Hazard Categories and Special Symbols

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 bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either 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.

NOTE: Provides additional information to clarify or simplify a procedure.

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.

FCC Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. This Class A digital apparatus complies with Canadian ICES-003.
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Section 1—General Information

Introduction

Standard Micrologic™ trip units are used on the PowerPact H-, J-, and L-frame circuit breakers. Standard Micrologic trip units consist of two families of electronic trip units:

- Micrologic 3 trip units for distribution protection
- Micrologic 1 and 2 trip units for motor circuit protection
- Micrologic 0 trip units for molded case switches

Advanced Micrologic trip units consist of two families of electronic trip units:

- Micrologic 5 and 6 trip units for distribution protection

This manual describes operation of the Micrologic 0, 1, 2, and 3 trip units only. For information on the Micrologic 5 and 6 trip units, see bulletin 48940-312-01, Micrologic™ 5 and 6 Electronic Trip Units—User Guide.

The product name specifies the protection provided by the trip unit.

For complete information on available circuit breaker models, frame sizes, interrupting ratings, and trip units, see the product catalog.

NOTE: Motor circuit protectors provide short-circuit protection and overload protection.

Reflex Tripping

In addition to the protection from the Micrologic trip units, the PowerPact L-frame circuit breakers have reflex protection. This system breaks very high fault currents by mechanically tripping the device with a “piston” actuated directly by the pressure produced in the circuit breaker from a short circuit. This piston operates the opening mechanism, resulting in ultra-fast circuit breaker tripping.
Micrologic 0, 1 M, 2 M, and 3 Trip Units

Micrologic 0, 1M, 2M, and 3 trip units are available in distribution and motor applications.

- **In distribution applications:**
  - Micrologic 0.3 trip units (L-frame only) are used with molded case switches, they have only an internal self-protection and do not protect loads.
  - Micrologic 3 trip units protect conductors in commercial and industrial electrical distribution.

- **In motor-feeder applications:**
  - Micrologic 1.3 M trip units (L-frame only) provide short-circuit protection of motor-feeders.
  - Micrologic 2 M trip units protect motor-feeders on standard applications. The thermal trip curves are calculated for self-cooled motors.

- Settings are adjusted using dials on the face of the trip unit.

**NOTE:** The Micrologic 0 (molded case switch) trip unit has no adjustment dials.

Sensor Rating $I_n$

The trip unit $I_n$ value (A) is visible on the front face of the circuit breaker when the trip unit is installed. The trip unit sensor rating $I_n$ (in amperes) is the maximum current that the trip unit can carry continuously with the contacts closed without temperature rise exceeding UL requirements.

For MCP versions, the Full Load Amp (FLA) range is displayed.

Example:

- 250 A trip unit
  - Setting range: 70/250 A
  - Sensor rating $I_n$: 250 A

Trip Unit

Sealing

The transparent cover on Micrologic trip units is sealable.

- A sealed cover prevents modification of the protection settings.
- A sealed cover prevents access to the test port.
- The protection settings and measurements can still be read on the keypad.
Micrologic Trip Unit Layout

Trip Unit Face

A. Indication LEDs:
   - show the trip unit operational state
   - vary in meaning depending on the trip unit type

<table>
<thead>
<tr>
<th>Type of Trip Unit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution Trip Units</td>
<td>1. Ready LED (green): Blinks slowly when the electronic trip unit is ready to provide protection.</td>
</tr>
<tr>
<td></td>
<td>2. Overload pre-alarm LED (orange): Lights when the load exceeds 90% of the I_r setting.</td>
</tr>
<tr>
<td></td>
<td>3. Overload alarm LED (red): Lights when the load exceeds 105% of the I_r setting.</td>
</tr>
<tr>
<td>Motor Trip Units</td>
<td>4. Ready LED (green): Blinks slowly when the electronic trip unit is ready to provide protection.</td>
</tr>
<tr>
<td></td>
<td>5. Overload temperature alarm LED (red): Lights when the motor thermal image exceeds 95% of the FLA setting.</td>
</tr>
</tbody>
</table>

B. Test Port

Use the test port for:
   - connecting a pocket tester for local testing of the Micrologic trip unit
   - connecting the UTA tester for testing, setting the Micrologic trip unit, and for installation diagnostics
The trip unit face contains three dials for setting protection functions. For distribution trip units, the dials are for setting long-time, short-time, and instantaneous protection, depending on the trip units. For motor trip units, the dials are for setting full load amp and short-time protection.

