites the oldest event in the relevant history.

Event history	Maximum number of events stored in history
Trip	30
Protection	50
Diagnostic	200
Operation	160

Displaying Event History on MicroLogic Active Display Screen

For more information about how events are displayed on MicroLogic Active display screen, refer to Alarms/History menu, page 72.

Displaying Event History on EcoStruxure Power Commission Software

All events logged in histories can be consulted using EcoStruxure Power Commission software. The events can be exported as an Excel file.

Events in histories are displayed in chronological order, starting with the most recent event.

Displaying Event History on EcoStruxure Power Device App

All events logged in histories are displayed on the EcoStruxure Power Device app.

Events in histories are displayed in chronological order, starting with the most recent event.

Events can be sorted by date and time, or by sequence number, and filtered by using the following criteria:

- Type
- Severity
- History

Clicking on a specific event in the list displays a list of all occurrences of the same event, in chronological order.

Event List

Event Characteristics

The events are listed according to the history in which they are logged, page 223.

Each event is defined by the following characteristics:

- Code: event code
- Event: user message
- History, page 223
- Type, page 215: not customizable
  - Entry/Exit: occurrence/completion event.
  - Pulse: instantaneous event.
- Latched, page 215:
  - Yes: the event is latched and the user must reset the event status.
  - No: the event is unlatched.
- Activity, page 215:
  - Enabled
  - Disabled
- Severity, page 213:
  - High severity events.
  - Medium severity events.
  - Low severity events.

Trip Events

Code	Event	History	Type	Latched	Activity	Severity
0x4000 (16384)	**Long Time (Ir) trip** , page 91	Trip	Pulse	Yes	Enabled	High
0x4001 (16385)	**Short Time (Isd) trip**, page 96	Trip	Pulse	Yes	Enabled	High
0x4002 (16386)	**Instantaneous (Ii) trip**, page 99	Trip	Pulse	Yes	Enabled	High
0x4003 (16387)	**Ground Fault (Ig) trip** , page 104	Trip	Pulse	Yes	Enabled	High
0x4005 (16389)	**Control unit over temperature trip**, page 175	Trip	Pulse	Yes	Enabled	High
0x4006 (16390)	**Ultimate self-protection (SELLIM) trip**, page 87	Trip	Pulse	Yes	Enabled	High
0x4007 (16391)	**Self diagnostic trip. Replace control unit**, page 172	Trip	Pulse	Yes	Enabled	High
0x400A (16394)	**ENCT Disconnected trip**, page 172	Trip	Pulse	Yes	Enabled	High
0x4010 (16400)	**Undervoltage trip on 1 phase**, page 121	Trip	Pulse	Yes	Enabled	High

Code	Event	History	Type	Latched	Activity	Severity
0x4011 (16401)	**Overvoltage trip on 1 phase**, page 124	Trip	Pulse	Yes	Enabled	High
0x401D (16413)	**Ultimate self-protection (DIN/DINF) trip**, page 87	Trip	Pulse	Yes	Enabled	High
0x401E (16414)	**Ig test trip**, page 104	Trip	Pulse	Yes	Enabled	High
0x402A (16426)	**Undervoltage trip on all 3 phases**, page 121	Trip	Pulse	Yes	Enabled	High
0x402B (16427)	**Overvoltage trip on all 3 phases**, page 124	Trip	Pulse	Yes	Enabled	High
0x4033 (16435)	**Current sensor loss. Replace Circuit Breaker**, page 172	Trip	Pulse	Yes	Enabled	High
0x4035 (16437)	**Ii test trip**, page 99	Trip	Pulse	Yes	Enabled	High

Protection Events

Code	Event	History	Type	Latch	Activity	Severity
0x0F11 (3857)	**Thermal memory reset order**, page 91	Protection	Pulse	No	Enabled	Low
0x03F5 (1013)	**Ir pre-alarm (I > 90% Ir)**, page 91	Protection	Entry/Exit	No	Enabled	Medium
0x6200 (25088)	**Ir start (I > 105% Ir)**, page 91	Protection	Entry/Exit	No	Enabled	High
0x6201 (25089)	**Isd start** , page 96	Protection	Entry/Exit	No	Enabled	Low
0x6203 (25091)	**Ig start**, page 104	Protection	Entry/Exit	No	Enabled	Low
0x6210 (25104)	**Undervoltage on 1 phase start**, page 121	Protection	Entry/Exit	No	Enabled	Low
0x6211 (25105)	**Overvoltage on 1 phase start**, page 124	Protection	Entry/Exit	No	Enabled	Low
0x622A (25130)	**Undervoltage on all 3 phases start**, page 121	Protection	Entry/Exit	No	Enabled	Low
0x622B (25131)	**Overvoltage on all 3 phases start**, page 124	Protection	Entry/Exit	No	Enabled	Low
0x6310 (25360)	**Undervoltage on 1 phase operate**, page 121	Protection	Entry/Exit	No	Enabled	Medium
0x6311 (25361)	**Overvoltage on 1 phase operate**, page 124	Protection	Entry/Exit	No	Enabled	Medium
0x632A (25386)	**Undervoltage on all 3 phases operate**, page 121	Protection	Entry/Exit	No	Enabled	Medium

Code	Event	History	Type	Latch	Activity	Severity
0x632B (25387)	**Overvoltage on all 3 phases operate**, page 124	Protection	Entry/Exit	No	Enabled	Medium
0x0C03 (3075)	**ERMS engaged**, page 116	Protection	Entry/Exit	No	Enabled	Low
0x0C08 (3080)	**Ii protection disabled**, page 99	Protection	Pulse	No	Enabled	Low
0x0C09 (3081)	**Ig protection disabled**, page 104	Protection	Pulse	No	Enabled	Low
0x1100 (4352)	**Protection changed by HMI**, page 89	Protection	Pulse	No	Enabled	Low
0x1108 (4360)	**Protection changed by communication**, page 89	Protection	Pulse	No	Enabled	Low

Diagnostic Events

Code	Event	History	Type	Latch	Activity	Severity
0x1122 (4386)	**Communication lost with EIFE or IFE module**, page 175	Diagnostic	Entry/Exit	No	Enabled	Medium
0x1123 (4387)	**Communication lost with IFM module**, page 175	Diagnostic	Entry/Exit	No	Enabled	Medium
0x1302 (4866)	**Control Unit in test mode**, page 203	Diagnostic	Entry/Exit	No	Enabled	Low
0x1303 (4867)	**Injection test in progress**, page 203	Diagnostic	Entry/Exit	No	Enabled	Low
0x1304 (4868)	**Test aborted by user**, page 203	Diagnostic	Pulse	No	Enabled	Low
0x1400 (5120)	**Self test 1. Replace control unit**, page 172	Diagnostic	Entry/Exit	No	Enabled	High
0x1404 (5124)	**Control unit over temperature**, page 175	Diagnostic	Entry/Exit	No	Enabled	High
0x1405 (5125)	**Self test 3. Replace control unit**, page 172	Diagnostic	Entry/Exit	No	Enabled	High
0x1406 (5126)	**Self test 4. Replace control unit**, page 172	Diagnostic	Entry/Exit	No	Enabled	High
0x1416 (5142)	**Mitop disconnected. Call Schneider Electric support**, page 172	Diagnostic	Entry/Exit	No	Enabled	High
0x1460 (5216)	**Invalid self test - MX1 voltage release**, page 179	Diagnostic	Entry/Exit	No	Disabled	Medium
0x1461 (5217)	**MX voltage release not detected**, page 179	Diagnostic	Entry/Exit	No	Disabled	Medium
0x1462 (5218)	**Invalid self test - XF voltage release**, page 179	Diagnostic	Entry/Exit	No	Disabled	Medium

