

Micrologic control units

5.0 P, 6.0 P, 7.0 P

Low Voltage Products

User manual



Merlin Gerin

Modicon

Square D

Talamecanique

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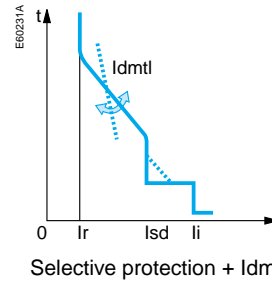
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All Masterpact NT and NW circuit breakers are equipped with a Micrologic control unit that can be changed on site. Control units are designed to protect power circuits and connected loads. They offer current, voltage, frequency, power and energy measurements. The functions provided by Micrologic 5.0 P, 6.0 P and 7.0 P control units optimise continuity of service and power management in your installation.

Micrologic 5.0 P

Selective protection + Idmtl, power measurements and additional protection



Micrologic 5.0 P



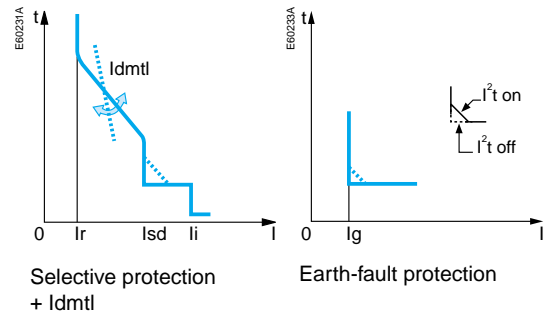
- X: type of protection
- 2 for basic protection
 - 5 for selective protection
 - 6 for selective + earth-fault protection
 - 7 for selective + earth-leakage protection

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

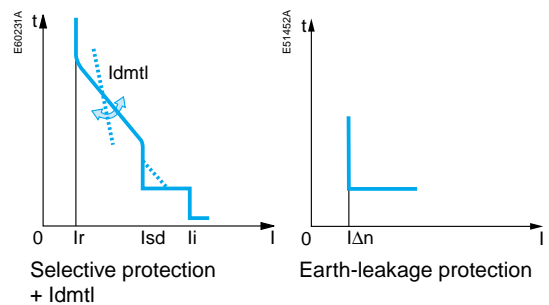
Micrologic 6.0 P

Selective protection + Idmtl + earth-fault protection, power measurements and additional protection



Micrologic 7.0 P

Selective protection + Idmtl + earth-leakage protection, power measurements and additional protection



Presentation

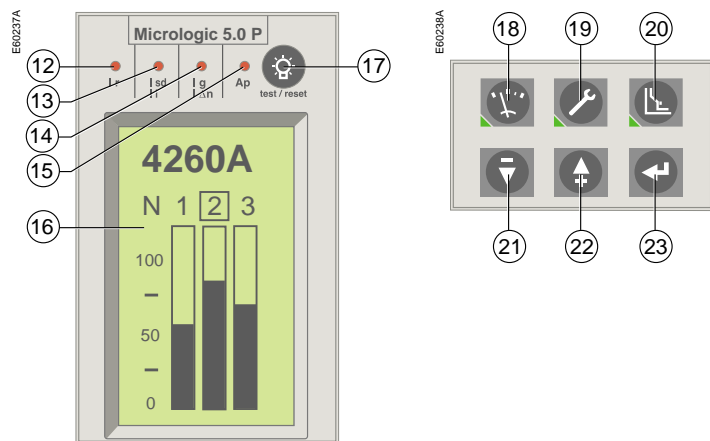
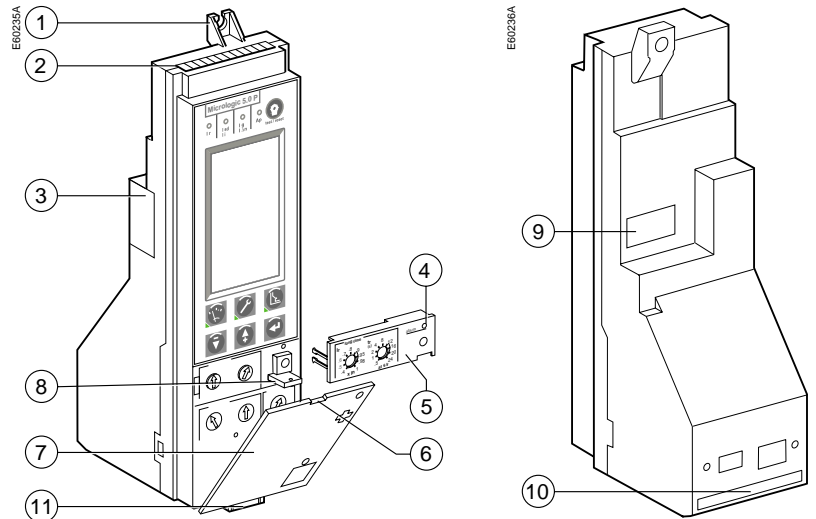
- 1 top fastener
- 2 terminal block for external connections
- 3 housing for battery
- 4 screw for long-time rating plug
- 5 long-time rating plug
- 6 cover opening point
- 7 protective cover
- 8 lead-seal fixture for protective cover
- 9 infrared link with communications interfaces
- 10 connection with circuit breaker
- 11 bottom fastener

Indications

- 12 LED indicating long-time tripping
- 13 LED indicating short-time or instantaneous tripping
- 14 LED indicating earth-fault or earth-leakage tripping
- 15 LED indicating additional-protection or auto-protection tripping
- 16 graphics display
- 17 button for reset of fault-trip LED reset and battery test

Navigation

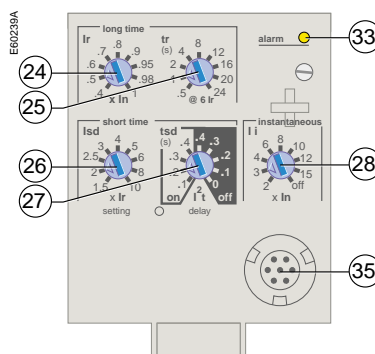
- 18 access button to the "Metering" menu (*)
- 19 access button to the "History, maintenance and setup" menu (*)
- 20 access button to the "Protection" menu (*)
- 21 button used to scroll down or reduce the displayed value
- 22 button used to scroll up or increase the displayed value
- 23 button used to select or confirm a choice