Long-time protection ($I_r$):
- protects equipment against overloads
- is standard on all distribution trip units
- uses true rms measurement

Long-time delay ($t_r$):
- adjust time delay for long-time protection
- is standard on 3.2 and 3.3 trip units

Short-time protection ($I_{sd}$):
- protects equipment against impedant short circuits
- is standard on 3.2S and 3.3S trip units
- uses true rms measurement

Instantaneous protection ($I_i$):
- protects equipment against solid short circuits
- is standard on all distribution trip units
- uses true rms measurement

Full load amp protection (FLA):
- protects equipment against overloads
- is standard on all motor trip units
- provides setting for trip class
- uses true rms measurement

### LED Indication

The number of LEDs and their meaning depend on the type of trip unit.

<table>
<thead>
<tr>
<th>Trip Unit</th>
<th>LEDs</th>
<th>LED Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ready</td>
<td>&gt;15A</td>
<td>&gt;90</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Motor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ready</td>
<td>&gt;30A</td>
<td>&gt;95</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>1. Ready LED (green) blinks slowly when the electronic trip unit is ready to provide protection. Overload temperature alarm LED (red) lights when the motor thermal image exceeds 95% of the FLA setting.</td>
</tr>
</tbody>
</table>

### Operation of the Ready LED

The Ready LED (green) blinks slowly to indicates that the trip unit is operating correctly:
- Sensors are connected
- Sufficient power for electronics
- Trip unit settings are consistent
- Actuator connected
Operation of Pre-Alarm and Alarm LEDs (Electrical Distribution Protection)

The pre-alarm (orange LED) and alarm (red LED) indication that the value of one of the phase currents exceeds 90% and 105% respectively of the Ir pickup setting:

- **Pre-alarm**
  Exceeding the pre-alarm threshold at 90% of Ir has no effect on the long-time protection.

- **Alarm**
  Crossing the alarm threshold at 105% of Ir activates the long-time protection with a trip time delay that depends on:
  - The value of the current in the load
  - The setting of the time delay \( t_r \)

![Diagram of pre-alarm and alarm thresholds](image)

1. Current in the load (most heavily loaded phase)
2. Thermal image calculated by the trip unit

**NOTE:** If the pre-alarm and alarm LEDs keep lighting up, carry out load shedding to avoid tripping due to a circuit breaker overload.

Operation of Alarm LEDs (Motor Protection)

The alarm indication (red LED) trips as soon as the value of the motor thermal image exceeds 95% of the FLA pickup setting.

Crossing the threshold of 95% of FLA is a temperature alarm: long-time protection is not activated.

![Diagram of alarm threshold](image)

1. Current in the load
2. Thermal image calculated by the trip unit
Section 2—Electrical Distribution Protection

Micrologic™ 3 trip units provide protection against overcurrents for most commercial and industrial applications.

When choosing the protection characteristics to use, take account of:
- Overcurrents (overloads and short-circuits)
- Conductors to protect
- The presence of harmonic currents
- Coordination between the devices
- Mission Critical trip units with enhanced selectivity have a “W” in the trip unit number (for example, 3.2W or 3.2S-W)

Protection Functions

**CAUTION**

HAZARD OF NO PROTECTION OR NUISANCE TRIPPING

Modifying the protection functions must be done only by qualified electrical personnel.

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

**DANGER**

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside 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.

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

Micrologic 3 and 3S trip units are set using dials on the front of the trip unit. The trip unit sensor rating \( I_n \) corresponds to the maximum value of the adjustment range.

![Diagram of Micrologic 3 trip unit settings]

A. Sensor rating \( I_n \)
B. Protection setting dial for \( I_r \)
C. Protection setting dial for \( I_i \)
D. Protection setting dial for \( I_{sd} \)
Selective Coordination

Selective coordination between the upstream and downstream devices is essential to optimize continuity of service. The large number of options for setting the protection functions on Micrologic 3 trip units improves the natural coordination between circuit breakers.

Schneider Electric provides trip curves for each circuit breaker and tables showing UL Listed series-rated circuit breakers. Trip curves can be found on our website:

http://www.schneider-electric.us

In the search box, type “PowerPact H, J, L”. Click on “PowerPact H/J/L Frame Molded Case Circuit Breakers”, then click on the “Documents and Downloads” tab. The user guides and trip curves are found within this tab.

For assistance, please call 1-888-SQUARED.

