Micrologic control units
2.0 A, 5.0 A, 6.0 A and 7.0 A
Low Voltage Products

User manual
Micrologic control units
2.0 A, 5.0 A, 6.0 A and 7.0 A

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Discovering your control unit

All Compact NS800-3200 and Masterpact NT and NW circuit breakers are equipped with a Micrologic control unit that can be changed on site. Control units are designed to protect power circuits and connected loads.

Identifying your control unit

Designations

- **X**: type of protection
  - 2 for basic protection
  - 5 for selective protection
  - 6 for selective + earth-fault protection
  - 7 for selective + earth-leakage protection

- **Y**: version number
  Identification of the control-unit generation.
  "0" signifies the first generation.

- **Z**: type of measurement
  - A for "ammeter"
  - P for "power meter"
  - H for "harmonic meter"
  - no indication: no measurements

**Micrologic 2.0 A**
- Basic protection and ammeter
- Long time + Instantaneous

**Micrologic 5.0 A**
- Selective protection and ammeter
- Long time + Short time + Instantaneous

**Micrologic 6.0 A**
- Selective + earth-fault protection and ammeter
- Long time + Short time + Instantaneous

**Micrologic 7.0 A**
- Selective + earth-leakage protection and ammeter
- Long time + Short time + Instantaneous

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Micrologic A
Schneider Electric
1 top fastener
2 bottom fastener
3 protective cover
4 cover opening point
5 lead-seal fixture for protective cover
6 long-time rating plug
7 screw for long-time rating plug
8 connection with circuit breaker
9 infrared link with communications interfaces
10 terminal block for external connections
11 housing for battery
12 digital display
13 three-phase bargraph and ammeter

Adjustment dials
14 long-time current setting Ir
15 long-time tripping delay tr
16 short-time pickup Isd
17 short-time tripping delay tsd
18 instantaneous pick-up Isd
19 instantaneous pick-up li
20 earth-fault pick-up Ig
21 earth-fault tripping delay tg
22 earth-leakage pick-up IΔn
23 earth-leakage tripping delay Δt

Indications
24 LED indicating long-time tripping
25 LED indicating short-time tripping
26 LED indicating earth-fault or earth-leakage tripping
27 LED indicating auto-protection tripping
28 LED indicating an overload

Navigation
29 navigation button to change menus
30 navigation button to view menu contents
31 button for fault-trip reset and battery test

Test
32 test button for earth-fault and earth-leakage protection
33 test connector
Discovering your control unit

Protection settings

Depending on the type of installation, it is possible to set the tripping curve of your control unit using the parameters presented below.

Micrologic 2.0 A

![Diagram of protection settings]

1. current setting Ir (long time)
2. tripping delay tr (long time) for 6 x Ir
3. pick-up Isd (instantaneous)

Micrologic 5.0 A, 6.0 A, 7.0 A

![Diagram of protection settings]

1. current setting Ir (long time)
2. tripping delay tr (long time) for 6 x Ir
3. pick-up Isd (short time)
4. tripping delay tsd (short time)
5. pick-up Ii (instantaneous)

Long-time protection

The long-time protection function protects cables (phases and neutral) against overloads. This function is based on true rms measurements.

Thermal memory

The thermal memory continuously accounts for the amount of heat in the cables, both before and after tripping, whatever the value of the current (presence of an overload or not). The thermal memory optimises the long-time protection function of the circuit breaker by taking into account the temperature rise in the cables. The thermal memory assumes a cable cooling time of approximately 15 minutes.

Long-time current setting Ir and standard tripping delay tr

<table>
<thead>
<tr>
<th>Micrologic control unit</th>
<th>2.0 A and 5.0 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>current setting tripping between</td>
<td>Ir = In x ...(*)</td>
</tr>
<tr>
<td>1.05 and 1.20 x Ir</td>
<td>0.4 0.5 0.6 0.7 0.8 0.9 0.95 0.98 1</td>
</tr>
<tr>
<td>other ranges or disable by changing rating plug</td>
<td></td>
</tr>
</tbody>
</table>

| Time delay (s) accuracy: | tr at 1.5 x Ir | 12.5 25 50 100 200 300 400 500 600 |
|------------------------|----------------|
| 0 to -20 % | tr at 6 x Ir | 0.5 1 2 4 8 12 16 20 24 |
| tr at 7.2 x Ir | 0.34 0.69 1.38 2.7 5.5 8.3 11 13.8 16.6 |

* In: circuit breaker rating

Setting accuracy of the Ir setting may be enhanced by using a different long-time rating plug.