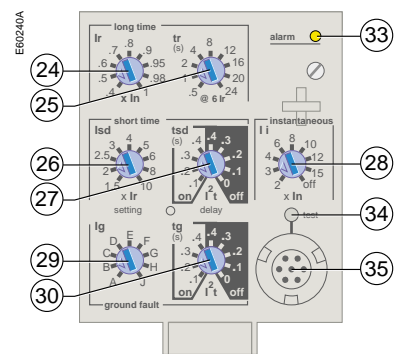
Adjustment dials

- 24 long-time current setting I_r
- 25 long-time tripping delay t_r
- 26 short-time pickup I_{sd}
- 27 short-time tripping delay t_{sd}
- 28 instantaneous pickup I_i
- 29 earth-fault pickup I_g
- 30 earth-fault tripping delay t_g
- 31 earth-leakage pickup $I_{\Delta n}$
- 32 earth-leakage tripping delay Δt
- 33 LED indicating an overload
- 34 test button for earth-fault and earth-leakage protection
- 35 test connector

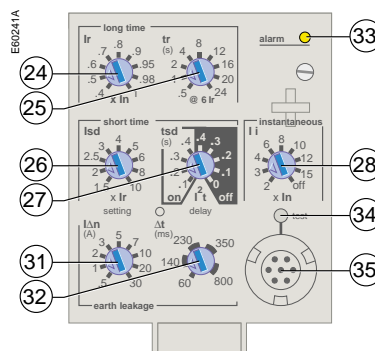
Micrologic 5.0 P control unit



Micrologic 6.0 P control unit



Micrologic 7.0 P control unit



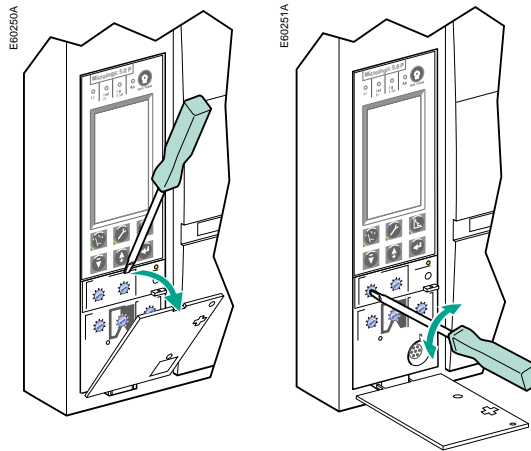
(*) These buttons include a LED indicating the active menu.

With the protective cover open
Make all the necessary settings for your control unit.

All fine adjustments are permanently stored in memory, unless the setting is modified using the adjustment dial.

For remote settings using the communications option, see the "Remote settings" section in the "Com setup" menu under "History, maintenance and setup".



Settings using the dials



■ open the protective cover.

- make the necessary settings using the dials
- the screen automatically displays the relevant curve
- check the set value on the screen, in absolute value in amperes (A) and in seconds (s).

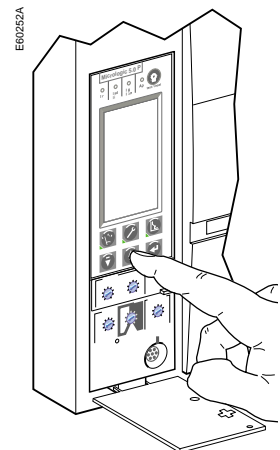
Settings using the keypad

- the  and  buttons under the screen may be used for fine adjustments of the settings made using the dials.
- all the settings not available via the dials are made in the same manner, using the keypad.

Caution!

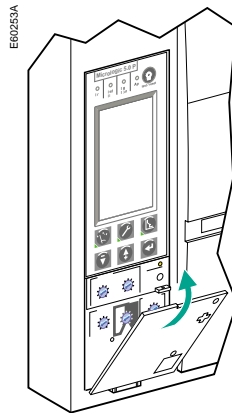
A new setting using one of the dials (including the neutral selector for four-pole devices):

- deletes all the fine adjustments previously made using the keypad for the overload protection (long time), short-circuit protection (short time and instantaneous), earth-fault and earth-leakage protection and neutral protection
- does not affect any other settings made using the keypad.

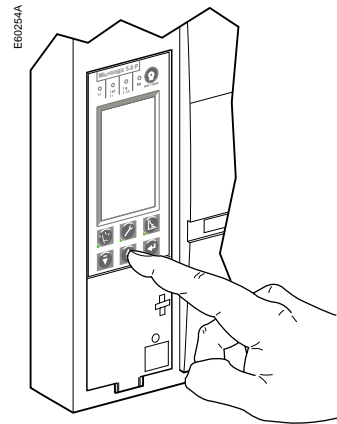


*With the protective cover closed
Settings may not be made. It is possible to
view the various settings using the keypad
or the communications option.*

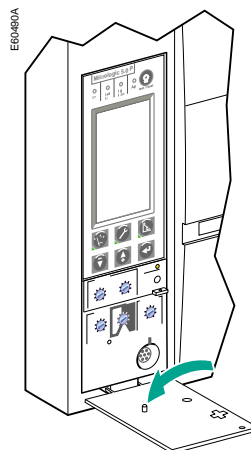
View the settings and measurements



- close the protective cover for the dials
- access to the dials is blocked and it is no longer possible to make fine adjustments using the keypad



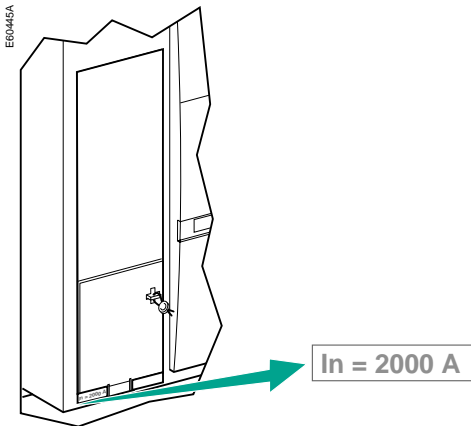
- if necessary, install a lead seal to protect the settings
- settings may be viewed at any time using the keypad.



Caution!
If you notice that the tab on the back of the protective cover has been broken off, contact the Schneider after-sales support department to replace the cover.

Setting Micrologic 5.0 P using the dials

Consider a 2000 A circuit breaker.