Mission Critical Circuit Breakers

The PowerPact J- and L-Frame Mission Critical circuit breakers deliver high levels of selective coordination with the QO™ family of miniature circuit breakers and the ED, EG, and EJ circuit breakers in a flexible design that can be easily configured for a variety of applications. These circuit breaker can be equipped with 3.2-W, 3.2S-W, 3.3-W, AND 3.3S-W Micrologic trip units.

The mission critical trip units have the same settings and trip curves as the standard trip units as described in this document.

For more information see catalog 0611CT1001 PowerPact H-, J-, and L-Frame Circuit Breakers on the Schneider Electric website.
Setting 3.2/3.3 (LI) Trip Units

Long-Time Protection

Figure 2: Long-Time Protection Curve

Tripping curve:

Long-time protection on Micrologic 3.2 and 3.3 trip units protect electrical distribution applications against overload currents.

Long-time protection is $I^2t$ IDMT (Inverse Definite Minimum Time).

- It incorporates the thermal image function.
- It is set with the $I_r$ pickup and the $t_r$ trip time delay dials.

Setting the Long-Time Protection

To set the $I_r$ pickup, use the $I_r$ dial.

The long-time protection tripping range is $1.05–1.20 I_r$.

The default $I_r$ pickup setting value is the maximum dial position $I_n$.

Table 2: Values of $I_r$ (A)

<table>
<thead>
<tr>
<th>$I_n$ Rating</th>
<th>Preset Values of $I_r$, Based on the Trip Unit $I_n$ Rating and the Dial Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 A</td>
<td>15 A  20 A  25 A  30 A  35 A  40 A  45 A  50 A  50 A  60 A</td>
</tr>
<tr>
<td>100 A</td>
<td>35 A  40 A  45 A  50 A  60 A  70 A  80 A  90 A  100 A</td>
</tr>
<tr>
<td>150 A</td>
<td>50 A  60 A  70 A  80 A  90 A  100 A  110 A  125 A  150 A</td>
</tr>
<tr>
<td>250 A</td>
<td>70 A  80 A  100 A  125 A  150 A  175 A  200 A  225 A  250 A</td>
</tr>
<tr>
<td>400 A</td>
<td>125 A  150 A  175 A  200 A  225 A  250 A  300 A  350 A  400 A</td>
</tr>
<tr>
<td>600 A</td>
<td>200 A  225 A  250 A  300 A  350 A  400 A  450 A  500 A  600 A</td>
</tr>
</tbody>
</table>

To set the $t_r$ time delay, use the $t_r$ dial.

The default $t_r$ time delay setting value is 0.5 (minimum value) that is, 0.5 seconds at 6 $I_r$.

Table 3 shows the value of the trip time delay (in seconds) according to the current in the load for the setting values displayed on-screen:

The accuracy range is -20%/+0%.

Table 3: Values of $t_r$ for Micrologic 3.2 and 3.3 Trip Units

<table>
<thead>
<tr>
<th>Current in the Load</th>
<th>Setting Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 $t_r$</td>
<td>15  25  50  100  200  400</td>
</tr>
<tr>
<td>1.5 $t_r$</td>
<td>15  25  50  100  200  400</td>
</tr>
<tr>
<td>6 $t_r$</td>
<td>0.5 1  2  4  8  16</td>
</tr>
<tr>
<td>7.2 $t_r$</td>
<td>0.35 0.7  1.4  2.8  5.5  11</td>
</tr>
</tbody>
</table>
Instantaneous Protection

Figure 3: Instantaneous Protection Curve

Instantaneous protection on Micrologic 3.2 and 3.3 trip units protects all types of electrical distribution applications against very high short-circuit currents.

Instantaneous protection is definite time, set as $I_i$ pickup and without a time delay.

To set the $I_i$ pickup using the $I_i$ dial.

The $I_i$ pickup setting value is in multiples of $I_n$.

The default $I_i$ pickup setting value is 1.5 $I_n$ (minimum value).

Table 4 shows the setting ranges and increments according to the Micrologic trip unit $I_n$ rating.

- The accuracy range is +/- 10%.
- The hold time is 10 milliseconds.
- The maximum breaking time is 50 milliseconds.