See the technical appendix "Changing the long-time rating plug".
For the characteristics and external wiring of the zone selective interlocking function, see the technical appendix on “Zone selective interlocking”.

The portable test kit can be used to test the wiring between circuit breakers for the zone selective interlocking function.

### Short-time protection
- The short-time protection function protects the distribution system against impedant short-circuits.
- The short-time tripping delay can be used to ensure discrimination with a downstream circuit breaker.
- This function carries out true rms measurements.
- The *I²t* ON and *I²t* OFF options enhance discrimination with downstream protection devices.
- Use of *I²t* curves with short-time protection:
  - *I²t* OFF selected: the protection function implements a constant time curve;
  - *I²t* ON selected: the protection function implements an *I²t* inverse-time curve up to 10 Ir. Above 10 Ir, the time curve is constant.
- Zone selective interlocking (ZSI)
  The short-time and earth-fault protection functions enable time discrimination by delaying the upstream devices to provide the downstream devices the time required to clear the fault. Zone selective interlocking can be used to obtain total discrimination between circuit breakers using external wiring.

### Short-time pick-up *I*₂*ₚ* and tripping delay *t*ₚ

<table>
<thead>
<tr>
<th>Micrologic control unit</th>
<th>Micrologic control unit: 2.0 A, 5.0 A, 6.0 A and 7.0 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>pick-up</td>
<td><strong>I</strong>₂<strong>ₚ</strong> = <strong>I</strong>₁ x ...</td>
</tr>
<tr>
<td>accuracy ± 10 %</td>
<td>1.5 2 2.5 3 4 5 6 8 10</td>
</tr>
<tr>
<td>Time delay</td>
<td>settings <em>I²t</em> OFF</td>
</tr>
<tr>
<td>(ms) at 10 Ir</td>
<td>0 0.1 0.2 0.3 0.4</td>
</tr>
<tr>
<td><em>I²t</em> ON or</td>
<td><em>I²t</em> ON (max resettable time)</td>
</tr>
<tr>
<td>tsd (max break time)</td>
<td>20 80 140 230 350</td>
</tr>
<tr>
<td><em>I²t</em> OFF</td>
<td>tsd (max resettable time)</td>
</tr>
<tr>
<td>tsd (max break time)</td>
<td>80 140 200 320 500</td>
</tr>
</tbody>
</table>

### Instantaneous protection
- The instantaneous-protection function protects the distribution system against solid short-circuits. Contrary to the short-time protection function, the tripping delay for instantaneous protection is not adjustable.
- The tripping order is sent to the circuit breaker as soon as current exceeds the set value, with a fixed time delay of 20 milliseconds.
- This function carries out true rms measurements.

### Instantaneous pick-up *I*₂*ₚ*

<table>
<thead>
<tr>
<th>Micrologic control unit: 2.0 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>pick-up</td>
</tr>
<tr>
<td>accuracy ± 10 %</td>
</tr>
</tbody>
</table>

### Instantaneous pick-up *I*₁

<table>
<thead>
<tr>
<th>Micrologic control unit: 5.0 A, 6.0 A and 7.0 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>pick-up</td>
</tr>
<tr>
<td>accuracy ± 10 %</td>
</tr>
</tbody>
</table>

* **I**ₙ: circuit-breaker rating
Protection of the fourth pole on four-pole circuit breakers
Protection of the neutral conductor depends on the distribution system.
There are three possibilities.