Set the thresholds

Diagram showing the threshold settings for a 2000 A circuit breaker:

- $I_n = 2000\text{ A}$
- $I_r = 0.5 \times 2000 = 1000\text{ A}$
- $I_{sd} = 2 \times 1000 = 2000\text{ A}$
- $I_i = 2 \times 2000 = 4000\text{ A}$

See pages 8 and 9 for selection of the setting ranges.

Set the time delays

Diagram showing the time delay settings for a 2000 A circuit breaker:

- $t_r = 1\text{ s}$
- $t_{sd} = 0.2\text{ s}$

thresholds

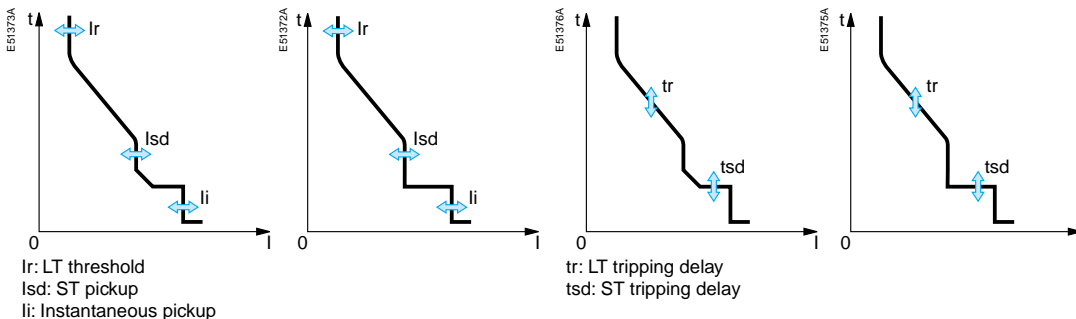
I^2t ON curve

I^2t OFF curve

time delays

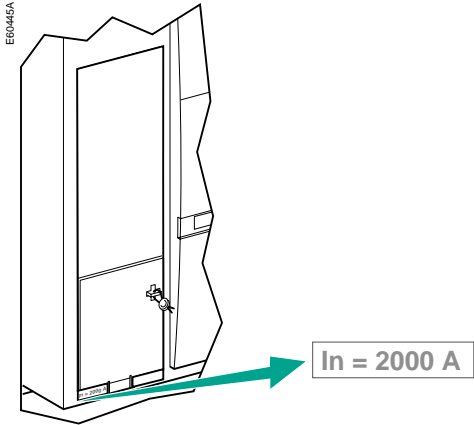
I^2t ON curve

I^2t OFF curve



Setting Micrologic 6.0 P using the dials

Consider a 2000 A circuit breaker.



Set the thresholds

E60330A

long time

I_r

short time

I_{sd}

instantaneous

I_i

setting

I_g

ground fault

$I_n = 2000 \text{ A}$

$I_r = 0.5 \times 2000 = 1000 \text{ A}$

$I_{sd} = 2 \times 1000 = 2000 \text{ A}$

$I_i = 2 \times 2000 = 4000 \text{ A}$

$B \rightarrow I_g = 640 \text{ A}$

See pages 8 to 11 for selection of the setting ranges.

Set the time delays

E60330A

long time

t_r (s)

short time

t_{sd} (s)

delay

t_g (s)

ground fault

$t_r = 1 \text{ s}$

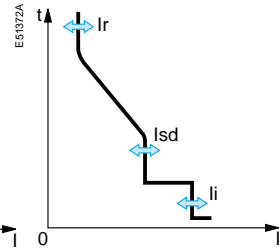
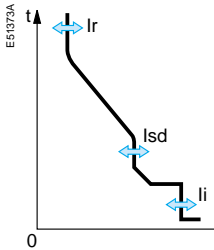
$t_{sd} = 0.2 \text{ s}$

$t_g = 0.2 \text{ s}$

thresholds

I^2t ON curve

I^2t OFF curve

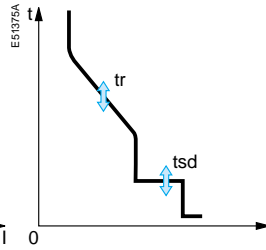
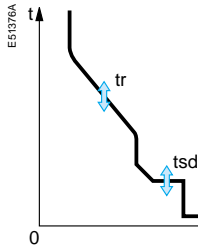


I_r : LT threshold
 I_{sd} : ST pickup
 I_i : Instantaneous pickup

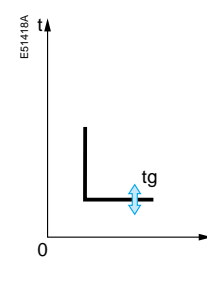
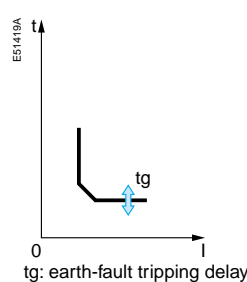
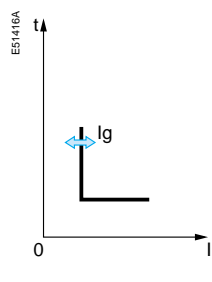
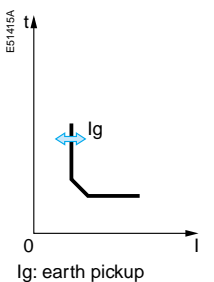
time delays

I^2t ON curve

I^2t OFF curve

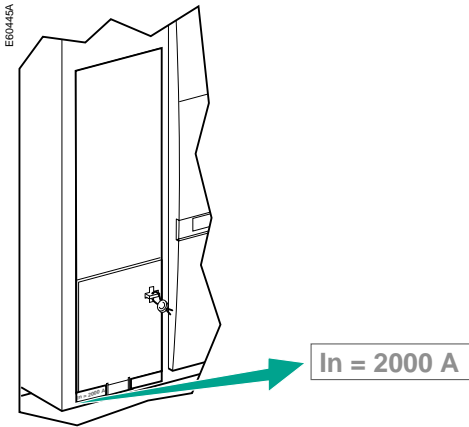


t_r : LT tripping delay
 t_{sd} : ST tripping delay



Setting Micrologic 7.0 P using the dials

Consider a 2000 A circuit breaker.