<table>
<thead>
<tr>
<th>$I_n$ Rating</th>
<th>Setting Range</th>
<th>Increment</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 A, 100 A and 150 A</td>
<td>1.5–15 $I_n$</td>
<td>0.5 $I_n$</td>
</tr>
<tr>
<td>250 A and 400 A</td>
<td>1.5–12 $I_n$</td>
<td>0.5 $I_n$</td>
</tr>
<tr>
<td>600 A</td>
<td>1.5–11 $I_n$</td>
<td>0.5 $I_n$</td>
</tr>
</tbody>
</table>

Setting 3.2S/3.3S (LSI) Trip Units

Long-Time Protection

Figure 4: Long-Time Protection Curve

Tripping curve:

Long-time protection on Micrologic 3.2S and 3.3S trip units protect electrical distribution applications against overload currents.

Long-time protection is $I^2t$ IDMT (Inverse Definite Minimum Time).

- It incorporates the thermal image function.
- It is set with the $I_r$ pickup
- It has a fixed $t_r$ trip time delay
Setting the Long-Time Protection

To set the \( I_r \) pickup, use the \( I_r \) dial.

The long-time protection tripping range is 1.05–1.20 \( I_r \).

The default \( I_r \) pickup setting value is the maximum dial position \( I_n \).

<table>
<thead>
<tr>
<th>( I_n ) Rating</th>
<th>Preset Values of ( I_r ) Depending on the Trip Unit ( I_n ) Rating and the Dial Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 A</td>
<td>15 A</td>
</tr>
<tr>
<td>100 A</td>
<td>35 A</td>
</tr>
<tr>
<td>150 A</td>
<td>50 A</td>
</tr>
<tr>
<td>250 A</td>
<td>70 A</td>
</tr>
<tr>
<td>400 A</td>
<td>125 A</td>
</tr>
<tr>
<td>600 A</td>
<td>200 A</td>
</tr>
</tbody>
</table>

Short-Time Protection

Short-time protection on Micrologic 3.2S and 3.3S trip units protects all types of electrical distribution applications against short-circuit currents.

Short-time protection:
- is definite time:
- has adjustable \( I_{sd} \) pickup
- has fixed short time delay \( t_{sd} \) on this trip unit

Setting the Short-Time Protection

Set the \( I_{sd} \) pickup using the dial of the face of the 3.2S or 3.3S trip unit. The \( t_{sd} \) time delay is fixed and cannot be adjusted.

The \( I_{sd} \) pickup setting value is in multiples of \( I_r \).

The default \( I_{sd} \) pickup setting value is 1.5 \( I_r \) (minimum dial value).

Table 6 shows the setting values.

<table>
<thead>
<tr>
<th>Value or Setting Range (x ( I_r ))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
</tr>
</tbody>
</table>
Instantaneous Protection

**Figure 6: Instantaneous Protection Curve**

Instantaneous protection on Micrologic 3.2S and 3.3S trip units protects all types of electrical distribution applications against very high short-circuit currents.

Instantaneous protection is definite time, set as \( I_i \) pickup and without time delay. Set the \( I_i \) pickup using the \( I_i \) dial.

The \( I_i \) pickup setting value is in multiples of \( I_n \).

The default \( I_i \) pickup setting value is \( 1.5 \cdot I_n \) (minimum value).

Table 7 shows the setting ranges and increments according to the Micrologic trip unit \( I_n \) rating.

- The accuracy range is \( \pm/\mp 10\% \).
- The hold time is 10 milliseconds.
- The maximum breaking time is 50 milliseconds.

**Table 7: Values of \( I_i \)**

<table>
<thead>
<tr>
<th>( I_n ) Rating</th>
<th>Setting Range</th>
<th>Increment</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 A, 100 A and 150 A</td>
<td>1.5–15 ( I_n )</td>
<td>0.5 ( I_n )</td>
</tr>
<tr>
<td>250 A and 400 A</td>
<td>1.5–12 ( I_n )</td>
<td>0.5 ( I_n )</td>
</tr>
<tr>
<td>600 A</td>
<td>1.5–11 ( I_n )</td>
<td>0.5 ( I_n )</td>
</tr>
</tbody>
</table>

Conductor Heat Rise and Tripping Curves

**Figure 7: Heat Rise Curve**

Use the analysis of the equation of heat rise in a conductor, through which a current \( I \) runs, to determine the nature of physical phenomena:

- For low- or medium-intensity currents \( (I < I_s) \), the conductor equilibrium temperature (for an infinite time) only depends on the current quadratic demand value. The limit temperature corresponds to a limit current \( (I_l \) pickup for trip unit long-time protection).

