Pact Series

MasterPact MTZ - MicroLogic B Trip Unit

User Guide

Pact Series offers world-class breakers and switches.

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

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

NOTICE

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

Please Note

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

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

About the Book

Document Scope

The aim of this guide is to provide users, installers, and maintenance personnel with the technical information needed to operate MicroLogic[™] B trip units in MasterPact[™] MTZ circuit breakers.

This guide applies to the following MicroLogic B trip units.

Trip units	Commercial reference						
MicroLogic 2.0 B	LV855192						
MicroLogic 5.0 B	LV855193						
MicroLogic 6.0 B	LV855194						
NOTE: The commercial reference is printed on the front face of the MicroLogic B trip unit.							

Related Documents

Title of documentation	Reference number
MasterPact MTZ1/MTZ2 Fixed Circuit Breakers with MicroLogic B Trip Unit - Instruction Sheet	QGH71263
MasterPact MTZ1/MTZ2 Drawout Circuit Breakers with MicroLogic B Trip Unit - Instruction Sheet	QGH58090

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

Introduction to the MicroLogic B Trip Unit

Pact Series Master Range

Future-proof your installation with Schneider Electric's low-voltage and mediumvoltage 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.

MicroLogic B Trip Unit: Presentation

MicroLogic B Trip Units - Overview

MasterPact MTZ circuit breakers with MicroLogic B trip units provide protection functions.

The MicroLogic B trip units are:

- MicroLogic 2.0 B
- MicroLogic 5.0 B
- MicroLogic 6.0 B

Range of MicroLogic B Trip Units

The following table indicates the functions available on MasterPact MTZ circuit breakers with MicroLogic B trip units:

	MicroLogic 2.0 B	MicroLogic 5.0 B	MicroLogic 6.0 B
Commercial reference	LV855192	LV855193	LV855194
Long-time overcurrent protection (L)	1	1	1
Short-time overcurrent protection (S)	-	1	1
Instantaneous overcurrent protection (I)	1	1	1
Ground-fault protection (G)	-	-	1
Neutral protection on 4P circuit breakers	1	1	1
Overload LED	1	1	1
Trip cause indicators	-	-	1

MicroLogic B Trip Unit: Description

MicroLogic 2.0 B Trip Unit Description



A. Top fastener

- B. Lead seal fixture for protective cover
- C. Connection with circuit breaker
- D. Protective cover
- E. Bottom fastener
- F. Cover opening point
- G. Long-time rating plug
- H. Screw for long-time rating plug
- I. Long-time current setting Ir
- J. Long-time time delay tr
- K. Short-time pickup Isd
- L. QR code, trip unit type, and identification number
- M. Test connector
- N. Overload indication LED

MicroLogic 5.0 B Trip Unit Description



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N)

- B. Lead seal fixture for protective cover
- C. Connection with circuit breaker
- D. Protective cover
- E. Bottom fastener

A. Top fastener

- F. Cover opening point
- G. Long-time rating plug
- H. Screw for long-time rating plug
- I. Long-time current setting Ir
- J. Long-time time delay tr
- K. Short-time pickup Isd
- L. Short-time time delay tsd
- M. Instantaneous pickup li
- N. QR code, trip unit type, and identification number
- O. Test connector
- P. Overload indication LED

MicroLogic 6.0 B Trip Unit Description







- A. Top fastener
- B. Terminal block for external connections
- C. Housing for battery
- D. Lead seal fixture for protective cover
- E. Connection with circuit breaker
- F. Protective cover
- G. Bottom fastener
- H. Cover opening point
- I. Long-time rating plug
- J. Screw for long-time rating plug
- K. Long-time current setting Ir
- L. Long-time time delay tr
- M. Short-time pickup Isd
- N. Short-time time delay tsd
- O. Ground-fault pickup Ig
- P. Ground-fault time delay tg
- Q. Test connector
- R. Test button for ground-fault protection
- S. Instantaneous pickup li
- T. Overload indication LED
- U. QR code, trip unit type and identification number
- V. Test/Reset button
- W. Auto-protection trip cause indication LED
- X. Ground-fault trip cause indication LED
- Y. Short-time trip cause indication LED
- Z. Long-time trip cause indication LED

Overload Indication LED

LED	Description
	Overload alarm: the load exceeds 105% of the Ir setting of the long-time protection.