Set the thresholds

E60333A

- long time: Ir = 0.5 x 2000 = 1000 A
- short time: I_{sd} = 2 x 1000 = 2000 A
- instantaneous: I_i = 2 x 2000 = 4000 A
- earth leakage: I_{Δn} = 1 A

See pages 8 to 11 for selection of the setting ranges.

Set the time delays

E60344A

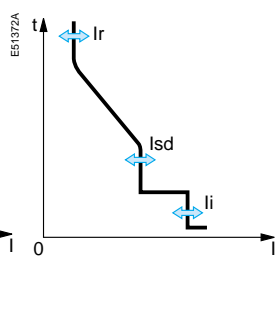
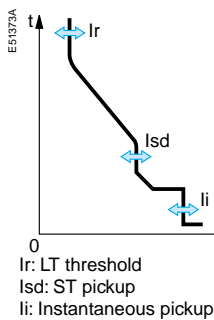
- long time: tr = 1 s
- short time: tsd = 0.2 s
- earth leakage: Δt = 140 ms

E60153A

thresholds

I²t ON curve

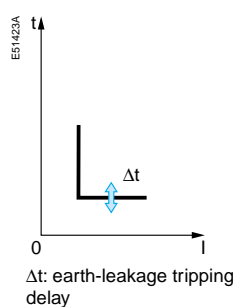
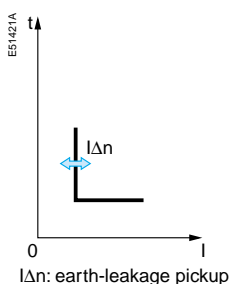
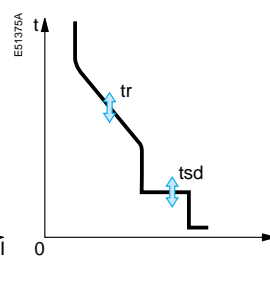
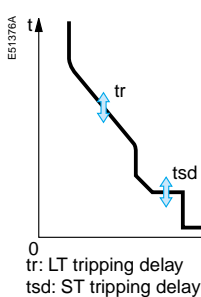
I²t OFF curve



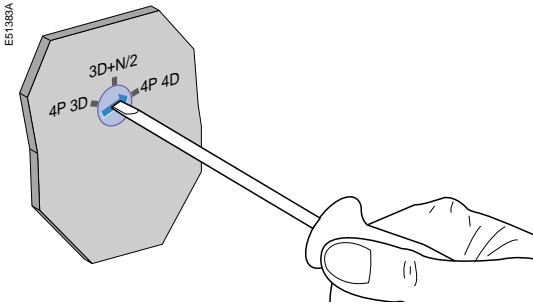
time delays

I²t ON curve

I²t OFF curve



Selecting the type of neutral protection



Selection dial on four-pole circuit breakers

On four-pole circuit breakers, it is possible to select the type of neutral protection for the fourth pole using the three-position dial on the circuit breaker:

- no neutral protection 4P 3D
- half neutral protection 3D + N/2
- full neutral protection 4P 4D.

Current protection

I²t long-time protection

For the default values, the setting ranges, increment steps and setting accuracies, see the technical appendix.

The long-time protection function protects cables against overloads. This function is based on true rms measurements. It is possible to select either I²t long-time protection or Idmtl long-time protection.

I²t long-time protection

Long-time current setting I_r and standard tripping delay t_r

Micrologic control unit	Accuracy	5.0 P, 6.0 P and 7.0 P									
current setting	I _r = I _n x ...(*)	0.4	0.5	0.6	0.7	0.8	0.9	0.95	0.98	1	
tripping between 1.05 and 1.20 I _r		other ranges or disable by changing rating plug									
time delay (s)	t _r at 1.5 x I _r	0 to - 30%	12.5	25	50	100	200	300	400	500	600
	t _r at 6 x I _r	0 to - 20%	0.5	1	2	4	8	12	16	20	24
	t _r at 7.2 x I _r	0 to - 20%	0.34	0.69	1.38	2.7	5.5	8.3	11	13.8	16.6

* I_n: circuit breaker rating

- it is possible to enhance the I_r setting accuracy (reduced range) or disable the long-time protection function by using a different long-time rating plug. See the technical appendix "Changing the long-time rating plug".

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.

Idmtl long-time protection

Idmtl Protection

Long-time current setting I_r and Idmtl tripping delay t_r

Micrologic control unit	Accuracy	5.0 P, 6.0 P and 7.0 P									
current setting	$I_r = I_n \times \dots (*)$	0.4	0.5	0.6	0.7	0.8	0.9	0.95	0.98	1	
tripping between 1.05 and 1.20 I_r		other ranges or disable by changing rating plug									
DT											
time delay (s)	tr at 1.5 x I_r	0 to - 20%	0.5	1	2	4	8	12	16	20	24
	tr at 6 x I_r	0 to - 20%	0.5	1	2	4	8	12	16	20	24
	tr at 7.2 x I_r	0 to - 20%	0.5	1	2	4	8	12	16	20	24
SIT											
time delay (s)	tr at 1.5 x I_r	0 to - 30%	1.9	3.8	7.6	15.2	30.4	45.5	60.7	75.8	91
	tr at 6 x I_r	0 to - 20%	0.5	1	2	4	8	12	16	20	24
	tr at 7.2 x I_r	0 to - 20%	0.44	0.88	1.77	3.54	7.08	10.6	14.16	17.7	21.2
VIT											
time delay (s)	tr at 1.5 x I_r	0 to - 30%	3.6	7.2	14.4	28.8	57.7	86.5	115.4	144.2	173.1
	tr at 6 x I_r	0 to - 20%	0.5	1	2	4	8	12	16	20	24
	tr at 7.2 x I_r	0 to - 20%	0.4	0.81	1.63	3.26	6.52	9.8	13.1	16.34	19.61
EIT											
time delay (s)	tr at 1.5 x I_r	0 to - 30%	12.5	25	50	100	200	300	400	500	600
	tr at 6 x I_r	0 to - 20%	0.5	1	2	4	8	12	16	20	24
	tr at 7.2 x I_r	0 to - 20%	0.34	0.69	1.38	2.7	5.5	8.3	11	13.8	16.6
HVF											
time delay (s)	tr at 1.5 x I_r	0 to - 30%	164.5	329	658	1316	2632	3950	5265	6581	7900
	tr at 6 x I_r	0 to - 20%	0.5	1	2	4	8	12	16	20	24
	tr at 7.2 x I_r	0 to - 20%	0.24	0.48	0.96	1.42	3.85	5.78	7.71	9.64	11.57

* I_n : circuit breaker rating

- these curves with different slopes are used to improve:
 - discrimination with fuses positioned upstream (HV) and/or downstream
 - protection for certain types of loads
- five types of curves are available:
 - DT: definite time curve
 - SIT: standard inverse time curve ($I^{0.5}t$)
 - VIT: very inverse time curve ($I t$)
 - EIT: extremely inverse time curve ($I^2 t$)
 - HVF: compatible with high-voltage fuses ($I^4 t$).