<table>
<thead>
<tr>
<th>Type of neutral</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutral unprotected</td>
<td>The distribution system does not require protection of the neutral conductor.</td>
</tr>
<tr>
<td>Neutral protection at 0.5 In</td>
<td>The cross-sectional area of the neutral conductor is half that of the phase conductors.</td>
</tr>
<tr>
<td></td>
<td>• the long-time current setting (I_r) for the neutral is equal to half the setting value</td>
</tr>
<tr>
<td></td>
<td>• the short-time pick-up (I_{sd}) for the neutral is equal to half the setting value</td>
</tr>
<tr>
<td></td>
<td>• the instantaneous pick-up (I_i) (Micrologic 2.0 A) for the neutral is equal to half the setting value</td>
</tr>
<tr>
<td></td>
<td>• the instantaneous pick-up (I_i) (Micrologic 5.0 A / 6.0 A / 7.0 A) for the neutral is equal to the setting value.</td>
</tr>
<tr>
<td>Neutral protection at In</td>
<td>The cross-sectional area of the neutral conductor is equal to that of the phase conductors.</td>
</tr>
<tr>
<td></td>
<td>• the long-time current setting (I_r) for the neutral is equal to the setting value</td>
</tr>
<tr>
<td></td>
<td>• the short-time pick-up (I_{sd}) for the neutral is equal to the setting value</td>
</tr>
<tr>
<td></td>
<td>• the instantaneous pick-ups (I_{sd}) and (I_i) for the neutral are equal to the setting value.</td>
</tr>
</tbody>
</table>

Earth-fault protection on Micrologic 6.0 A
An earth fault in the protection conductors can provoke local temperature rise at the site of the fault or in the conductors.
The purpose of the earth-fault protection function is to eliminate this type of fault.
There are two types of earth-fault protection.

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual</td>
<td>The function determines the zero-phase sequence current, i.e. the vectorial sum of the phase and neutral currents</td>
</tr>
<tr>
<td></td>
<td>• it detects faults downstream of the circuit breaker</td>
</tr>
<tr>
<td>Source Ground Return</td>
<td>Using a special external sensor, this function directly measures the fault current returning to the transformer via the earth cable</td>
</tr>
<tr>
<td></td>
<td>• it detects faults both upstream and downstream of the circuit breaker</td>
</tr>
<tr>
<td></td>
<td>• the maximum distance between the sensor and the circuit breaker is ten metres.</td>
</tr>
</tbody>
</table>

Earth-fault pick-up \(I_g\) and tripping delay \(t_g\)
The pick-up and tripping-delay values can be set independently and are identical for both the residual and "source ground return" earth-fault protection functions.

<table>
<thead>
<tr>
<th>Micrologic control unit</th>
<th>6.0 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>pick-up</td>
<td>(I_g = I_n \times (\ast))</td>
</tr>
<tr>
<td>accuracy</td>
<td>(I_n \leq 400\ A)</td>
</tr>
<tr>
<td>± 10 %</td>
<td>(400\ A &lt; I_n \leq 1200\ A)</td>
</tr>
<tr>
<td></td>
<td>(I_n &gt; 1200\ A)</td>
</tr>
<tr>
<td></td>
<td>500 A</td>
</tr>
<tr>
<td></td>
<td>640 A</td>
</tr>
<tr>
<td></td>
<td>720 A</td>
</tr>
<tr>
<td></td>
<td>800 A</td>
</tr>
<tr>
<td></td>
<td>880 A</td>
</tr>
<tr>
<td></td>
<td>960 A</td>
</tr>
<tr>
<td></td>
<td>1040 A</td>
</tr>
<tr>
<td></td>
<td>1120 A</td>
</tr>
<tr>
<td></td>
<td>1200 A</td>
</tr>
<tr>
<td>time delay</td>
<td>(I_{2t}) OFF</td>
</tr>
<tr>
<td>(ms) at 10 (I_n) (*)</td>
<td>(I_{2t}) ON</td>
</tr>
<tr>
<td>settings</td>
<td>0</td>
</tr>
<tr>
<td>(I_{2t}) OFF or (I_{2t}) ON</td>
<td>0.1</td>
</tr>
<tr>
<td>(I_{2t}) ON or (t_g) (max resettable time)</td>
<td>0.2</td>
</tr>
<tr>
<td>(t_g) (max break time)</td>
<td>0.3</td>
</tr>
<tr>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>80</td>
<td>140</td>
</tr>
<tr>
<td>80</td>
<td>140</td>
</tr>
<tr>
<td>140</td>
<td>200</td>
</tr>
<tr>
<td>200</td>
<td>320</td>
</tr>
<tr>
<td>320</td>
<td>500</td>
</tr>
</tbody>
</table>

\(\ast\) \(I_n\): circuit-breaker rating
Current protection and alarms

Earth-leakage protection on Micrologic 7.0 A
- The earth-leakage protection function primarily protects people against indirect contact because an earth-leakage current can provoke an increase in the potential of the exposed conductive parts. The earth-leakage pick-up value $I_{\Delta n}$ is displayed directly in amperes and the tripping delay follows a constant-time curve.
- An external rectangular sensor is required for this function.
- This function is inoperative if the long-time rating plug is not installed.
- Protected against nuisance tripping.