QR Code

When the QR code on the front face of a MicroLogic B trip unit is scanned with a smartphone running a QR code reader and connected to the Internet, the Go2SE landing page is displayed, page 15. The landing page displays some information about the device and a list of menus.

Trip Unit Identification Number

The identification number 0000PPYYWWDLxxxxLV8 is made up as follows:

- Serial number of the MicroLogic B trip unit in the format:
 - 0000PP = 0000 + Plant Code (6 alphanumeric characters)
 - YY = Year of manufacture
 - WW = Week of manufacture
 - D = Day of the week of manufacture (Monday = 1)
 - L = Line or machine number (alphanumeric characters)
 - xxxx = Unique product number during the day D
- Commercial reference of the MicroLogic B trip unit (8 alphanumeric characters): LV8
 LV8

Trip Unit Type

This code indicates the type of MicroLogic trip unit, page 8:

- The number (for example, 6.0) defines the types of protection provided by the trip unit.
- The letter (B) identifies the range of the trip unit.

Sensor Plug

The protection ranges depend on the rated current In, defined by the sensor plug, page 16 present below the MicroLogic B trip unit.

Long-time Rating Plug

Four interchangeable long-time rating plugs, page 20 may be used to limit the long-time pickup setting range for higher accuracy.

Trip Cause Indication LED (MicroLogic 6.0 B)

LED	Description
MICROLOGIC Micrologic Microl	Trip due to long-time protection
MICROLOGIC • V Vit Vit Vit Vit Vit Vit Vit Vit Vit V	Trip due to short-time protection
MICROLOGIC	Trip due to ground-fault protection
MICROLOGIC • • • • • • • • • • • • • • • • • • •	Trip due to auto-protection

NOTE: The battery maintains the trip cause indications. If there are no indications, check the battery.

Test Button for Ground-Fault Protection (MicroLogic 6.0 B)

The test button is used to test the ground-fault protection, page 28 for MicroLogic 6.0 B trip unit.

Test/Reset Button (MicroLogic 6.0 B)

Use the Test/Reset button to:

- Reset the trip cause indications:
 - 1. Determine why the circuit breaker tripped. The trip cause indication is maintained until it is reset on the trip unit.
 - 2. Press the Test/Reset button.
 - 3. Check the parameter settings of the trip unit.
- Check the battery: press the Test/Reset button to check the luminance of the trip cause indication LEDs. If the LEDs are dim, or not lit, change the battery, page 13.



Internal Battery (MicroLogic 6.0 B)

The internal battery powers the trip cause indication LEDs on a MicroLogic 6.0 B trip unit.

The internal battery of the MicroLogic B trip unit can be replaced on site when discharged.

Order a new battery with the Schneider Electric catalog number LV833593SP.

- · Lithium battery
- 1.22 AA, 3.6 V, 850 mA/h
- SAFT LS3 SONNENSCHEIN TEL-S
- · Service life 10 years

Internal Battery Replacement

A A 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.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside this equipment.
- · Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers 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.

Follow these steps to replace the internal battery:

- 1. Remove the circuit breaker front cover as directed in the circuit breaker instruction sheet shipped with the circuit breaker.
- 2. Remove the battery cover: insert a small screwdriver blade into battery housing cover notch and rotate to slide battery housing cover out of trip unit.



3. Remove the battery.



4. Insert a new battery. Make sure that the polarity is correct.



5. Put the battery housing cover back in place.



6. Press the Test/Reset button to check the new battery.



7. Reinstall the circuit breaker front cover as directed in the circuit breaker instruction sheet shipped with the circuit breaker.