- For low overcurrents \( (I_s < I < I_{sq}) \), the conductor temperature only depends on the \( I^2t \) energy provided by the current. The limit temperature is an \( I^2t \) IDMT curve.

- For high overcurrents \( (I > I_{sq}) \), the phenomenon is identical if the \( I^2t \) ON function of the short-time protection has been configured.

**Thermal Memory**

Micrologic 3 trip units incorporate a thermal memory function to protect the cables or bus bars from overheating in cases of low amplitude repetitive faults. Traditional electronic protection does not protect against repetitive faults because the duration of each overload above the pickup setting is too short to cause tripping. Nevertheless, each overload causes a temperature rise in the installation, the cumulative effect could lead to overheating of the system.

The thermal memory function remembers and integrates the thermal heating caused by each pickup setting overrun. Before tripping, the thermal memory reduces the associated time delay and, therefore, the reaction of the trip unit is closer to the real heating of the power network system. After tripping, the function reduces the time delay when closing the circuit breaker on an overload.

The thermal memory function remembers for 20 minutes before or after tripping.
Neutral Protection

Neutral protection on Micrologic 3 trip units protects all types of electrical distribution applications against overload and short-circuit currents. It is available on four pole (4P) PowerPact L circuit breakers.

Normally, the phase protection protects the neutral conductor (if it is distributed and identical to the phases in size, that is, full neutral). The neutral must have specific protection if:

- It is reduced in size compared to the phases
- 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
- Distributed, not switched off, and not protected
- Distributed, not switched off but protected on these trip units (only with 4P circuit breakers)

Neutral protection has the same characteristics as phase protection:

- Its pickup is in proportion with the long-time \( I_r \) and short-time \( I_{sd} \) protection pickups.
- It has the same trip time delay values as the long-time \( I_r \) and short-time \( I_{sd} \) protections.
- Its instantaneous protection is identical.

Setting the Neutral Protection

To set the trip unit Neutral status and the \( I_N \) pickup:

- On the Micrologic trip unit, use the switch proved with 4P circuit breakers

<table>
<thead>
<tr>
<th>Circuit Breaker</th>
<th>Possible Types</th>
<th>Neutral Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>3P Circuit Breaker</td>
<td>3P</td>
<td>None</td>
</tr>
<tr>
<td>4P Circuit Breaker</td>
<td>4P, 3D</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>4P, 3D + N/2</td>
<td>Half neutral</td>
</tr>
<tr>
<td></td>
<td>4P, 3D + N</td>
<td>Full neutral</td>
</tr>
</tbody>
</table>

P: Pole; D: Trip unit; N: Neutral protection

In

\[ \begin{align*}
I_n &= \text{Sensor rating} \\
I_r &= \text{Long-time protection pickup} \\
I_i &= \text{Neutral protection pickup}
\end{align*} \]
Section 3—Motor-Feeder Applications

Description

The Micrologic™ 1.3 M, 2.2 M, and 2.3 M motor trip units are designed for protecting motor-feeder applications.

The Micrologic motor trip units:

- Provide protection for direct-on-line motor-feeders (direct-on-line starting is the most widely used type of motor-feeder)
- Integrate the standard protections (overload, short-circuit, and phase unbalance) for the motor-feeder and additional protections and specific options for motor applications

Circuit breakers equipped with the Micrologic motor trip unit can be used to create motor-feeders to two devices.

Figure 9: Micrologic 2.2 M Trip Unit

Figure 10: Motor-Feeder Wiring

1 Circuit breaker equipped with a Micrologic 2.2 M trip unit
1A Short-circuit protection
1B Overload protection
2 Contactor
3 SDTAM Module
Operating States

Motor trip units consider the motor to be operating when the motor current exceeds 10% of FLA pickup.

Two operating states are:
- Startup
- Steady state

Startup Mode

Micrologic motor trip units consider the motor to be in startup mode according to the following criteria:
- Start: When the motor current reaches 10% of FLA pickup
- End: When the motor current drops below Id pickup or after a td time delay. The Id pickup equals 1.5 FLA and the td time delay equals 10 seconds (fixed values). Exceeding the 10 second time delay does not result in tripping.

NOTE: The Micrologic trip unit measurement electronics filter the subtransient state (first current peak of approximately 20 milliseconds on contactor closing). This current peak is therefore ignored when assessing whether the Id pickup has been exceeded.