DC-component withstand class A up to 10 A.

<table>
<thead>
<tr>
<th>Micrologic control unit</th>
<th>7.0 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pick-up value $I_{\Delta n}$ and tripping delay $\Delta t$</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>0 to -20 %</td>
</tr>
<tr>
<td>Time delay (ms)</td>
<td>Settings</td>
</tr>
<tr>
<td>$\Delta t$ (max resettable time)</td>
<td>60</td>
</tr>
<tr>
<td>$\Delta t$ (max break time)</td>
<td>140</td>
</tr>
</tbody>
</table>

Overload LED

This LED signals that the long-time current setting $I_r$ has been overrun.

Fault indications

- Signals tripping due to an overrun of the long-time current setting $I_r$.
- Signals tripping due to an overrun of the short-time pick-up $I_{sd}$ or the instantaneous pick-up $I_{sd}/I_i$.
- Signals tripping due to an overrun of the earth-fault pick-up $I_g$ or the earth-leakage pick-up $I_{\Delta n}$.
- Signals tripping due to the auto-protection function of the control unit.

Caution.
If the circuit breaker remains closed and the Ap LED remains on, contact the Schneider after-sales support department.

Caution.
The battery maintains the fault indications. If there are no indications, check the battery.
Discovering your control unit

Overview of functions
Ammeter measurements

If no information is displayed on the screen, see the technical appendix "Digital display".

- All Micrologic control units measure the true rms value of currents.
- The most heavily loaded phase is continuously displayed on the digital screen.
- Using the navigation buttons, it is possible to display successively the I1, I2, I3, neutral IN, Ig, IbN and stored-current (maximeter) values.
- The percent load on each phase is displayed. A bargraph displays the currents measured on phases 1, 2 and 3 as a percentage of the long-time current setting Ir.
On four-pole circuit breakers, it is possible to select the type of neutral protection for the fourth pole:
- neutral unprotected (4P 3D);
- neutral protection at 0.5 In (3D + N/2);
- neutral protection at In (4P 4D).
Setting procedure

1. Open the protective cover.

2. Select the desired setting. The set value is automatically displayed on the digital screen in absolute value with the relevant units.
- Current in amperes (A and kA);
- Tripping delays in seconds.

3. If no information is displayed, see the technical appendix "Digital display". If no further action is taken, after a few seconds, the display returns to the main menu for current measurements.

4. Close the protective cover and, if necessary, install a lead seal to protect the settings.

See the user manual for the portable test kit

Using the portable test kit

To test the control unit, connect the portable test kit via the test connector.
Setting your control unit

Setting the Micrologic 2.0 A control unit

The rating of the circuit breaker in this example is 2000 A.

Set the threshold values

\[ I_{in} = 2000 \text{ A} \]

Set the tripping delay

\[ I_{tr} = 1 \text{ second} \]
Setting the Micrologic 5.0 A control unit

The rating of the circuit breaker in this example is 2000 A.

Set the threshold values

See pages 4 and 5 for information on the available settings

Thresholds

Tripping delays

Set the tripping delay

In = 2000 A
Ir = 0.7 x In = 1400 A
Isd = 2 x Ir = 2800 A
Li = 3 x In = 6000 A

tr = 1 second
tsd = 0.2 seconds
Setting your control unit

The rating of the circuit breaker in this example is 2000 A.

See pages 4 to 6 for information on the available settings.

Setting the Micrologic 6.0 A control unit

Set the threshold values

- \( I_n = 2000 \text{ A} \)
- \( I_r = 0.7 \times I_n = 1400 \text{ A} \)
- \( I_{sd} = 2 \times I_r = 2800 \text{ A} \)
- \( I_{i} = 3 \times I_n = 6000 \text{ A} \)
- \( B \rightarrow I_g = 640 \text{ A} \)

Set the tripping delay

- \( t_r = 1 \text{ second} \)
- \( t_{sd} = 0.2 \text{ seconds} \)
- \( t_{g} = 0.2 \text{ seconds} \)
Setting the Micrologic 7.0 A control unit

The rating of the circuit breaker in this example is 2000 A.