Code	Event	History	Type	Latch	Activity	Severity
0x1463 (5219)	**XF voltage release not detected**, page 179	Diagnostic	Entry/Exit	No	Disabled	Medium
0x1518 (5400)	**Self-test 6. Replace control unit**, page 172	Diagnostic	Entry/Exit	No	Enabled	High
0x1402 (5122)	**Current sensor loss. Replace circuit breaker**, page 172	Diagnostic	Entry/Exit	No	Enabled	High
0x1403 (5123)	**ENCT disconnected**, page 172	Diagnostic	Entry/Exit	No	Enabled	High
0x1430 (5168)	**Protection settings reset to factory values**, page 172	Diagnostic	Entry/Exit	No	Enabled	High
0x142F (5167)	**Last protection settings have not been applied**, page 175	Diagnostic	Entry/Exit	No	Enabled	Medium
0x140F (5135)	**Protection settings not accessible 1**, page 175	Diagnostic	Entry/Exit	No	Enabled	Medium
0x1474 (5236)	**Protection settings not accessible 2**, page 175	Diagnostic	Entry/Exit	No	Enabled	Medium
0x1473 (5235)	**Internal access loss. Reboot control unit**, page 175	Diagnostic	Entry/Exit	No	Enabled	Medium
0x1433 (5171)	**Replace internal battery**, page 175	Diagnostic	Entry/Exit	No	Enabled	Low
0x1437 (5175)	**Internal battery not detected**, page 175	Diagnostic	Entry/Exit	No	Enabled	Low
0x1436 (5174)	**Control unit memory degradation**, page 175	Diagnostic	Pulse	No	Enabled	Low
0x1409 (5129)	**Unable to read sensor plug**, page 172	Diagnostic	Entry/Exit	No	Enabled	High
0x0D00 (3328)	**Critical hardware modules discrepancy**, page 175	Diagnostic	Entry/Exit	No	Enabled	Medium
0x0D01 (3329)	**Critical firmware modules discrepancy**, page 175	Diagnostic	Entry/Exit	No	Enabled	Medium
0x0D02 (3330)	**Non-critical hardware modules discrepancy**, page 175	Diagnostic	Entry/Exit	No	Enabled	Medium
0x0D03 (3331)	**Non-critical firmware modules discrepancy**, page 175	Diagnostic	Entry/Exit	No	Enabled	Medium
0x0D09 (3337)	**Firmware discrepancy within control unit**, page 38	Diagnostic	Entry/Exit	No	Enabled	Medium
0x0D0A (3338)	**Invalid CU factory config. 1**, page 175	Diagnostic	Entry/Exit	No	Enabled	Low
0x1413 (5139)	**Ig test - no trip**, page 104	Diagnostic	Pulse	No	Enabled	High
0x142A (5162)	**Ig test launched**, page 104	Diagnostic	Pulse	No	Enabled	Low

Code	Event	History	Type	Latch	Activity	Severity
0x151B (5403)	**Ii test - no trip**, page 99	Diagnostic	Pulse	No	Enabled	High
0x151C (5404)	**Ii test button pressed**, page 99	Diagnostic	Pulse	No	Enabled	Low
0x1482 (5250)	**Sched. Manufact. maintenance within 3 months**, page 168	Diagnostic	Entry/Exit	No	Enabled	Medium
0x1440 (5184)	**Contact wear > 60%. Check contacts**, page 181	Diagnostic	Entry/Exit	No	Enabled	Medium
0x1441 (5185)	**Contact wear > 95%. Plan circuit breaker replacement**, page 181	Diagnostic	Entry/Exit	No	Enabled	Medium
0x1442 (5186)	**Contact wear > 100%. Replace circuit breaker**, page 181	Diagnostic	Entry/Exit	No	Enabled	Medium
0x150F (5391)	**Iron CT loss. Replace circuit breaker**, page 175	Diagnostic	Entry/Exit	No	Enabled	High
0x1517 (5399)	**Current unbalance > 50%. Check load balancing**, page 150	Diagnostic	Entry/Exit	No	Enabled	Low
0x1421 (5153)	**Invalid PowerTag communication**, page 205	Diagnostic	Entry/Exit	No	Enabled	Medium
0x1423 (5155)	**Loss of Zigbee communication with Gateway**, page 205	Diagnostic	Entry/Exit	No	Enabled	Low
0x1800 (6144)	**Communication lost with BCIM**, page 198	Diagnostic	Entry/Exit	No	Enabled	Medium
0x1802 (6146)	**BCIM in Critical Status**, page 198	Diagnostic	Entry/Exit	No	Enabled	Medium
0x1803 (6147)	**BCIM in non-Critical Status**, page 198	Diagnostic	Entry/Exit	No	Enabled	Medium

Operation Events

Code	Event	History	Type	Latch	Activity	Severity
0x0410 (1040)	**Opening order sent to MX voltage release**, page 191	Operation	Pulse	No	Enabled	Low
0x0411 (1041)	**Closing order sent to XF voltage release**, page 194	Operation	Pulse	No	Enabled	Low
0x1000 (4096)	**Circuit breaker opened**, page 191	Operation	Pulse	No	Enabled	Low
0x1001 (4097)	**Circuit breaker closed**, page 194	Operation	Pulse	No	Enabled	Low
0x1002 (4098)	**Manual mode enabled**, page 185	Operation	Pulse	No	Enabled	Low
0x1004 (4100)	**Local mode enabled**, page 185	Operation	Pulse	No	Enabled	Low

Code	Event	History	Type	Latch	Activity	Severity
0x1307 (4871)	**Alarm reset**, page 219	Operation	Pulse	No	Enabled	Low
0x112B (4395)	**Control unit firmware update mode**, page 38	Operation	Entry/Exit	No	Enabled	Low
0x112C (4396)	**Control unit firmware update unsuccessful**, page 38	Operation	Pulse	No	Enabled	Low
0x1107 (4359)	**Date and time set**, page 34	Operation	Pulse	No	Enabled	Low
0x1301 (4865)	**Connection on USB port**, page 203	Operation	Entry/Exit	No	Enabled	Low
0x1801 (6145)	**BCIM update unsuccessful**, page 198	Operation	Pulse	No	Enabled	Low

MicroLogic Active Replacement

What's in This Part

Presentation 232
Prepare the Replacement 234
Obtain Data from MicroLogic Active Control Unit 235
Prepare the MasterPacT MTZ1 Device 236
Prepare the MasterPacT MTZ2/MTZ3 Device 240
Replace MicroLogic Active Control Unit 243
Perform a Primary Injection Test 248
Perform a Secondary Injection Test 251
Test the Microswitch 252
Test the BCIM Module 253
Prepare Drawout MasterPacT MTZ Circuit Breaker for Setting 254
Set Replacement MicroLogic Active Control Unit 256

Presentation

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Do not install a MicroLogic Active control unit with version number less than 004.000.000 in a MasterPacT MTZ circuit breaker with performance level L1 or H3.

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

The replacement procedure described in this guide specifically applies to:

- The replacement of a MicroLogic Active control unit embedded in a MasterPacT MTZ circuit breaker, by another MicroLogic Active control unit.
- The removal and reinstallation of a MicroLogic Active control unit embedded in a MasterPacT MTZ circuit breaker, for example during the replacement of an accessory.