■ neutral protection

Overload protection (long time) for the neutral is disabled if the Idmtl protection function is selected. However, the short-circuit protection (short time and instantaneous) remains operational.

■ intermittent overloads

As long as the Micrologic P control unit remains supplied with power, the effects of intermittent overloads on cables are calculated. If power is cut, temperature rise in cables is not calculated.

Current protection

Short-time and instantaneous protection

For the default values, the setting ranges, increment steps and setting accuracies, see the technical appendix.

For the characteristics and external wiring of the zone selective interlocking function, see the technical appendix on "Zone selective interlocking".

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 I_r. Above 10 I_r, 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.

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

Short-time pickup I_{sd} and tripping delay t_{sd}

Micrologic control unit		5.0 P, 6.0 P and 7.0 P							
pickup accuracy ± 10 %	I _{sd} = I _r x ...	1.5	2	2.5	3	4	5	8	10
time delay (ms) at 10 I _r	setting								
	I ² t Off	0	0.1	0.2	0.3	0.4			
	I ² t On		0.1	0.2	0.3	0.4			
I ² t On or I ² t Off	t _{sd} (max resettable time)	20	80	140	230	350			
	t _{sd} (max break time)	80	140	200	320	500			

If the "without long-time protection" plug is used and the long-time protection function is disabled, the short-time pickup I_{sd} is automatically multiplied by I_n instead of I_r as is the standard case.

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 pickup I_i

Micrologic control unit		5.0 P, 6.0 P and 7.0 P								
pickup accuracy ± 10 %	I _i = I _n x ... (*)	2	3	4	6	8	10	12	15	OFF

* I_n: circuit-breaker rating

- circuit breakers have two types of instantaneous protection:
 - adjustable instantaneous protection I_i
 - self-protection.
 Depending on the circuit breaker, the OFF position corresponds to the self-protection pickup.

Neutral protection

For the default values, the setting ranges, increment steps and setting accuracies, see the technical appendix.

Three-pole circuit breakers



Protection of the neutral is possible on a three-pole circuit breaker by connecting an external sensor.

Settings are made using the  and  buttons on the control unit.

Micrologic control unit		5.0 P, 6.0 P and 7.0 P			
Setting		OFF	N/2	N	Nx2
Type of neutral	Description				
No neutral protection	The distribution system does not require protection of the neutral conductor.				
Half neutral protection	The cross-sectional area of the neutral conductor is half that of the phase conductors. <ul style="list-style-type: none"> ■ the long-time current setting I_r for the neutral is equal to half the setting value ■ the short-time pickup I_{sd} for the neutral is equal to half the setting value ■ the instantaneous pickup I_i for the neutral is equal to the setting value ■ for earth-fault protection (Micrologic 6.0 P), pickup I_g for the neutral is equal to the setting value. 				
Full neutral protection	The cross-sectional area of the neutral conductor is equal to that of the phase conductors. <ul style="list-style-type: none"> ■ the long-time current setting I_r for the neutral is equal to the setting value ■ the short-time pickup I_{sd} for the neutral is equal to the setting value ■ the instantaneous pickup I_i for the neutral is equal to the setting value ■ for earth-fault protection (Micrologic 6.0 P), pickup I_g for the neutral is equal to the setting value. 				
Double neutral protection	In installations with a high level of third-order harmonic currents (or multiples thereof), the current in the neutral conductor may exceed that of the phase currents under steady-state conditions <ul style="list-style-type: none"> ■ the long-time current setting I_r for the neutral is double that of the setting value ■ the short-time pickup I_{sd} for the neutral is double that of the setting value, but may not exceed $10 I_n$ to limit transients and self-protect the installation ■ the instantaneous pickup I_i for the neutral is equal to the setting value ■ for earth-fault protection (Micrologic 6.0 P), pickup I_g for the neutral is equal to the setting value. 				

Four-pole circuit breakers

The initial protection setting is made using the dial on the neutral pole of the circuit breaker.

The  and  buttons on the control unit may then be used for a more precise setting. The dial setting constitutes the upper limit for adjustments using the keypad.

Micrologic control unit		5.0 P, 6.0 P and 7.0 P		
Setting		OFF	N/2	N
Type of neutral	Description			
No neutral protection	The distribution system does not require protection of the neutral conductor.			
Half neutral protection	The cross-sectional area of the neutral conductor is half that of the phase conductors. <ul style="list-style-type: none"> ■ the long-time current setting I_r for the neutral is equal to half the setting value ■ the short-time pickup I_{sd} for the neutral is equal to half the setting value ■ the instantaneous pickup I_i for the neutral is equal to the setting value 			
Full neutral protection	The cross-sectional area of the neutral conductor is equal to that of the phase conductors. <ul style="list-style-type: none"> ■ the long-time current setting I_r for the neutral is equal to the setting value ■ the short-time pickup I_{sd} for the neutral is equal to the setting value ■ the instantaneous pickup I_i for the neutral is equal to the setting value. 			

Current protection

Earth-fault and earth-leakage protection

For the default values, the setting ranges, increment steps and setting accuracies, see the technical appendix.

Earth-fault protection on Micrologic 6.0 P

- 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.

Type	Description
Residual	<ul style="list-style-type: none"> ■ the function determines the zero-phase sequence current, i.e. the vector sum of the phase and neutral currents (depending on the type of installation).
Source Ground Return	<ul style="list-style-type: none"> ■ using a special external sensor, this function directly measures the fault current returning to the transformer via the earth cable ■ it detects faults both upstream and downstream of the circuit breaker ■ the maximum distance between the sensor and the circuit breaker is ten metres.

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

Earth-fault pickup I_g and tripping delay t_g

The pickup and tripping-delay values can be set independently and are identical for both the residual and "source ground return" earth-fault protection functions.