A A D A N G E R

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Replace circuit breaker front cover before energizing circuit breaker to help prevent access to live terminals.
- Do not pinch the wires when reinstalling the front cover.

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

Go2SE Landing Page

Presentation

When the QR code on the front face of a MasterPact MTZ device 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 device and 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 following example shows the landing page displayed on an Android smartphone:

	Range MasterPact MTZ Ref. LV855192 Desc. Control unit Micrologic 2.0B - for MTZ	Masterpact
Characteristics		-
Manage & Maintai	n your assets	
	xpert	()
Operate your assets		
EcoStruxure	Power Device	>
mySchneider	g online, parsonalize your service and talk to our expects o	irectly.
	🖌 (f) (in 💩 📖 🞯	

A Commercial reference of MicroLogic B trip unit

B Type of MicroLogic B trip unit

C Landing page menus. See the following menu descriptions for details.

D Downloadable applications

Characteristics

Selecting this menu gives access to a product datasheet with detailed information about the MicroLogic B trip unit.

Documentation

Selecting this menu gives access to the MicroLogic B technical publications.

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.

Protection Functions

Electrical Distribution Protection

Presentation

MicroLogic B trip 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 B trip unit.

Rated Current In

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

The sensor plug can be replaced or modified. Mechanical mismatch protection prevents the installation of a sensor plug that is not compatible with the circuit breaker frame.

In	Commercial	Frame rated current												
	reference	MTZ1				MTZ2								
		06	08	10	12	16	08	10	12	16	20	25	32	40
400 A	LV855114	1	1	1	-	-	1	1	-	-	-	-	-	-
630 A	LV855115	1	1	1	1	-	1	1	1	-	-	-	-	-
800 A	LV855116	-	1	1	1	1	1	1	1	1	-	-	-	-
1,000 A	LV855117	-	-	1	1	1	-	1	1	1	1	-	-	-
1,250 A	LV855118	-	-	-	1	1	-	-	1	1	1	1	-	-
1,600 A	LV855119	-	-	-	-	1	-	-	-	1	1	1	1	-
2,000 A	LV855120	-	-	-	-	-	-	-	-	-	1	1	1	1
2,500 A	LV855121	-	-	-	-	-	-	-	-	-	-	1	1	1
3,200 A	LV855122	-	-	-	-	-	-	-	-	-	_	-	1	1
4,000 A	LV855123	-	-	-	-	_	-	-	-	-	_	_	-	1

The range of sensor plugs available is shown in the following table.

MicroLogic 2.0 B Trip Unit



MicroLogic 2.0 B trip units provide:

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

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

MicroLogic 5.0 B Trip Unit



MicroLogic 5.0 B trip units provide:

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

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

MicroLogic 6.0 B Trip Unit



MicroLogic 6.0 B trip units provide:

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

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

DIN / DINF Instantaneous Protections

DIN / DINF 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.

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, page 33. 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 2.0 B, 5.0 B, and 6.0 B trip units
- 3-pole and 4-pole circuit breakers

and neutral.

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.

Long-time overcurrent protection is based on the true RMS current of phases

Long-time overcurrent protection is implemented independently for each

Operating Principle



Setting the Protection



phase and for neutral when present, page 29.

The long-time overcurrent protection settings are:

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

They can be set by using the Ir and tr multi-position dials on the front face of the MicroLogic B trip unit.

Setting the Ir Pickup

The Ir pickup setting values depend on the long-time rating plug inserted in the MicroLogic B trip unit. For more information on the long-time rating plug, see detailed topic, page 20.

Ir pickup = setting value x In rated current.

As standard, trip units are equipped with the standard rating plug $(0.4-1 \times \ln)$.