  NOTE: Replacement of a MicroLogic Active control unit in MasterPacT NT/NW circuit breakers must be carried out by accredited Schneider Electric Services representatives or accredited Schneider Electric certified partners.

In all cases, the replacement procedure must be followed by the compulsory tests to perform after reinstallation of the MicroLogic Active control unit.

Replacement Process

Stage	Description
1	Prepare the replacement, page 234.
2	Obtain data from the initial MicroLogic Active control unit, page 235.
3	On site, prepare the MasterPacT MTZ1 circuit breaker, page 236 or MasterPacT MTZ2/MTZ3 circuit breaker, page 240, before working on the equipment.
4	Replace the MicroLogic Active control unit, page 243.
5	Perform the test required after MicroLogic Active control unit replacement, page 232.
6	Prepare the drawout MasterPacT MTZ circuit breaker for setting, page 254.
7	Set data in the replacement MicroLogic Active control unit, page 256.

Test Required After MicroLogic Active Control Unit Replacement

Test requirement	Test description
Mandatory	Perform a primary injection test on each pole of the circuit breaker, page 248.
Mandatory	Perform a trip test, page 59.
Recommended	Perform a secondary injection test, page 251.
Recommended	Test the internal battery, page 23.
Recommended	If the microswitch is present, test the microswitch, page 252.

Test requirement	Test description
Recommended	If the BCIM module is present, test circuit breaker communication, page 253.
Recommended	If the BCIM module is present and remote control of the circuit breaker is enabled, test the remote control operation, page 253.

MicroLogic Active Replacement Video

To access a demonstration video about replacement of a MicroLogic Active control unit, click here, scan the QR code, or copy and paste the link to your Web browser:

https://youtu.be/IcEhHBog9GM

Prepare the Replacement

Replacement MicroLogic Active Control Units

For equivalent features the MicroLogic Active control unit can be replaced by a MicroLogic Active control unit with the same part number, or it can be upgraded with the corresponding spare MicroLogic Active control unit described in the following table.

Initial MicroLogic Active control unit		Replacement MicroLogic Active control unit	
Description	**Part number**	**Description**	**Part number**
MicroLogic Active 2.0 A control unit	LV933071	MicroLogic Active 2.0 E spare part	LV947600SP
MicroLogic Active 5.0 A control unit	LV933072	MicroLogic Active 6.0 E spare part	LV947603SP
MicroLogic Active 6.0 A control unit	LV933073	MicroLogic Active 6.0 E spare part	LV947603SP
MicroLogic Active 2.0 Econtrol unit	LV947600	MicroLogic Active 2.0 E spare part	LV947600SP
MicroLogic Active 5.0 E control unit	LV947602	MicroLogic Active 6.0 E spare part	LV947603SP
MicroLogic Active 6.0 E control unit	LV947603	MicroLogic Active 6.0 E spare part	LV947603SP
MicroLogic Active 6.0 Ei control unit	LV949603	MicroLogic Active 6.0 Ei spare part	LV949603SP
MicroLogic Active 2.0 AP control unit with Zigbee wireless communication	LV933071W	MicroLogic Active 2.0 EP spare part	LV947600WSP
MicroLogic Active 5.0 AP control unit with Zigbee wireless communication	LV933072W	MicroLogic Active 6.0 EP spare part	LV947603WSP
MicroLogic Active 6.0 AP control unit with Zigbee wireless communication	LV933073W	MicroLogic Active 6.0 EP spare part	LV947603WSP
MicroLogic Active 2.0 AP control unit with Zigbee wireless communication	LV947600W	MicroLogic Active 2.0 EP spare part	LV947600WSP
MicroLogic Active 5.0 AP control unit with Zigbee wireless communication	LV947602W	MicroLogic Active 6.0 EP spare part	LV947603WSP
MicroLogic Active 6.0 AP control unit with Zigbee wireless communication	LV947603W	MicroLogic Active 6.0 EP spare part	LV947603WSP

Ordering Spare Parts

Use the MySchneider app, page 33 to order spare parts.

Obtain Data from MicroLogic Active Control Unit

The settings can be retrieved from the MicroLogic Active control unit, by manually noting the settings displayed:

- On the MicroLogic Active HMI
- In EcoStruxure Power Device app

Prepare the MasterPacT MTZ1 Device

Safety Instructions

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, NOM 029-STPS, or local equivalent.
- Manufacturer maintenance and repair activities must be conducted only by accredited Schneider Electric Services representatives or accredited Schneider Electric certified partners. Accreditation requires attending Manufacturer training at one of the Schneider Electric training centers.
- Unless specified otherwise in the maintenance procedures, all operations (inspection, test, and preventive maintenance) must be carried out with the device, the chassis, and the auxiliary circuits de-energized.
- Check that the device and the chassis are de-energized on the upstream and downstream terminals.
- Always use a properly rated voltage sensing device to confirm that the device, the chassis, and the auxiliary circuits are de-energized.
- Install safety barriers and display a danger sign.
- During the tests, it is strictly forbidden for anyone to touch the device, the chassis, or the conductors while voltage is applied.
- Before turning on power to this equipment, check that all connections are made with the correct tightening torque and the device is open (OFF position).
- Before turning on power to this equipment, put all devices, doors, and covers back in place.
- Before turning on power to this equipment, beware of potential hazards and carefully inspect the work area for tools and objects that may have been left inside the equipment.

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

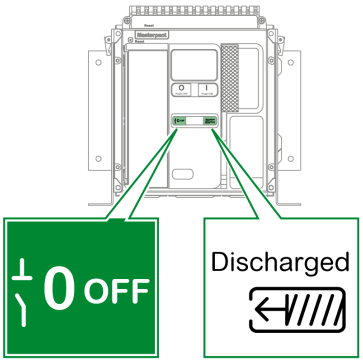
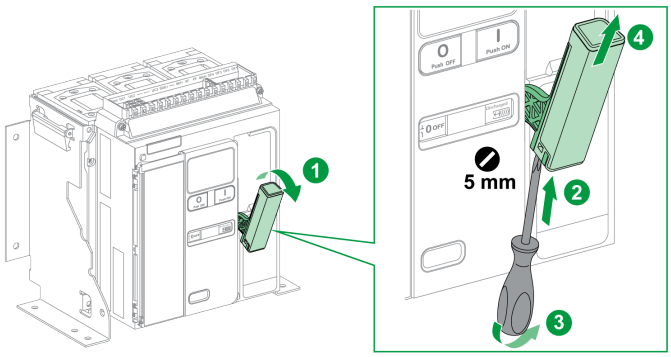
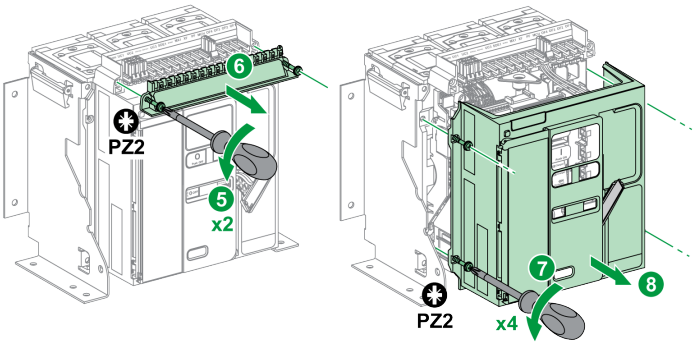
Procedure Definition

Procedure characteristics	Description
Action	Carry out preliminary operations before replacing the MicroLogic Active control unit in a MasterPacT MTZ1 device.
Goal	Put the MasterPacT MTZ1 device in a safe environment before working on it.
Necessary tools	• 5 mm flat-headed screwdriver • PZ2 screwdriver
Reference documents, page 10	DOCA0284•• *MasterPacT MTZ1 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide*

Prepare the Fixed MasterPacT MTZ1 Devices

Before working on the equipment, always manually open the circuit breaker by pressing the opening pushbutton. This helps to prevent the circuit breaker from

opening automatically when you remove the MicroLogic Active control unit with the circuit breaker closed.