Micrologic control unit		6.0 P								
pickup accuracy $\pm 10\%$	$I_g = I_n \times \dots$	A	B	C	D	E	F	G	H	I
	$I_n \leq 400\text{ A}$	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
	$400\text{ A} < I_n \leq 1200\text{ A}$	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
	$I_n > 1200\text{ A}$	500 A	640 A	720 A	800 A	880 A	960 A	1040 A	1120 A	1200 A
time delay (ms) at $10 I_n$	settings									
	I^2t Off	0	0.1	0.2	0.3	0.4				
I^2t On or I^2t Off	I^2t On	0.1	0.2	0.3	0.4					
	t_g (max resettable time)	20	80	140	230	350				
	t_g (max. break time)	80	140	200	320	500				

Earth-leakage protection on sur Micrologic 7.0 P

- 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 pickup 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
- \int_{ν} Protected against nuisance tripping
- $\wedge \wedge$ DC-component withstand class A up to 10 A.

Pickup value $I_{\Delta n}$ and tripping delay Δt

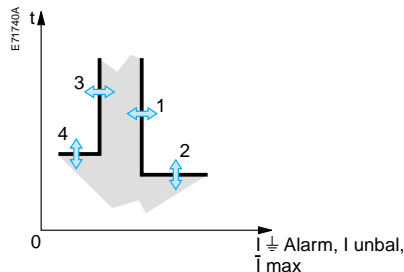
Micrologic control unit		7.0 P									
pickup (A) accuracy 0 to - 20 %	$I_{\Delta n}$	0.5	1	2	3	5	7	10	20	30	
	settings										
time delay (ms)	Δt (max resettable time)	60	140	230	350	800					
	Δt (max. break time)	140	200	320	500	1000					

I $\bar{\bar{I}}$ Alarm, current unbalance, maximum current

For the pickup and dropout thresholds and time delays, see the technical appendix.

Operating principle

protection tripped by a maximum value



- 1: pickup threshold
- 2: pickup time delay
- 3: dropout threshold
- 4: dropout time delay

■ for protection tripped by a maximum value, it is possible to set:

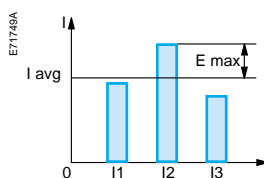
- a pickup threshold (1) that activates an alarm, a contact and/or tripping
- a pickup time delay (2) that steps in when the pickup threshold (1) is reached
- a dropout threshold (3) corresponding to deactivation of the alarm and/or contact
- a dropout time delay (4) that steps in when the dropout threshold (3) is reached
- the dropout threshold is always less than or equal to the pickup threshold.

I $\bar{\bar{I}}$ Alarm

- the alarm function is tripped by the rms value of an earth-leakage current
- this alarm signals an earth-leakage current under the pickup value and does not produce circuit-breaker tripping.

Current-unbalance protection I unbal

- this protection is activated by an adjustable level of unbalance between the RMS values of the three phase currents.



■ from:

- I avg is the average value of the rms currents of the three phases

$$I \text{ avg} = \frac{I_1 + I_2 + I_3}{3}$$

- E max is the maximum difference between the current of each phase and I avg

■ Micrologic P uses the two values above to calculate the current unbalance:

$$I \text{ unbal} = \frac{E \text{ max}}{I \text{ avg}}$$

Maximum-current protection per phase $\bar{I} \text{ max}$

■ protection values may be set for each of the following currents:

- $\bar{I} 1 \text{ max}$: maximum current on phase 1
- $\bar{I} 2 \text{ max}$: maximum current on phase 2
- $\bar{I} 3 \text{ max}$: maximum current on phase 3
- $\bar{I} N \text{ max}$: maximum current in the neutral

■ this function calculates the rms demand value of the current for the given phase ($\bar{I} 1, \bar{I} 2, \bar{I} 3$) or the neutral ($\bar{I} N$), over a sliding time interval.

The time interval is the same as that for the calculation of the demand currents in the "Metering" menu.

Settings are made in the "Metering setup" menu.

Note:

$\bar{I} N \text{ max}$ protection does not take into account the neutral-protection setting (N, N/2, Nx2, OFF).

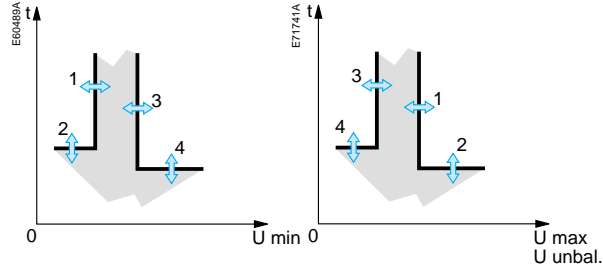
Voltage protection, Minimum voltage, maximum voltage, voltage unbalance

For the pickup and dropout thresholds and time delays, see the technical appendix.

Operating principle

protection tripped
by a minimum value

protection tripped
by a maximum value



- 1: pickup threshold
- 2: pickup time delay
- 3: dropout threshold
- 4: dropout time delay

- for protection tripped by a minimum or maximum value, it is possible to set:
 - a pickup threshold (1) that activates an alarm, a contact and/or tripping
 - a pickup time delay (2) that steps in when the pickup threshold (1) is reached
 - a dropout threshold (3) corresponding to deactivation of the alarm and/or contact
 - a dropout time delay (4) that steps in when the dropout threshold (3) is reached
- for protection tripped by a minimum value, the dropout threshold is always greater than or equal to the pickup threshold
- for protection tripped by a maximum value, the dropout threshold is always less than or equal to the pickup threshold
- if both the minimum and maximum protection functions are activated at the same time, the minimum threshold is automatically limited to the value of the maximum and vice versa.

Minimum-voltage protection U min

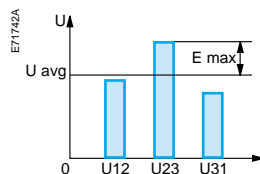
- this function calculates the minimum rms value of the three phase-to-phase voltages
- protection is activated when the three phase-to-phase voltages (U12, U23, U31) are simultaneously below the threshold set by the user.

Maximum-voltage protection U max

- this function calculates the maximum rms value of the three phase-to-phase voltages
- protection is activated when the three phase-to-phase voltages (U12, U23, U31) are simultaneously above the threshold set by the user.