See pages 4 to 7 for information on the available settings.

Set the threshold values

- \( I_{\text{In}} = 2000 \text{ A} \)
- \( I_{\text{Ir}} = 0.7 \times I_{\text{In}} = 1400 \text{ A} \)
- \( I_{\text{Isd}} = 2 \times I_{\text{Ir}} = 2800 \text{ A} \)
- \( I_{\text{II}} = 3 \times I_{\text{In}} = 6000 \text{ A} \)
- \( I_{\Delta n} = 1 \text{ A} \)

Set the tripping delay

- \( t_{\text{tr}} = 1 \text{ second} \)
- \( t_{\text{tsd}} = 0.2 \text{ seconds} \)
- \( \Delta t = 140 \text{ milliseconds} \)
Fault and status indications

The procedure for closing the circuit breaker following a fault trip is presented in the circuit-breaker user manual.

Resetting the fault indications

- determine why the circuit breaker tripped.
- press the fault-trip reset button.

Press the battery-test button (same as the fault-trip reset button) to display the battery status.

- Battery fully charged
- Battery half charged
- Change the battery

If no information is displayed, either:
- no battery is installed in the control unit, or;
- an auxiliary power supply is required.

See the technical appendix “Digital display”.

Changing the control-unit battery

1. Remove the battery cover.
2. Remove the battery.
3. Insert a new battery. Check the polarity.
4. Put the cover back in place. Press the battery-test button to check the new battery.

If the battery needs to be changed, please use the one with Schneider catalogue number 33593 (characteristics given on the battery compartment cover).
Testing the earth-fault and earth-leakage functions

Charge and close the circuit breaker.
Using a screwdriver, press the test button for earth-fault and earth-leakage protection. The circuit breaker should open.

If the circuit breaker does not open, contact the Schneider after-sales support department.
### Symbols used:

- **Briefly press a key.**

- **Press and hold a key.**

### Accessing the menus

Three menus may be accessed on Micrologic control units, providing the following information:

- Phase current measurements $I_1$, $I_2$, $I_3$, neutral $I_N$, earth-fault current $I_g$ on the Micrologic 6.0 A control unit and earth-leakage current $I_{\Delta n}$ on the Micrologic 7.0 A control unit;
- Maximeter current values for phases $I_1$, $I_2$, $I_3$, neutral $I_N$, the maximum earth-fault current $I_g$ on the Micrologic 6.0 A control unit and the maximum earth-leakage current $I_{\Delta n}$ on the Micrologic 7.0 A control unit;
- Protection settings and tripping delays.

1. **Measurements**

   - Press the "menu" button to access the maximum current values measured by the maximeter.

2. **Maximeter**

   - Press the "menu" button to access the protection settings and tripping delays.

3. **Settings**

   - Press the "menu" button to return to the current measurements.

4. The system returns to the main "Measurements" menu.

It is possible at any time to stop consulting a current measurement, a maximum current value recorded by the maximeter or the setting values. After a few seconds, the Micrologic control unit automatically returns to the main menu displaying the current value of the most heavily loaded phase.

The protection settings can be displayed directly on the digital display.
Current values may be read in the “Measurements” menu, which is also the main menu.

If no particular action is taken, the system displays the current value of the most heavily loaded phase.

“Measurements” menu
Phase 1 is the most heavily loaded.

Display of current I1.

Display of current I2.

Press the “arrow” button to go on to current I2.

Press the “arrow” button to go on to current I3.

Display of current I3.

Press the “arrow” button to go on to current IN if the circuit breaker is connected to the neutral.

Press the “arrow” button to go on to the earth-fault current Ig or the earth-leakage current IΔn.

Display of current Ig
(Micrologic 6.0 A) or current IΔn
(Micrologic 7.0 A).

The system returns to the display of current I1.

Press the “arrow” button to return to current I1.
Menus

Maximum current values may be read in the "Maximeter" menu.

If no particular action is taken, the system returns to the main menu.

Displaying the maximum current values

Display of the maximum $I_1$ current.

Display of the maximum $I_2$ current.

Display of the maximum $I_3$ current.

Display of the maximum $I_g$ current or the maximum $I_{\Delta n}$ current.

Press the "arrow" button to go on to the maximum $I_1$ current.

Press the "arrow" button to go on to the maximum $I_2$ current.

Press the "arrow" button to go on to the maximum $I_3$ current.