Step	Action
1	Turn off all power supplying the equipment before working on or inside the equipment.
2	Use a properly rated voltage sensing device to confirm that power is off.
3	Press the opening pushbutton to open the device.
4	Check that the position indicators show that the device is **OFF** and that the mechanism is discharged. 
5	Remove the rubber cover from the spring charging handle. 
6	Remove the front cover of the terminal blocks and the front cover of the device. 

Prepare the Drawout MasterPacT MTZ1 Devices

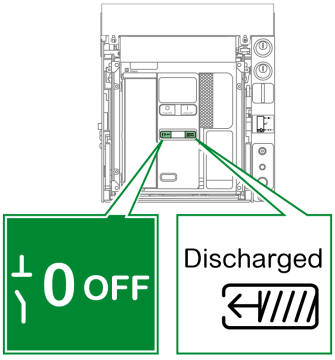
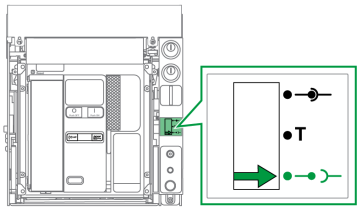
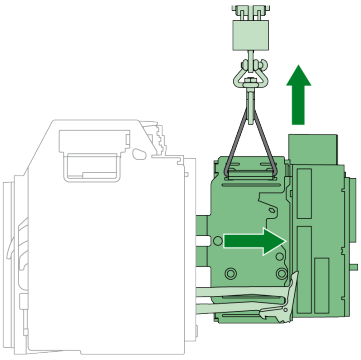
⚠ DANGER

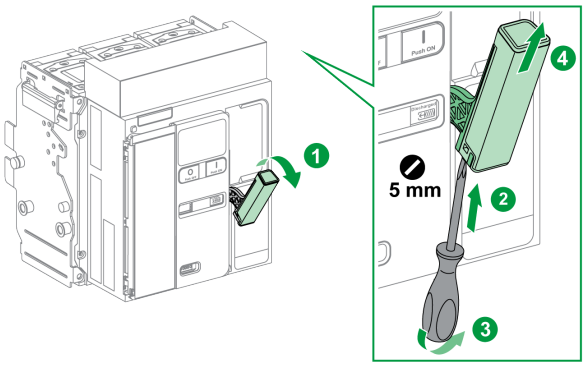
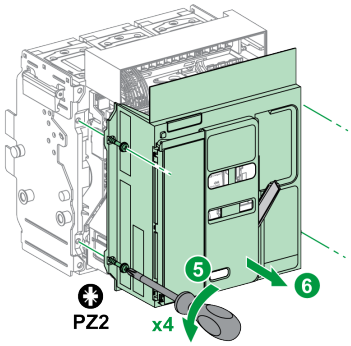
HAZARD OF DEVICE FALLING

- Be sure that lifting equipment has lifting capacity for the device being lifted.
- Follow manufacturer's instructions for use of lifting equipment.
- Wear hard hat, safety shoes, and heavy gloves.

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

Before working on the equipment, always manually open the circuit breaker by pressing the opening pushbutton. This helps to prevent the circuit breaker from opening automatically when you remove the MicroLogic Active control unit with the circuit breaker closed.

Step	Action
1	Turn off all power supplying the equipment before working on or inside the equipment.
2	Use a properly rated voltage sensing device to confirm that power is off.
3	Press the opening pushbutton to open the device.
4	Check that the position indicators show that the device is **OFF** and that the mechanism is discharged. 
5	Rack out the device and check that it is in the disconnected position. 
6	Remove the device from the chassis. 

Step	Action
7	Remove the rubber cover from the spring charging handle. 
8	Remove the front cover of the device. 

Prepare the MasterPacT MTZ2/MTZ3 Device

Safety Instructions

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, NOM 029-STPS, or local equivalent.
- Manufacturer maintenance and repair activities must be conducted only by accredited Schneider Electric Services representatives or accredited Schneider Electric certified partners. Accreditation requires attending Manufacturer training at one of the Schneider Electric training centers.
- Unless specified otherwise in the maintenance procedures, all operations (inspection, test, and preventive maintenance) must be carried out with the device, the chassis, and the auxiliary circuits de-energized.
- Check that the device and the chassis are de-energized on the upstream and downstream terminals.
- Always use a properly rated voltage sensing device to confirm that the device, the chassis, and the auxiliary circuits are de-energized.
- Install safety barriers and display a danger sign.
- During the tests, it is strictly forbidden for anyone to touch the device, the chassis, or the conductors while voltage is applied.
- Before turning on power to this equipment, check that all connections are made with the correct tightening torque and the device is open (OFF position).
- Before turning on power to this equipment, put all devices, doors, and covers back in place.
- Before turning on power to this equipment, beware of potential hazards and carefully inspect the work area for tools and objects that may have been left inside the equipment.

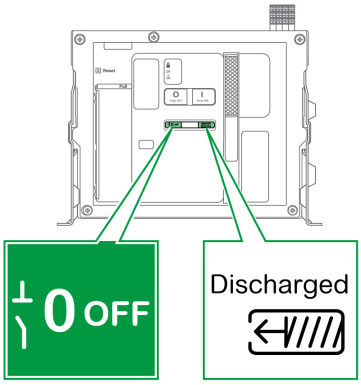
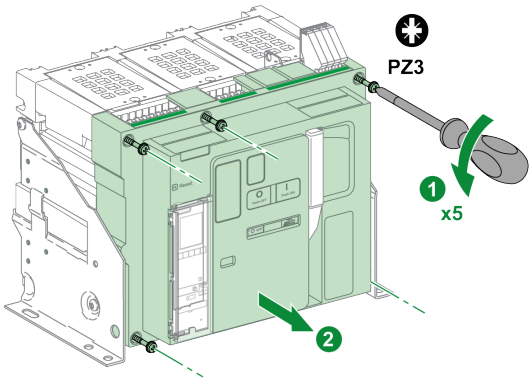
Failure to follow these instructions will result in death or serious injury.

Procedure Definition

Procedure characteristics	Description
Action	Carry out preliminary operations before replacing the MicroLogic Active control unit in a MasterPacT MTZ2/MTZ3 device.
Goal	Put the MasterPacT MTZ2/MTZ3 device in a safe environment before working on it.
Necessary tools	PZ3 screwdriver
Reference documents, page 10	DOCA0285•• *MasterPacT MTZ2/MTZ3 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide*

Prepare the Fixed MasterPacT MTZ2/MTZ3 Devices

Before working on the equipment, always manually open the circuit breaker by pressing the opening pushbutton. This helps to prevent the circuit breaker from opening automatically when you remove the MicroLogic Active control unit with the circuit breaker closed.

Step	Action
1	Turn off all power supplying the equipment before working on or inside the equipment.
2	Use a properly rated voltage sensing device to confirm that power is off.
3	Press the opening pushbutton to open the device.
4	Check that the position indicators show that the device is **OFF** and that the mechanism is discharged. 
5	Remove the front cover of the device. 