Steady State

Micrologic motor trip units consider the motor to be in steady state mode according to the following criteria:
- Start: As soon as startup ends
- End: As soon as the motor current drops below 10% of FLA pickup

Protection Functions

The protection function values can be set using the dials on the face of the trip unit.

CAUTION

HAZARD OF NO PROTECTION ORNUISANCE TRIPPING

Modifying the protection functions must be done only by qualified electrical personnel.

Failure to follow these instructions can result in injury or equipment damage.
The Micrologic 2.2 M and 2.3 M trip units provide the following protective functions:

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Description</th>
<th>Adj.</th>
<th>Y / N</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>FLA Min/Max</td>
<td>FLA adjustment range</td>
<td>N</td>
<td>Y</td>
<td>—</td>
</tr>
<tr>
<td>1</td>
<td>FLA</td>
<td>Full load amp setting</td>
<td>Y</td>
<td></td>
<td>Dial Max</td>
</tr>
<tr>
<td>2</td>
<td>Cl</td>
<td>Long-time protection trip class</td>
<td>Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>I_sd</td>
<td>Short-time protection pickup</td>
<td>Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>t_s</td>
<td>Short-time protection time delay</td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>I_i</td>
<td>Instantaneous protection pickup</td>
<td>N</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Each function is reviewed in detail on the following pages.

**Setting the Protection**

To set the protection functions, use the dials on the face of the trip unit.

**SDTAM Module Option**

Use the SDTAM Module early tripping function to command contactor opening 400 milliseconds before the calculated circuit breaker tripping in the case of:

- Full load amp protection
- Phase unbalance protection

The contactor can be closed again automatically or manually depending on the setting of the SDTAM Module (see the bulletin shipped with the circuit breaker for more information).
Full Load Amp (FLA) Protection

Full load amp protection on Micrologic 2.2 M trip units protects all types of motor applications against overload currents.

Full load amp protection is $I^2t$ IDMT (Inverse Definite Minimum Time):

- It incorporates the thermal image function.
- Set as the FLA pickup and as the $t_r$ trip time delay.

**NOTE:** The SDTAM Module early tripping protection can be used to command contactor opening (see “SDTAM Module Option” on page 19).

To set:

- Set the FLA pickup using the FLA dial on the Micrologic trip unit
- Set the trip class using the Class dial on the Micrologic trip unit

The full load amp protection tripping range is 1.05–1.20 FLA.

The default FLA pickup setting value is the maximum dial value.

Set the FLA pickup using the trip unit FLA dial.

The accuracy range is $+5\%$/$+20\%$.

**FLA Pickup Settings**

The full load amp protection tripping range is 1.05–1.20 FLA.

The default FLA pickup setting value is the maximum dial value.

Set the FLA pickup using the trip unit FLA dial.

The accuracy range is $+5\%$/$+20\%$.

**Table 10: FLA Pickup Settings**

<table>
<thead>
<tr>
<th>$I_n$ Rating</th>
<th>Preset Values of FLA Depending on the $I_n$ Rating and the Dial Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 A</td>
<td>14 A 16 A 18 A 20 A 21 A 22 A 23 A 24 A 25 A</td>
</tr>
<tr>
<td>50 A</td>
<td>14 A 17 A 21 A 24 A 27 A 28 A 32 A 36 A 42 A</td>
</tr>
<tr>
<td>100 A</td>
<td>30 A 35 A 41 A 45 A 51 A 56 A 63 A 71 A 80 A</td>
</tr>
<tr>
<td>150 A</td>
<td>58 A 71 A 79 A 85 A 91 A 97 A 110 A 119 A 130 A</td>
</tr>
<tr>
<td>250 A</td>
<td>114 A 137 A 145 A 155 A 163 A 172 A 181 A 210 A 217 A</td>
</tr>
<tr>
<td>400 A</td>
<td>190 A 230 A 250 A 270 A 290 A 310 A 330 A 348 A</td>
</tr>
<tr>
<td>600 A</td>
<td>312 A 338 A 364 A 390 A 416 A 442 A 468 A 494 A 520 A</td>
</tr>
</tbody>
</table>

**Trip Class CI Settings**

The trip class corresponds to the value of the trip time delay for a current of 7.2 FLA.

Use the trip unit class dial to set the class to one of the three defined values: 5, 10, and 20. The default class setting value is 5 (minimum value).

Table 11 shows the value of the trip time delay depending on the current in the load for all trip classes.