Press the "arrow" button to go on to the maximum $I_g$ current or the maximum $I_{\Delta n}$ current.

Press the "arrow" button to go on to the maximum $I_{\Delta n}$ current if the circuit breaker is connected to the neutral.

Press the "arrow" button to go on to the maximum earth-fault current $I_g$ (Micrologic 6.0 A) or the maximum earth-leakage current $I_{\Delta n}$ (Micrologic 7.0 A).

The system returns to the display of the maximum $I_1$ current.

Press the "arrow" button to return to the maximum $I_1$ current.
Resetting the maximum current values

**Maximum current values can be reset using the “Maximeter” menu.**

If no particular action is taken, the system returns to the main menu.

**“Maximeter” menu.**

Select the maximum current value to be reset (e.g. I2 max.).

Reset.

Select another value to reset or return to the main menu.

Press the “arrow” button as many times as required to select I2 max.

Press and hold the “arrow” button down for three to four seconds. The current value flashes during the reset, then changes to the present value (the new maximum).

Press the “arrow” button as many times as required to select another maximum value to reset or return to the main menu.
# Viewing the settings

## Menus

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micrologic control unit</td>
<td></td>
</tr>
<tr>
<td>2.0 A 5.0 A 6.0 A 7.0 A</td>
<td></td>
</tr>
</tbody>
</table>

### Long-time current setting \( \text{Ir} \)
- Select the “Settings” menu.
- The \( \text{Ir} \) value is the first displayed.
- \( 1400 \text{A} \)

### Long-time tripping delay \( \text{tr} \)
- Press the “arrow” button to go on to the \( \text{Ir} \) value.
- \( 1 \text{S} \)

### Short-time pick-up \( \text{Isd} \)
- Press the “arrow” button to go on to the \( \text{tr} \) value.
- \( 2800 \text{A} \)

### Short-time tripping delay \( \text{tsd} \)
- Press the “arrow” button to go on to the \( \text{Isd} \) value.
- \( 0.200 \text{S} \)

### Instantaneous pick-up \( \text{Isd} \)
- Press the “arrow” button to go on to the \( \text{tsd} \) value.
- \( \text{OFF A} \)

### Instantaneous pick-up \( \text{Ii} \)
- Press the “arrow” button to go on to the \( \text{Isd} \) value.
- \( \text{OFF A} \)

### Earth-fault pick-up \( \text{Ig} \)
- Press the “arrow” button to go on to the \( \text{Ii} \) value.
- \( 40 \text{A} \)

### Earth-leakage pick-up \( \Delta n \)
- Press the “arrow” button to go on to the \( \text{Ig} \) value.
- \( 131 \text{A} \)

### Earth-fault tripping delay \( \text{tg} \)
- Press the “arrow” button to go on to the \( \Delta n \) value.
- \( 0.200 \text{S} \)

### Earth-leakage tripping delay \( \Delta t \)
- Press the “arrow” button to go on to the \( \text{tg} \) value.
- \( 0.100 \text{S} \)

### Earth-fault tripping delay \( \text{tg} \)
- Press the “arrow” button to go on to the beginning of the menu.
- \( 1400 \text{A} \)
### Tripping curves

#### Long-time and instantaneous protection (Micrologic 2.0 A)

![Graph showing tripping curves for long-time and instantaneous protection.](image)

- **Ir** = 0.4…1 x In
- **tr** = 0.5…24 s
- **Isd** = 1.5…10 x Ir

#### Long-time, short-time and instantaneous protection (Micrologic 5.0 A, 6.0 A and 7.0 A)

![Graph showing tripping curves for long-time, short-time, and instantaneous protection.](image)

- **Ii** = 2…15 x In
- **O.F.F.**
- **I2 t OFF**
- **I2 t ON**
- **tr** = 0.5…24 s
Earth-fault protection (Micrologic 6.0 A)

\[ I_g = A \cdot I_t \cdot \log(I_n) \]

1200 A max.

\[ \frac{I}{I_n} \]

\[ t(s) \]

<table>
<thead>
<tr>
<th>10 000</th>
<th>5 000</th>
<th>2 000</th>
<th>1 000</th>
<th>500</th>
<th>200</th>
<th>100</th>
<th>50</th>
<th>20</th>
<th>10</th>
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<td>.07</td>
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<td>30</td>
<td>50</td>
<td>100</td>
<td>200</td>
<td>300</td>
<td></td>
</tr>
</tbody>
</table>

I2 t OFF

I2 t ON

Schneider Electric
The available rating plugs are listed below.