Prepare the Drawout MasterPacT MTZ2/MTZ3 Devices

⚠ DANGER

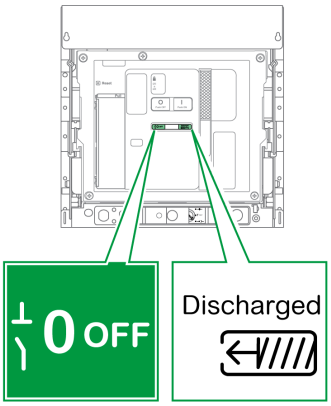
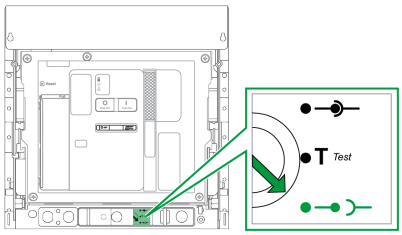
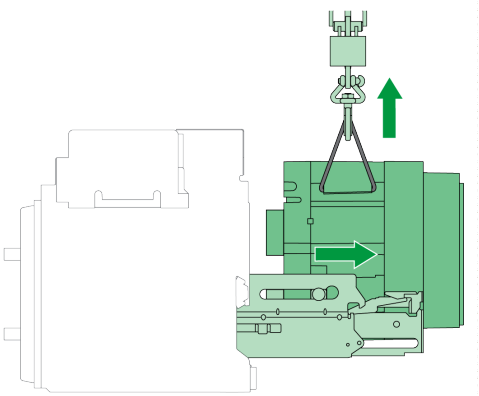
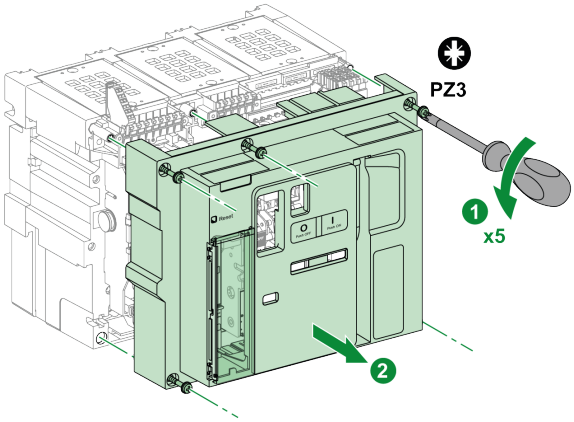
HAZARD OF DEVICE FALLING

- Be sure that lifting equipment has lifting capacity for the device being lifted.
- Follow manufacturer's instructions for use of lifting equipment.
- Wear hard hat, safety shoes, and heavy gloves.

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

Before working on the equipment, always manually open the circuit breaker by pressing the opening pushbutton. This helps to prevent the circuit breaker from opening automatically when you remove the MicroLogic Active control unit with the circuit breaker closed.

Step	Action
1	Turn off all power supplying the equipment before working on or inside the equipment.
2	Use a properly rated voltage sensing device to confirm that power is off.
3	Press the opening pushbutton to open the device.

Step	Action
4	Check that the position indicators show that the device is **OFF** and that the mechanism is discharged. 
5	Rack out the device and check that it is in the disconnected position. 
6	Remove the device from the chassis. 
7	Remove the front cover of the device. 

Replace MicroLogic Active Control Unit

Safety Instructions

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, NOM 029-STPS, or local equivalent.
- Manufacturer maintenance and repair activities must be conducted only by accredited Schneider Electric Services representatives or accredited Schneider Electric certified partners. Accreditation requires attending Manufacturer training at one of the Schneider Electric training centers.
- Unless specified otherwise in the maintenance procedures, all operations (inspection, test, and preventive maintenance) must be carried out with the device, the chassis, and the auxiliary circuits de-energized.
- Check that the device and the chassis are de-energized on the upstream and downstream terminals.
- Always use a properly rated voltage sensing device to confirm that the device, the chassis, and the auxiliary circuits are de-energized.
- Install safety barriers and display a danger sign.
- During the tests, it is strictly forbidden for anyone to touch the device, the chassis, or the conductors while voltage is applied.
- Before turning on power to this equipment, check that all connections are made with the correct tightening torque and the device is open (OFF position).
- Before turning on power to this equipment, put all devices, doors, and covers back in place.
- Before turning on power to this equipment, beware of potential hazards and carefully inspect the work area for tools and objects that may have been left inside the equipment.

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

Procedure Definition

Procedure characteristics	Description
Action	• Remove a MicroLogic Active control unit from a MasterPacT circuit breaker and install a replacement one. • Remove a MicroLogic Active control unit from a MasterPacT circuit breaker and reinstall it after installation of an accessory.
Goal	• Replace a MicroLogic Active control unit. • Install an accessory.
Frequency	On demand
Special indications	–

Procedure characteristics	Description
Necessary tools	• PZ1 screwdriver • Thin flat-headed screwdriver • Adjustable external AC/DC power supply • Torx T20 screwdriver
Reference documents, page 10	• DOCA0284•• *MasterPacT MTZ1 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide* • DOCA0285•• *MasterPacT MTZ2/MTZ3 IEC Circuit Breakers with MicroLogic Active Control Unit - User Guide* • DOCA0306•• *MasterPacT MTZ IEC Circuit Breakers with MicroLogic Active Control Unit - End-User Maintenance Procedures*

Removal Procedure

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Do not damage any wire in a wiring loom. Any damage may require the replacement of the wiring loom or the breaking block.

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

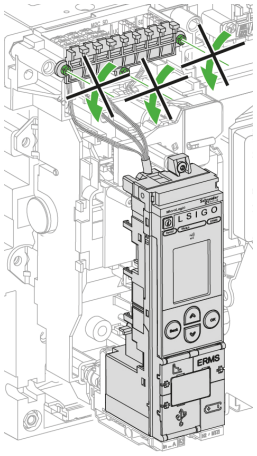
⚠CAUTION

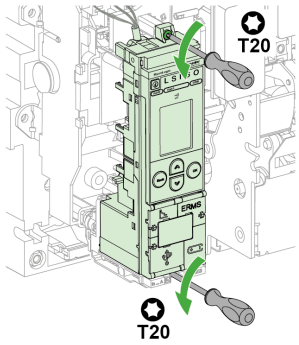
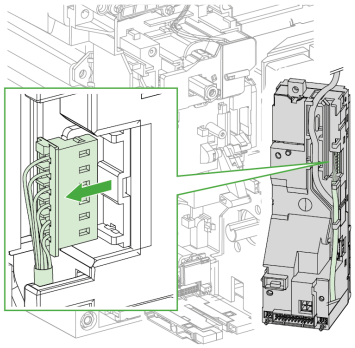
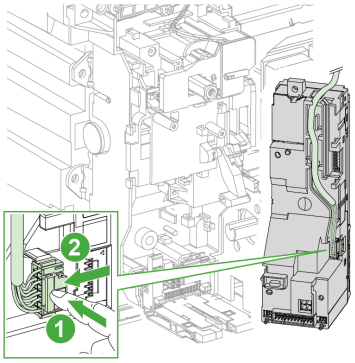
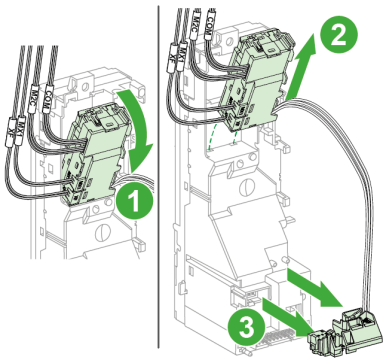
DISCONNECTED OR LOOSE WIRES

While removing a terminal block, pull it by holding the sides, not the wires.