**Table 11: Trip Time Delays**

<table>
<thead>
<tr>
<th>Current in the Load</th>
<th>Trip Class CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
</tr>
<tr>
<td>$I_r$ Trip Time Delay</td>
<td></td>
</tr>
<tr>
<td>1.5 FLA</td>
<td>120</td>
</tr>
<tr>
<td>6 FLA</td>
<td>6.5</td>
</tr>
<tr>
<td>7.2 FLA</td>
<td>5</td>
</tr>
</tbody>
</table>
Thermal Memory

Micrologic M trip units use a thermal memory function to protect the cables or bus bars from overheating in cases of low amplitude repetitive faults. Traditional electronic protection does not protect against repetitive faults because the duration of each overload above the pickup setting is too short to cause tripping. Nevertheless, each overload causes a temperature rise in the installation, the cumulative effect could lead to overheating of the system.

The thermal memory function remembers and integrates the thermal heating caused by each pickup setting overrun. Before tripping, the thermal memory reduces the associated time delay and, therefore, the reaction of the trip unit is closer to the real heating of the power network system. After tripping, the function reduces the time delay when closing the circuit breaker on an overload.

The thermal memory function remembers for 20 minutes before or after tripping.

Short-Time Protection

Figure 14: Short-Time Protection Trip Curve

- FLA = Full load amp protection pickup
- \( I_{sd} \) = Short-time protection pickup
- \( t_{sd} \) = Short-time protection fixed time delay

Short-time protection on Micrologic M trip units protects all types of motor applications against short-circuit currents.

Short-time protection is definite time. Set as the \( I_{sd} \) pickup.

- The \( I_{sd} \) pickup setting value is in multiples of FLA.
- The default \( I_{sd} \) pickup setting value is 5 FLA (minimum value).
- The pickup setting range on the keypad is 5–13 FLA. The increment is 0.5 FLA.
- The accuracy is \( \pm\, 15\% \).

- \( t_{sd} \) time delay:
  - The time delay cannot be adjusted.
  - The hold time is 20 milliseconds.
  - The maximum breaking time is 60 milliseconds.

Set the \( I_{sd} \) pickup using the dial on the face of the trip unit. The \( t_{sd} \) short-time delay is not adjustable.

Instantaneous Protection

Figure 15: Instantaneous Protection Tripping Curve

- FLA Min/Max = FLA adjustment range
- \( I_i \) = Instantaneous protection pickup

Instantaneous protection on Micrologic M trip units protects all types of motor applications against very high intensity short-circuit currents.

Instantaneous protection is fixed, with the pickup value determined by the trip unit rating.

The \( I_i \) pickup is based on the trip unit \( I_n \) rating and is a multiple of \( I_n \).

The hold time is 0 milliseconds.

The maximum breaking time is 30 milliseconds.

Table 12: \( I_i \) Pickup Values

<table>
<thead>
<tr>
<th>( I_i ) Rating</th>
<th>30 A</th>
<th>50 A</th>
<th>100 A</th>
<th>150 A</th>
<th>250 A</th>
<th>400 S</th>
<th>600 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instantaneous Pickup</td>
<td>450 A</td>
<td>750 A</td>
<td>1500 A</td>
<td>2250 A</td>
<td>3750 A</td>
<td>4800 A</td>
<td>7200 A</td>
</tr>
</tbody>
</table>
Micrologic 1.3 M Electronic Trip Unit Settings

The Micrologic 1.3 M electronic trip unit with high short time protection pick-up is designed to provide motor-feeders with short-circuit protection. The trip unit can be used to create a type 1 or type 2 coordination motor-feeder. Set using the adjustment dial on the front face of the trip unit.

**Setting the Short Time Protection**

The short time protection pick-up $I_{sd}$ is set by turning the pick-up $I_{sd}$ adjustment dial (a) which modifies the curves (b) as shown. The precision range is +/- 15%.

<table>
<thead>
<tr>
<th>Trip Unit Rating $I_n$</th>
<th>$I_{sd}$ Dial Values (A)</th>
<th>$I_i$ (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 A</td>
<td>2000  2400  2800  3200  3600  4000  4400  4800  4800  4800</td>
<td></td>
</tr>
<tr>
<td>600 A</td>
<td>3000  3600  4200  4800  5400  6000  6600  7200  7200  7200</td>
<td></td>
</tr>
</tbody>
</table>
Micrologic 2.2 M and 2.3 M Electronic Trip Unit

The Micrologic 2.2 M and 2.3 M electronic trip unit can be used to create a type 1 or type 2 coordination motor-feeder, and is suitable for protecting motor-feeders on standard applications. The thermal trip curves are calculated for self-ventilated motors.