Voltage-unbalance protection U unbal

This protection is activated by an adjustable level of unbalance between the rms values of the three phase-to-phase voltages.
This function calculates the rms value of the unbalance between the three phase-to-phase voltages.



- from:
 - U avg is the average value of the rms voltages of the three phases
 - $$U \text{ avg} = \frac{U12 + U23 + U31}{3}$$
 - E max: is the maximum difference between the voltage of each phase and U avg
 - Micrologic P uses the two values above to calculate the voltage unbalance:
 - $$U \text{ unbal} = \frac{|E \text{ max}|}{U \text{ avg}}$$

Other protection

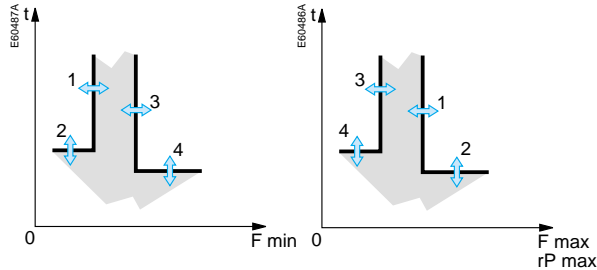
Reverse power, min. frequency, max. frequency, phase rotation

For the pickup and dropout thresholds and time delays, see the technical appendix.

Operating principle

protection tripped by a minimum value

protection tripped by a maximum value



- 1: pickup threshold
- 2: pickup time delay
- 3: dropout threshold
- 4: dropout time delay

- for protection tripped by a minimum or maximum value, it is possible to set:
 - a pickup threshold (1) that activates an alarm, a contact and/or tripping
 - a pickup time delay (2) that steps in when the pickup threshold (1) is reached
 - a dropout threshold (3) corresponding to deactivation of the alarm and/or contact
 - a dropout time delay (4) that steps in when the dropout threshold (3) is reached
- for protection tripped by a minimum value, the dropout threshold is always greater than or equal to the pickup threshold
- for protection tripped by a maximum value, the dropout threshold is always less than or equal to the pickup threshold
- if both the minimum and maximum protection functions are activated at the same time, the minimum threshold is automatically limited to the value of the maximum and vice versa.

Reverse-power protection rP max

- this function calculates the value of the total active power on the three phases
- the function is activated when the total active power of the three phases flows in the direction opposite that set by the user is greater than the pickup threshold (1) for a time greater than the time delay (2).

Note:

The direction of flow is set by the user in the "Power flow" section of the "Protection setup" menu under "History, maintenance and settings".

- "Top fed" corresponds to the normal direction of flow, i.e. from the top terminals on the circuit breaker to the bottom terminals
- "Bottom fed" is the opposite.

Minimum and maximum-frequency protection F min. and F max

These functions monitor the value of the frequency on the distribution system.

Phase-rotation protection

This protection function is activated if two of the three phases are inverted.

Note:

The function is activated following a fixed 300-millisecond time delay. If one of the phases is absent, the function is disabled.

Load shedding and reconnection

For the pickup and dropout thresholds and time delays, see the technical appendix.

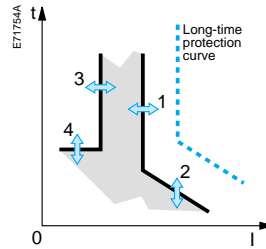
Load shedding and reconnection depending on current

The pickup curve for load shedding and reconnection depending on current is parallel to the LT I^2t and I_{dmtl} curves.

- I^2t protection: the neutral is taken into account
- I_{dmtl} : the neutral is not taken into account.

This function does not trip the circuit breaker, but can be used to set off an alarm linked to an M2C or M6C contact (disconnection and reconnection of non-priority loads).

The load-shedding and reconnection function is determined by thresholds and time delays.



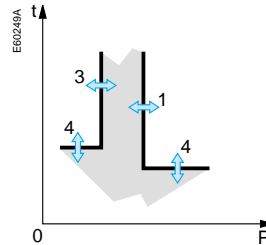
- 1: pickup threshold
- 2: pickup time delay
- 3: dropout threshold
- 4: dropout time delay

The pickup threshold is always greater than or equal to the dropout threshold.

Load shedding and reconnection depending on power

Load shedding and reconnection depending on power calculates the total active power on the three phases. This function does not trip the circuit breaker, but can be used to set off an alarm linked to an M2C or M6C contact (disconnection and reconnection of non-priority loads).

The load-shedding and reconnection function is determined by thresholds and time delays.



- 1: pickup threshold
- 2: pickup time delay
- 3: dropout threshold
- 4: dropout time delay

The pickup threshold is always greater than or equal to the dropout threshold.

Setting dials and buttons

Dials

- dials are used to set thresholds and time delays for protection functions against overloads, short-circuits and earth faults or earth leakage on Micrologic P control units
- if the set thresholds are overrun, these functions systematically trip the circuit breaker.

Buttons

- buttons on the keypad are subsequently used for fine adjustment of the thresholds and time delays for the functions listed above, i.e. to intermediate values between the dial settings. The value previously set using a dial automatically becomes the maximum value for keypad settings
- buttons are also used to activate the other protection functions offered by Micrologic P (not activated in the basic factory configuration). These functions are not accessible via the dials.

For the setting ranges and measurement accuracies, see the technical appendix.

Instantaneous current I inst.

Micrologic P control units offer two, non-exclusive possibilities.

- display of the instantaneous current on the bargraph
The unit automatically displays the values in amperes for phases 1, 2 and 3 and the neutral (depending on the type of distribution system). The bargraph also indicates the most heavily loaded phase.
- current measurements
 - measurement in amperes of the instantaneous currents I (rms) on phases I1, I2 and I3 and the neutral current IN, the earth-fault current Ig (Micrologic 6.0 P), the earth-leakage current IΔn (Micrologic 7.0 P)
 - the maximum value of each current is stored in memory (maximeter)
 - the maximeter can be reset.

Demand current I demand

- display of the demand current on phases $\bar{I}1$, $\bar{I}2$, $\bar{I}3$ and the neutral $\bar{I}N$ (depending on the type of distribution system)
- display of the interval over which the value is calculated
- the maximum demand value is stored in memory (maximeter)
- the maximeter can be reset.