Rating plug	Setting va	Setting values										
Standard	0.4	0.5	0.6	0.7	0.8	0.9	0.95	0.98	1			
Low-setting option	0.4	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.8			



Rating plug	Setting val	Setting values									
High-setting option	0.80	0.82	0.85	0.88	0.90	0.92	0.95	0.98	1		
Off-plug	No long-tim	ne overcurrer	nt protection	(Ir = In for Isc	l setting)						

NOTE: The long-time rating plug must always be removed, page 20 before carrying out insulation or dielectric withstand tests.

When the current is higher than Isd or Ii, only short-time overcurrent protection and instantaneous protection are operational.

Setting the tr Time Delay

The time delay settings indicated on the rating plugs correspond to the tripping times for an overload of $6 \times Ir$ in cold-state conditions.

The table below	v gives tripping	times according to tr ti	ime delay.
-----------------	------------------	--------------------------	------------

tr setting	Accuracy	0.5 s	1 s	2 s	4 s	8 s	12 s	16 s	20 s	24 s
Resulting tripping time at 1.5 x Ir	0 to -30%	12.5 s	25 s	50 s	100 s	200 s	300 s	400 s	500 s	600 s
Resulting tripping time at 6 x Ir	0 to -20%	0.7 s ¹	1 s	2 s	4 s	8 s	12 s	16 s	20 s	24 s
Resulting tripping time at 7.2 x Ir	0 to -20%	0.7 s ²	0.69 s	1.38 s	2.7 s	5.5 s	8.3 s	11 s	13.8 s	16.6 s
1 Accuracy 0 to -40%										
2 Accuracy 0 to -60%										

Long-time Rating Plug

Selecting the Long-time Rating Plug

The setting range for the long-time current setting on MicroLogic B trip units is defined by the long-time rating plug.

The available rating plugs are listed in the following table:

Part number	Setting range for the Ir value				
LV855150	Standard	0.4–1 x lr			
LV855151	Low setting	0.4–0.8 x lr			
LV855152	High setting	0.8–1 x lr			
LV855153	Without long-time protection. Ir = In for short-time protection setting				

Replacement Procedure

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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.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside this equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers 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.

Follow these steps to change the rating plug.

- 1. Disconnect the circuit breaker as directed in the circuit breaker instruction sheet shipped with the circuit breaker.
- 2. Open the protective cover of the trip unit.



3. Record switch settings.

4. Unscrew the long-time rating plug mounting screw.



5. Remove the adjustable rating plug.



- 6. Inspect mounting area for debris and contamination.
- 7. Take out the replacement rating plug.

NOTE: Adjustable rating plug must be removed when doing dielectric testing. If adjustable rating plug is removed, the circuit breaker will default to a long-time pickup rating of 0.4 x sensor size (In) and a long-time delay of whatever setting was selected before the rating plug was removed.

8. Gently push in the replacement rating plug.



9. Tighten the long-time rating plug mounting screw.

- 10. Set trip unit settings to values recorded previously or modify settings.
- 11. Reinstall the circuit breaker front cover as directed in the circuit breaker instruction sheet shipped with the circuit breaker.

A A DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Replace circuit breaker front cover before energizing circuit breaker to help prevent access to live terminals.
- Do not pinch the wires when reinstalling the front cover.

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

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

Presentation

Short-time overcurrent protection helps to protect equipment against phase-tophase, 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 5.0 B, and 6.0 B trip units
- 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 additional external power supply.

Operating Principle



The short-time overcurrent pickup 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 pickup 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.

In order to trip on an intermittent fault, the trip 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 pickup
- · tsd: short-time overcurrent protection time delay
- I²t (tsd): short-time overcurrent protection curve (I²t ON or I²t OFF)

They can be set by using the Isd and tsd multi-position dials on the front face of the MicroLogic B trip unit.

Protection Settings

Short-time pickup Isd.