The adjustment dials and indications are on the front face. The trip unit rated current ($I_n$) corresponds to the maximum value of the adjustment range.

Setting the Long Time Protection

Set the circuit protection in relation to the starting characteristics of the application. See Table 13.

1. Set the long time protection pick-up FLA using the FLA dial.
2. Set the long time protection time delay class using the Class dial. The precision range is - 20%, + 0%.
3. Set the pick-up for short time protection using the $I_{sd}$ dial.

$I_{sd}$ is set to FLA x $I_{sd}$ setting and is displayed in multiples of FLA. The precision range is +/- 15%.

Short Time Protection

The short time protection time delay is 30 milliseconds and cannot be adjusted.

Instantaneous Protection

The instantaneous protection is not adjustable. The precision range is +/- 15%.

Phase Unbalance Protection

Micrologic 2.2 M and 2.3 M trip units incorporate phase unbalance protection.

- Protection is not adjustable
- Pick-up: 30% phase unbalance (the precision range is +/- 20%)
Table 13:  Dial Settings

<table>
<thead>
<tr>
<th>Trip unit rating $I_n$ (A)</th>
<th>30</th>
<th>50</th>
<th>100</th>
<th>150</th>
<th>250</th>
<th>400</th>
<th>600</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>14</td>
<td>30</td>
<td>58</td>
<td>114</td>
<td>190</td>
<td>312</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>17</td>
<td>35</td>
<td>71</td>
<td>137</td>
<td>210</td>
<td>338</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>21</td>
<td>41</td>
<td>79</td>
<td>145</td>
<td>230</td>
<td>364</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>24</td>
<td>45</td>
<td>85</td>
<td>155</td>
<td>250</td>
<td>390</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>27</td>
<td>51</td>
<td>91</td>
<td>163</td>
<td>270</td>
<td>416</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>29</td>
<td>56</td>
<td>97</td>
<td>172</td>
<td>290</td>
<td>442</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>32</td>
<td>63</td>
<td>110</td>
<td>181</td>
<td>310</td>
<td>468</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>36</td>
<td>71</td>
<td>119</td>
<td>210</td>
<td>330</td>
<td>494</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>42</td>
<td>80</td>
<td>130</td>
<td>217</td>
<td>348</td>
<td>520</td>
<td></td>
</tr>
</tbody>
</table>

Long-Time Protection Class Settings

<table>
<thead>
<tr>
<th>Current in the Load</th>
<th>Trip Time Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Trip time delay $t_r$ (in seconds)</td>
</tr>
<tr>
<td></td>
<td>Class 5</td>
</tr>
<tr>
<td>1.5 $I_f$</td>
<td>120</td>
</tr>
<tr>
<td>6 $I_f$</td>
<td>6.5</td>
</tr>
<tr>
<td>7.2 $I_f$</td>
<td>5</td>
</tr>
</tbody>
</table>

Short-Time Protection Pickup $I_{sd}$

<table>
<thead>
<tr>
<th>Short-Time Protection Pickup</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 x $I_f$</td>
</tr>
<tr>
<td>6 x $I_f$</td>
</tr>
<tr>
<td>7 x $I_f$</td>
</tr>
<tr>
<td>8 x $I_f$</td>
</tr>
<tr>
<td>10 x $I_f$</td>
</tr>
<tr>
<td>11 x $I_f$</td>
</tr>
<tr>
<td>12 x $I_f$</td>
</tr>
<tr>
<td>13 x $I_f$</td>
</tr>
</tbody>
</table>

- Overshoot time: 4 s in steady state, 0.7 s during startup
Section 4—Molded Case Switches

Figure 16: Micrologic 0.3 Trip Unit

Micrologic™ 0.3 trip units are used for L-frame automatic molded case switches.

DANGER
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside 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.

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

Micrologic 0.3 trip units have no adjustments.
A
Adjustable switches 5
Advanced trip units 5
Micrologic 5 5
Micrologic 6 5
Alarm LED 9
Application suffix 5
C
Conductor heat rise 13
D
Dials 8
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selective coordination 11
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setting 14
time delay (tsd) 14
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Frame size 5
Full load amp protection
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setting 20
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I
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In rating 6
In sensor rating 6
In. See Setting range
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motor protection LED 9
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motor protection 9
operation 9
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reflex tripping 11
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setting 14
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