Failure to follow these instructions can result in injury or equipment damage.

The following procedure applies to MasterPacT MTZ1 and MasterPacT MTZ2/MTZ3 circuit breakers, unless otherwise indicated.

Step	Action	Illustration
1	Before working on the equipment, prepare the MasterPacT MTZ1 circuit breaker, page 236 or MasterPacT MTZ2/MTZ3 circuit breaker, page 240. **NOTE:** There is no need to unscrew the terminal blocks cover. It is recommended to keep it in place.	
2	Remove and dispose of the battery in accordance with end-of-life instructions.	

Step	Action	Illustration
3	Unscrew the two screws of the MicroLogic Active control unit by using a Torx T20 screwdriver.	
4	Carefully extract the MicroLogic Active control unit. There is no need to remove the performer and sensor plugs.	
5	Unclip the optional microswitch connector on the top left side, on the back of the MicroLogic Active control unit.	
6	Unclip the connector on the bottom left side on the back of the MicroLogic Active control unit, by pressing the connector clip. Extract the wiring from its housing and keep it for installation of the new MicroLogic Active control unit.	
7	If the optional BCIM module is installed: 1. Unclip the BCIM module from the back of the MicroLogic Active control unit. 2. Lift out the BCIM module. 3. Unclip the BCIM connector from the back of the MicroLogic Active control unit.	
8	Dispose of the MicroLogic Active control unit in accordance with the end-of-life instructions.	

Installation Procedure

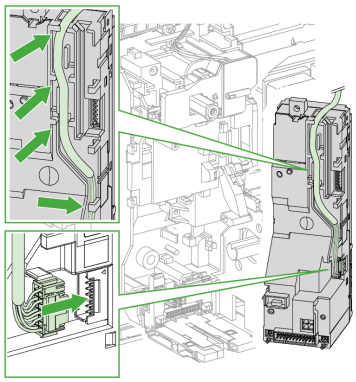
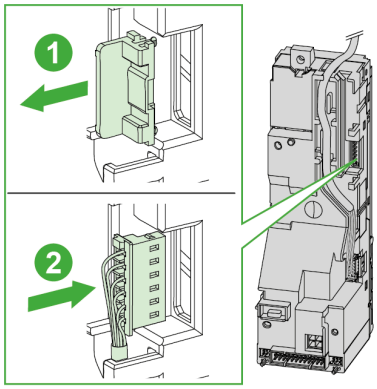
DANGER

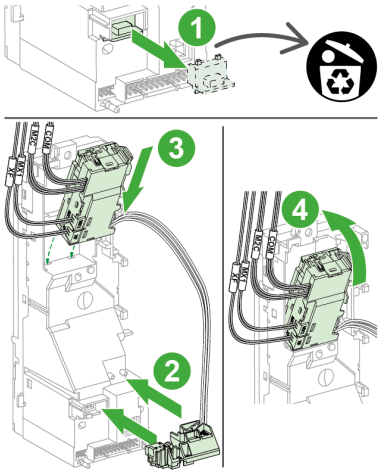
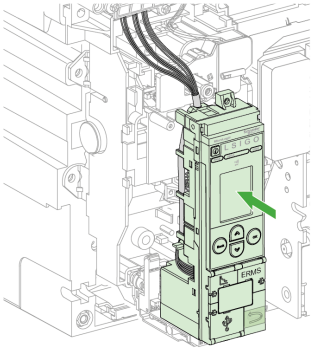
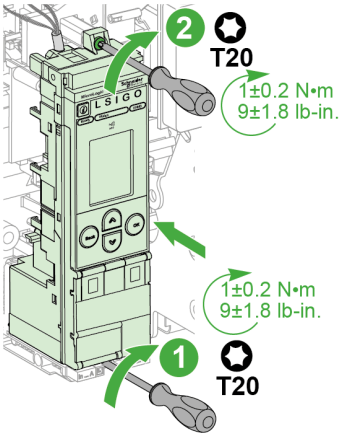
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Do not damage the wires in a wiring loom. Any damage may require the replacement of the wiring loom or the breaking block.
- Tighten the MicroLogic Active control unit screws to a torque of 1 +/-0.2 N•m (9 +/-1.8 lb-in).

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

The following procedure applies to MasterPacT MTZ1 and MasterPacT MTZ2/MTZ3 circuit breakers, unless otherwise indicated.

Step	Action	Illustration
1	Check the commercial reference, page 234 of the MicroLogic Active control unit.	
2	Remove the battery strip to activate the battery, as described in the instruction sheets for MasterPacT MTZ circuit breakers, page 10.	
3	Check the battery by using the button, page 23	
4	Clip the connector on the bottom left side on the back of the MicroLogic Active control unit. Route the wiring through its housing.	
5	If the optional microswitch connector was installed: 1. Remove the microswitch housing cover from the replacement MicroLogic Active control unit. 2. Clip the microswitch connector on the top left side, on the back of the MicroLogic Active control unit.	

Step	Action	Illustration
6	If the optional BCIM module was installed: 1. Remove and dispose of the BCIM connector cover on the back of the replacement MicroLogic Active control unit. 2. Clip the BCIM connector on the back of the MicroLogic Active control unit. 3. Place the BCIM module in the slot provided on the back of the MicroLogic Active control unit. 4. Clip the BCIM module on the back of the MicroLogic Active control unit.	
7	Carefully install the MicroLogic Active control unit onto the base without damaging or pinching the wires.	
8	While applying pressure to the control unit, tighten the MicroLogic Active screws by using a Torx T20 screwdriver: 1. Tighten the bottom screw to a torque of 1 +/-0.2 N•m (9 +/-1.8 lb-in). 2. Tighten the top screw to a torque of 1 +/-0.2 N•m (9 +/-1.8 lb-in).	
9	Perform a manual opening/closing of the circuit breaker, (follow procedure Mechanism NII_ZA_2 in *MasterPacT MTZ IEC Circuit Breakers with MicroLogic Active Control Unit - End-User Maintenance Procedures*).	
10	Reinstall the front cover of the circuit breaker.	

Perform a Primary Injection Test

Description

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

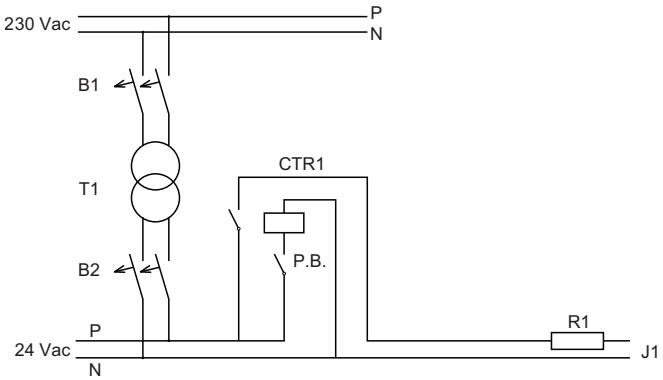
Perform a primary injection test on each pole of the circuit breaker to check that the MicroLogic Active control unit is able to provide standard protection functions.