Pickup (accuracy ± 10%)	lsd = lr x	1.5	2	2.5	3	4	5	6	8	10
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Short-time time delay tsd.

tsd time delay (s)	I²t OFF	0	0.1	0.2	0.3	0.4
	I²t ON		0.1	0.2	0.3	0.4
Tripping time at 10 x Ir (ms) with I ² t	Maximum resettable time	20	80	140	230	350
	Maximum break time	80	140	200	320	500

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.

Availability

Instantaneous overcurrent protection is available on:

- MicroLogic 2.0 B, 5.0 B, and 6.0 B trip units
- 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 pickup sets the level of short-circuit current at which the circuit breaker trips with no intentional time delay.

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

Setting Instantaneous Protection for MicroLogic 2.0 B



The instantaneous protection pickup Isd is set by using the Ir and Isd multiposition dials on the front face of the MicroLogic B trip unit.

The setting value is expressed in multiples of Ir.

- 1. Set the long-time protection first. The setting pickup is Ir.
- 2. Turn the lsd multi-position dial to the value required.
- 3. Isd = Isd setting x Ir.

The lsd setting values are: 1.5, 2, 2.5, 3, 4, 5, 6, 8, 10.

Accuracy: +/-10 %

NOTE: The tripping time cannot be adjusted. The tripping time characteristics are:

- Maximum resettable time: 20 ms
- Maximum break time: 80 ms

Setting Instantaneous Protection for MicroLogic 5.0 B and 6.0 B



The instantaneous protection pickup li is set by using the li multi-position dial on the front face of the MicroLogic B trip unit.

The setting value is expressed in multiples of In.

- 1. Turn the li multi-position dial to the value required.
- 2. Ii = Ii setting x In.

The li setting values are: 2, 3, 4, 5, 6, 8, 10, 12, 15 and off.

Accuracy: +/-10 %

The off setting disables the instantaneous overcurrent protection.

NOTE: The tripping time cannot be adjusted. The tripping time characteristics are:

- Maximum resettable time: 20 ms
- Maximum break time: 80 ms

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.

A ground fault in the protection conductors can provoke local temperature rise at the site of the fault or in the conductors.

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

Ground-fault and neutral protection are independent and can therefore be combined.

There are two types of ground-fault protection:

- Residual ground-fault protection is based on the summation of the phases and neutral current. It detects faults downstream of the circuit breaker.
- Source ground return (SGR) ground-fault protection is based on the signal delivered by an external sensor, source ground return (SGR) current transformer through the MDGF module. It detects faults both upstream and downstream of the circuit breaker.

The maximum distance between the sensor and the circuit breaker is ten metres.

Availability

Ground-fault protection is available on:

- MicroLogic 6.0 B trip units
- 3-pole and 4-pole circuit breakers

External sensors can be used:

- External Neutral Current Transformer (ENCT): measurement of the current on neutral. For information about the installation of ENCT, consult the ENCT instruction sheet.
- Source ground return protection: including ground-fault protection and an SGR sensor installed around the connection of the transformer neutral point to ground.

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.

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	lg ground-fault current
3P	lg = I1 + I2 + I3
4P	lg = I1 + I2 + I3 + IN
3P + ENCT	lg = I1 + I2 + I3 + IN (ENCT)
3P or 4P + SGR	lg = ISGR



The ground-fault protection pickup 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 pickup 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.

In order to trip on an intermittent electrical fault, the trip 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



The ground-fault protection settings are:

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

They can be set by using the Ig and tg multi-position dials on the front face of the MicroLogic B trip unit.