<table>
<thead>
<tr>
<th>Part number</th>
<th>Setting range for the Ir value</th>
</tr>
</thead>
<tbody>
<tr>
<td>33542</td>
<td>standard 0.4 to 1 x Ir</td>
</tr>
<tr>
<td>33543</td>
<td>low setting 0.4 to 0.8 x Ir</td>
</tr>
<tr>
<td>33544</td>
<td>high setting 0.8 to 1 x Ir</td>
</tr>
<tr>
<td>33545</td>
<td>without long-time protection</td>
</tr>
</tbody>
</table>

Select the long-time rating plug
A number of setting ranges for the long-time current setting are available on Micrologic A control units by changing the long-time rating plug.

Change the long-time rating plug
Proceed in the following manner.

1. Open the circuit breaker.
2. Open the protective cover of the control unit.
3. Completely remove the long-time rating plug screw.
4. Snap out the rating plug.
5. Clip in the new rating plug.
6. Refit the screw for the long-time rating plug.
7. Check and/or modify the control-unit settings.

Caution.
If no long-time rating plug is installed, the control unit continues to operate under the following downgraded conditions:
- the long-time current setting Ir is 0.4;
- the long-time tripping delay tr corresponds to the value indicated by the adjustment dial;
- the earth-leakage protection function is disabled.
Zone selective interlocking (ZSI)

Operating principle
- A fault occurs at point A. Downstream device no. 2 clears the fault and sends a signal to upstream device no. 1, which maintains the short-time tripping delay tsd or the earth-fault tripping delay tg to which it is set.
- A fault occurs at point B. Upstream device no. 1 detects the fault. In the absence of a signal from a downstream device, the upstream device immediately trips without taking into account its tripping-delay settings. If it is connected to a device even further upstream, it sends a signal to that device, which delays tripping according to its tsd or tg setting.

Note:
On a circuit breaker likely to receive a ZSI signal, the tsd and tg tripping delays must not be set to zero, as this would make discrimination impossible.

Connections between control units
A logic signal (0 or 5 volts) can be used for zone selective interlocking between the upstream and downstream circuit breakers.
- Micrologic 5.0 A, 6.0 A, 7.0 A.
- Micrologic 5.0 P, 6.0 P, 7.0 P.
- Micrologic 5.0 H, 6.0 H, 7.0 H.

Wiring
- maximum impedance: 2.7 Ω / 300 metres
- capacity of connectors: 0.4 to 2.5 mm²
- maximum cross-sectional area of wires (including insulation): 3.5 mm²
- wires: single or multicore
- maximum length: 3000 metres
- limits to device interconnection:
  - the common ZSI - OUT - SOURCE (Z1) and the output ZSI - OUT (Z2) can be connected to a maximum of 10 inputs;
  - a maximum of 100 devices may be connected to an input ZSI IN CR (Z4) or GF (Z5)
- connections are made from the output ZSI - OUT (Z2) on the downstream device to the input(s) ZSI - IN - ST (Z4) and/or GF (Z5) on the upstream device.

Terminals Z1 to Z5 correspond to the identical indications on the circuit-breaker terminal blocks.
Digital display

The display of measurements operates without an external power supply. The digital display goes off if the current drops below 0.2 x In (In = rated current). Display back-lighting is disabled in the following situations:

- Current less than 1 x In on one phase;
- Current less than 0.4 x In on two phases;
- Current less than 0.2 x In on three phases.

The maximeter does not operate for currents under 0.2 x In.

These three functions may be maintained by adding an external power supply. Even if an external power supply is installed, the long-time, short-time, instantaneous and earth protection functions will not use it.

For information on connecting an external power supply, see the electrical diagrams in the circuit-breaker user manual.
Thermal memory

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.

Control 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.

Control 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 control units and thermal memory

All Micrologic control units are equipped as standard with a thermal memory:
- for all protection functions, prior to tripping, the temperature-rise and cooling time constants are equal and depend on the tripping delay in question:
  - if the tripping delay is short, the time constant is low;
  - if the tripping delay is long, the time constant is high.

- for long-time protection, following tripping, the cooling curve is simulated by the control 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.