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

A primary injection test on each pole of the circuit breaker is mandatory to check that trip system connections have been correctly made and that the MicroLogic Active control unit is able to provide standard protection functions, for example tripping the circuit breaker in case of an electrical network incident. The test is performed by injecting a controlled current from an external power source, into the primary circuit of the circuit breaker.

Preparing the Primary Injection Test

A wiring diagram of the primary injection test kit for MasterPacT MTZ1 and MasterPacT MTZ2 circuit breakers is illustrated below.



Use 2.5 mm² cables between R1 and CTR1.

B1	MCB circuit breaker 10 A
T1	Transformer 250 VA
B2	MCB circuit breaker 16 A
CTR1	Control relay
P.B.	Pushbutton
R1	Resistance 300 W - 2.2 Ohms
J1	Jaws for connection to the upstream and equivalent downstream of one pole

Bill of Materials

Schneider Electric recommends the following components for the primary injection test kit for MasterPacT MTZ1 and MasterPacT MTZ2 circuit breakers.

Schematic reference	Item	Supplier	Reference	Quantity
B1	Circuit breaker DT40 – 10 A + Vigi 30 mA	Schneider Electric	A9D55610	1
T1	Transformer 250VA 220 Vac – 24 Vac	BLOCK	FST 250/24	1
B2	Circuit breaker DT40 – 16 A + Vigi 30 mA	Schneider Electric	A9N21025+ A9N21454	1
CTR1	Auxiliary Zelio relay	Schneider Electric	RSB2A080B7	1
P.B	Pushbutton with normally open contact	Schneider Electric	XB4BL41	1
R1	Resistor 2.2 ohms – 300 W	WIDAP	160169	1
		Conrad	1525215	1
J1	Jaws	GRELUMA	ZL373LUM	2
–	Terminal block for multimeter connection	Schneider Electric	47075	2

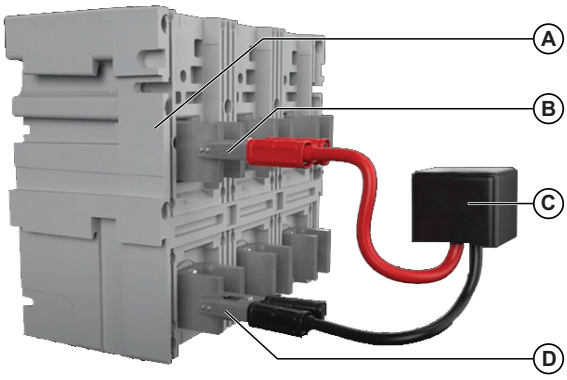
NOTE: For the MasterPacT MTZ3 primary injection test kit, contact Schneider Electric Customer Care.

Performing the Primary Injection Test

Perform this test on each pole of the circuit breaker.

Step	Action
1	Disconnect the circuit breaker from the switchboard network before starting.
2	Charge the mechanism by pulling the spring charging handle down seven times.
3	Close the circuit breaker by pressing the closing pushbutton on the front of the circuit breaker.
4	Connect the primary circuit of the circuit breaker to the kit using the jaws (J1), as shown in the wiring diagram above. • Use 10 A 24 Vac for MasterPacT MTZ1 and MasterPacT MTZ2 circuit breakers. • Use 30 A 24 Vac for MasterPacT MTZ3 circuit breakers. Connect the external power source to the upstream and downstream of one pole.
5	• Connect the positive probe of the multimeter to M1 on the UC1 terminal block. • Connect the negative probe of the multimeter to M3 on the UC2 terminal block.
6	Press the pushbutton to inject current into the circuit breaker.
7	Wait until the voltage reading is greater than 1 Vdc.
8	The test passes if the measured voltage is greater than 1 Vdc.

Example of a Primary Injection Test Kit



A	Circuit breaker block
B	Jaw connected to upstream pole
C	Primary injection test kit
D	Jaw connected to downstream pole

Perform a Secondary Injection Test

Description

A secondary injection test is recommended to check long-time, short-time and instantaneous overcurrent protection functions. The secondary injection test is performed by running the automatic trip curve test function of EcoStruxure Power Commission software.

Preparing the Secondary Injection Test

Necessary tools for the secondary injection test:

- A PC running EcoStruxure Power Commission software
- A USB-A to USB-C cable (RS PRO, reference: 251-3298)

Performing the Secondary Injection Test

Follow this procedure to run the automatic trip curve test using simulated secondary injection.

Step	Action
1	Close the circuit breaker.
2	If the circuit breaker is equipped with an MN undervoltage release, either connect it to the power supply with its rated voltage or remove the MN undervoltage release.
3	Use a cable to connect a PC running EcoStruxure Power Commission software, to the USB-C port on the front face of the MicroLogic Active control unit.
4	On EcoStruxure Power Commission software, select the circuit breaker and connect to it.
5	In the **Device Check up** section, click the **Device** tab.
6	Select the **Automatic Trip Test** section.
7	Select **Preconfigured test point**.
8	Select the overcurrent protection to be tested.
9	Click **Run Test**.
10	Check that the circuit breaker trips.
11	Check that the blue fault-trip reset button has popped out
12	Check that the related trip cause LED is blinking red.
13	Check the SDE contacts have switched.
14	After the test, reset the circuit breaker.

Test the Microswitch

If the microswitch is present, it is recommended to test the microswitch.

Test the Microswitch by Using ULP Wired Communication

Test the microswitch by verifying that the status of the circuit breaker can be read from the Modbus tables.

For more information, refer to DOCA0384•• *MasterPacT, ComPacT, PowerPacT Circuit Breakers - Modbus Communication - User Guide*, page 10

Test the Microswitch by Using Zigbee Wireless Communication

For MicroLogic Active AP/EP control units, test the microswitch by verifying that the status of the circuit breaker is available on Panel Server webpages.

Step	Action
1	Select the **Monitoring & Control** menu on Panel Server webpages.
2	Select the MasterPacT MTZ circuit breaker with MicroLogic Active AP/EP control unit to test, from the list of connected devices.
3	Check the circuit breaker status.
4	If the circuit breaker status (open or closed), displayed on Panel Server webpages does not match the actual status of the circuit breaker, the microswitches are not correctly connected to the MicroLogic Active AP/EP control unit. Repeat the procedure to replace the control unit, page 243. If the problem persists, contact your Schneider Electric Services representative.

Test the BCIM Module

Test the BCIM Module by Using Wired Communication

If the BCIM module is present, it is recommended to test circuit breaker communication.

Use the Modbus end-user client to test the communication network between the communicating devices of the project:

- Circuit breakers connected to the Ethernet network through an IFE or EIFE Ethernet interface.
- Circuit breakers connected to a Modbus serial line network from an IFM interface.
- Circuit breakers connected to a Modbus serial line network through an IFM interface stacked to an IFE Ethernet server.

Step	Action
1	With the circuit breaker in the closed position, read the Modbus Circuit Breaker Status register to check that the circuit breaker status indicates closed.
2	Press the opening pushbutton on the front of the circuit breaker.
3	Read the Modbus Circuit Breaker Status register to check that the circuit breaker status indicates open.

For more information, refer to DOCA0384•• *MasterPacT, ComPacT, PowerPacT Circuit Breakers - Modbus Communication - User Guide*, page 10

Test the BCIM Module by Performing Remote Control Operations

If the BCIM module is present and remote control of the circuit breaker is enabled, it is recommended to test the remote control operations.