Protection Settings

The ground-fault pickup Ig and time delay tg values can be set independently and are identical for both the residual and source ground return ground-fault protection functions.

lg Pickup			А	В	С	D	Е	F	G	Н	I
(accuracy ± 10%)	In ≤ 400 A	lg = ln x	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
	400 A < In ≤ 1200 A	lg = ln x	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
	ln > 1200 A	lg =	500 A	640 A	720 A	800 A	880 A	960 A	1040 A	1120 A	1200 A

tg Time delay (s)	I ² t OFF	0	0.1	0.2	0.3	0.4
	I²t ON	—	0.1	0.2	0.3	0.4
Tripping time (ms) at In or 1200 A with I²t ON or I²t OFF	Maximum resettable time	20	80	140	230	350
	Maximum break time	80	140	200	320	500

Testing the Ground-Fault Protection

Test the operation of ground-fault protection as follows:

- 1. Check that the circuit breaker is closed.
- 2. Use a thin screwdriver to briefly push in (< 1 s) the **TEST** button on the front face of the MicroLogic B trip unit.
- 3. The circuit breaker trips.
- 4. If the circuit breaker does not trip, contact your field service representative.

Neutral Protection

Presentation

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

Availability

Neutral protection is available on:

- MicroLogic 2.0 B, 5.0 B, and 6.0 B trip units
- 4-pole circuit breakers

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 crosssectional area of the phase conductors
- Non-linear loads generating third order harmonics (or multiples thereof) are installed

MicroLogic B trip units are suitable for the following protection types.

Possible types	Neutral protection		
4P, 3D	Off		
4P, 3D + N/2	Half neutral		
4P, 4D	Full neutral		
P: Pole, D: Trip unit, N: Neutral protection			

NOTE: With the 4P 3D setting, the current in the neutral must not exceed the rated current of the circuit breaker.

Operating Principle

Neutral protection has the same characteristics as phase protection:

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

Setting the Neutral Protection

Set the type of neutral protection by using the three-position switch on four-pole MasterPact MTZ circuit breakers.





A. Cover for neutral protection three-position switch.

Follow these steps to set the type of neutral protection.

1. Remove the cover of the switch.



2. Select the protection type.



3. Put the cover back in place.



Setting Values for Neutral Protection

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

Neutral protection type	Neutral long-time pickup value
OFF	No long-time protection for neutral
N/2 (factory setting)	lr/2
Ν	lr

Testing the MicroLogic B Trip Unit

Using a dedicated test equipment, test the MicroLogic B trip unit as follows:

1. Open the protective cover of the trip unit.



2. Connect the test equipment via the test connector.



Thermal Memory

Introduction

The thermal memory is a means to simulate temperature rise and cooling caused by changes in the flow of current in the conductors.

These changes may be caused by:

- · Repetitive motor starting
- · Loads fluctuating near the protection settings
- · Repeated circuit-breaker closing on a fault

Trip units without a thermal memory (contrary to bimetal strip thermal protection) do not react to the above types of overloads because they do not last long enough to cause tripping. However, each overload produces a temperature rise and the cumulative effect can lead to dangerous overheating.

Trip units with a thermal memory record the temperature rise caused by each overload. Even very short overloads produce a temperature rise that is stored in the memory. This information stored in the thermal memory reduces the tripping time.

MicroLogic Trip Units and Thermal Memory

The MicroLogic trip units are equipped as standard with a thermal memory.

- For the protection functions, prior to tripping, the temperature-rise and cooling time constants are equal and depend on the time delay in question:
 - If the time delay is short, the time constant is low
 - If the time delay is long, the time constant is high
- For long-time protection, following tripping, the cooling curve is simulated by the trip unit. Closing of the circuit breaker prior to the end of the time constant (approximately 15 minutes) reduces the tripping time indicated in the tripping curves.

Short-time Protection and Intermittent Faults

For the short-time protection function, intermittent currents that do not provoke tripping are stored in the MicroLogic memory. This information is equivalent to the long-time thermal memory and reduces the time delay for the short-time protection. Following a trip, the short-time tsd time delay is reduced to the value of the minimum setting for 20 seconds.

Ground-fault Protection and Intermittent Faults

The ground-fault protection implements the same function as the short-time protection.

Tripping Curves



Long-time and Instantaneous Protection - MicroLogic 2.0 B





Ground-fault Protection - MicroLogic 6.0 B



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As standards, specifications, and design change from time to time, please ask for confirmation of the information given in this publication.

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