Step	Action
1	Close the circuit breaker.
2	Make sure the MicroLogic Active control unit and BCIM module are powered.
3	Connect the BCIM IO channels to external pushbuttons: • BCIM IO channel 1 is used for the opening action. • BCIM IO channel 2 is used for the closing action.
4	Select **Open/Close** on the MicroLogic Active display screen at **Configuration > BCIM > IO Settings > IO Mode**.
5	Open the circuit breaker by pressing the external pushbutton connected to BCIM IO channel 1.
6	Check that the circuit breaker is open.
7	Close the circuit breaker by pressing the external pushbutton connected to BCIM IO channel 2.
8	Check that the circuit breaker is closed.

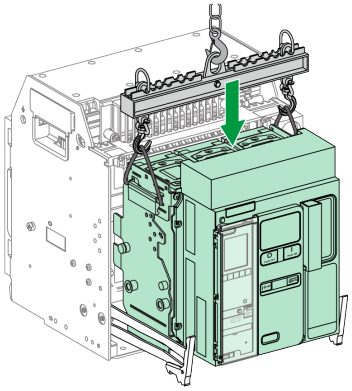
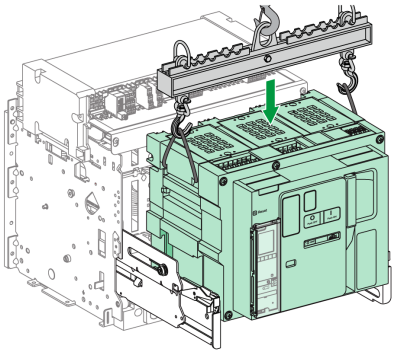
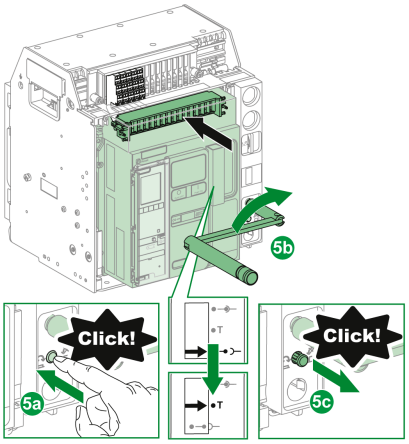
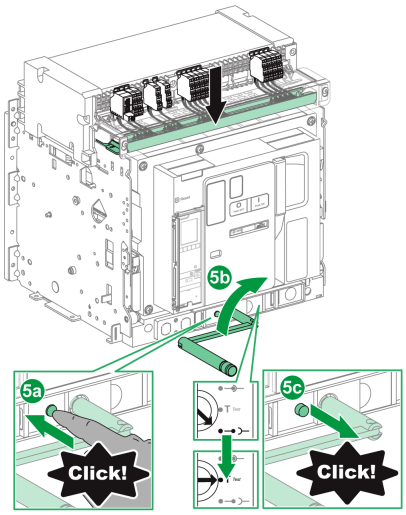
Prepare Drawout MasterPacT MTZ Circuit Breaker for Setting

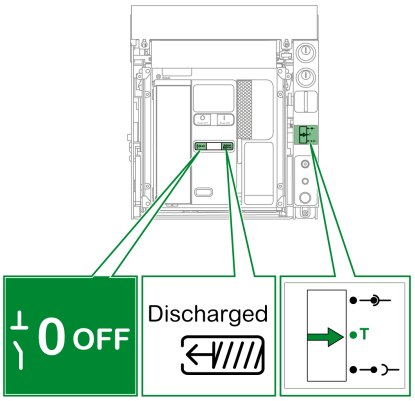
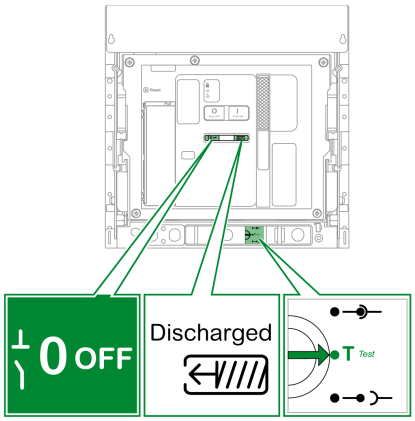
⚠ DANGER

HAZARD OF DEVICE FALLING

- Be sure that lifting equipment has lifting capacity for the device being lifted.
- Follow manufacturer's instructions for use of lifting equipment.
- Wear hard hat, safety shoes, and heavy gloves.

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

Step	Action
1	Use a properly rated voltage sensing device to confirm that power is off.
2	Install the circuit breaker in the chassis.  
3	Rack-in the circuit breaker in Test position.  
4	Check that the position indicators show that the circuit breaker is **OFF**, in test position, and the mechanism is discharged.

Step	Action
	 

Set Replacement MicroLogic Active Control Unit

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- The replacement MicroLogic Active control unit must be configured and protections must be set before turning on power to the equipment.
- The replacement MicroLogic Active control unit must be configured and set only by qualified personnel, using the results of the installation protection system study.
- During commissioning of the installation and following any modification, check that the MicroLogic Active configuration and protection function settings are consistent with the results of this study.

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

After completing the replacement, parameters must be set into the replacement MicroLogic Active control unit. The setting procedure varies according to the type of replacement.

Setting After Replacement of MicroLogic Active Control Unit

Step	Action
1	Check that the battery strip has been removed.
2	If installed, configure the BCIM module, page 257.
3	Set the circuit breaker information, page 256 for the replacement MicroLogic Active E/EP/Ei control unit on the MicroLogic Active HMI.
4	Manually configure the protection settings and other settings of the replacement MicroLogic Active E/EP/Ei control unit on the MicroLogic Active HMI. • Set the date and time. • Set the protection settings available according to the type of MicroLogic Active control unit, and defined by the installation protection system study. See Standard Protection Setting Procedure, page 60. • Set the characteristics of the local network. See MicroLogic Active Network Settings, page 154. • Set the other settings, defined by the application.
5	In the case of replacement of MicroLogic Active 5.0 A/E control unit by MicroLogic Active 6.0 E control unit, or replacement of MicroLogic Active 5.0 AP/EP control unit by MicroLogic Active 6.0 EP control unit, manually disable ground-fault protection with EcoStruxure Power Commission software.

Set the Circuit Breaker Information

Step	Action
1	Set the circuit breaker information on the MicroLogic Active display screen, from the tree navigation menu, at **Maintenance** > **Replacement**, page 74.
2	Scroll down to **Manuf. Maint** to set the number of months since the last manufacturer maintenance.

Step	Action
3	Scroll down to **Contact Wear** to set the wear of the contacts as a percentage. Use the contact wear previously read from the initial MicroLogic Active control unit.
4	Scroll down to **ID** to set the identification parameters of the circuit breaker. Select the correct value from each menu: • **Range**: select the circuit breaker range • **Rating**: select the circuit breaker rating • **Performance**: select the circuit breaker performance Read the rating plate on the front cover of the circuit breaker to obtain the relevant information. If an invalid circuit breaker configuration is entered, a pop-up message appears, asking you to review the parameters.

Configure the BCIM Module

Step	Action
1	Configure the BCIM module on the MicroLogic Active display screen, from the tree navigation menu, at **Configuration** > **BCIM**, page 76.
2	Scroll down to **BCIM** to indicate the presence of the BCIM module in the circuit breaker.
3	Scroll down to **Coil XF** to enable control of the XF communicating closing voltage release by the BCIM module.
4	Scroll down to **Coil MX** to enable control of the MX communicating opening voltage release by the BCIM module.

Appendices

What's in This Part

Licensing Information 259

Licensing Information

Licensing Information for Cryptographic Software

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DOCA0265EN-08