Note:

The interval for calculation of the demand value over a sliding window may be set in the "Metering setup" menu under "History, maintenance and setup".

Phase-to-neutral and phase-to-phase voltages

Micrologic P offers different voltage measurements:

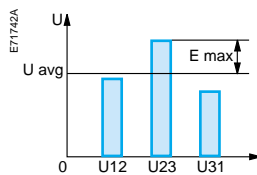
- phase-to-phase voltages (rms): measurement in volts of the voltage between phases U12, U23 and U31
- phase-to-neutral voltages (rms): measurement in volts of the voltage between the phases and the neutral U1N, U2N and U3N.

Average voltage U avg

Average voltage: measurement in volts of the average voltage between phases U12, U23 and U31.

Voltage unbalance U unbal

This function calculates the percentage of the unbalance between the three phase-to-phase voltages.



■ from:

- U avg is the average value of the rms voltages of the three phases

$$U_{avg} = \frac{U_{12} + U_{23} + U_{31}}{3}$$

- E max is the maximum difference between the voltage of each phase and U avg

■ Micrologic P uses the two values above to calculate the voltage unbalance

$$U_{unbal} = \frac{|E_{max}|}{U_{avg}}$$

To display the phase-to-neutral voltages, select the "3Φ 4w 4CT" option in "System type" in the "Metering setup" menu under "History, maintenance and setup".

Power, energy and frequency

For the setting ranges and measurement accuracies, see the technical appendix.

Instantaneous power and power factor

Micrologic P offers a number of different power measurements.

- total power measurements:
 - instantaneous active power P in kW
 - instantaneous reactive power Q in kvar
 - instantaneous apparent power S in kVA
- measurement of the power factor PF.

Demand power

- display of the demand values for the active power P, reactive power Q and apparent power S
- display of the interval for calculation of the demand value
- the maximum demand value is stored in memory (maximeter)
- the maximeter can be reset.

Note:

The type of calculation, over a block or sliding window, and the interval may be set in the "Metering setup" menu.

The selected window type and the interval for calculation of the demand value applies to all demand powers (active power P, reactive power Q and apparent power S). If the settings are modified, the maximeter values are reset to zero.

Energy

Micrologic P offers a number of different energy measurements:

- total energy:
 - total active energy E.P in kWh
 - total reactive energy E.Q in kvarh
 - total apparent energy E.S in kVAh
- measurement of the energy consumed (Energy in) and positively incremented (according to the sign convention set in the "Metering setup" menu):
 - active energy E.P in kWh
 - reactive energy E.Q in kvarh
- measurement of the energy supplied (Energy out) and negatively incremented (according to the sign convention set in the "Metering setup" menu under "History, maintenance and setup"):
 - active energy E.P in kWh
 - reactive energy E.Q in kvarh
- energy measurement values can be reset.

Note:

■ as standard, the total calculated energy values are "absolute total values".

They represent the sum of the energy in and out values:

□ $EP = \Sigma EP \text{ in} + \Sigma EP \text{ out}$

□ $EQ = \Sigma EQ \text{ in} + \Sigma EQ \text{ out}$

■ as an option (access exclusively via the COM communications option), energy can be calculated algebraically:

□ $EP = \Sigma EP \text{ in} - \Sigma EP \text{ out}$


□ $EQ = \Sigma EQ \text{ in} - \Sigma EQ \text{ out}$

These values are called "signed" energies.

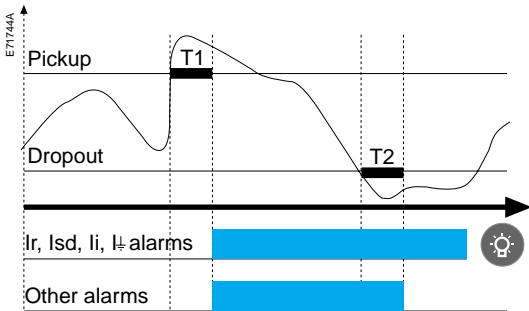
Frequency

Micrologic P directly measures the frequency of the distribution system.

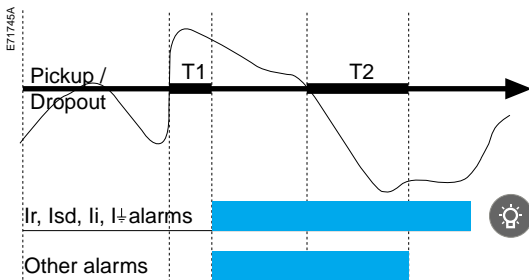
For information on the communications option and the portable test kit, see the respective user guides.

- an alarm may be viewed using:
 - the "Alarm history" menu
 - the COM communications option
 - the portable test kit.
- the commands in the "Protection" menu are used to attribute a specific operating mode to each of the protection functions:
 - OFF: protection disabled
 - Alarm: the function issues an alarm, but does not trip the circuit breaker
 - Trip + Alarm: the function issues an alarm and trips the circuit breaker.
- the protection functions against overloads (long time), short circuits (short time and instantaneous) and earth faults (earth-fault and earth-leakage currents) automatically result in tripping and cannot be deactivated (Trip mode only).
- the "I_Δ Alarm" can be set exclusively to OFF or Alarm mode.
- the other protection functions for current, voltage, power, frequency and the phase rotation may be set to any of the three modes, OFF, Alarm or Trip + Alarm.
- the load shedding and reconnection function may be set to ON or OFF.
- the resettable alarms linked to device tripping are activated when the I_r, I_{sd}/I_i or I_Δ thresholds are overrun. They may be reset by pressing the button .

Different pickup and dropout thresholds



Identical pickup and dropout thresholds



Current protection	Off	Alarm	Trip + Alarm
I _r			■
I _{sd} / I _i			■
I _Δ			■

■ delayed alarms are activated when the pickup and dropout thresholds are overrun and the corresponding time delays have expired.

Current protection	Off	Alarm	Trip + Alarm
I _Δ Alarm	■	■	
I unbal	■	■	■
I ₁ max	■	■	■
I ₂ max	■	■	■
I ₃ max	■	■	■
I _N max	■	■	■

Voltage protection	Off	Alarm	Trip + Alarm
U min	■	■	■
U max	■	■	■
U unbal	■	■	■

Other protection	Off	Alarm	Trip + Alarm
rP max	■	■	■
F min	■	■	■
F max	■	■	■
Phase inversion	■	■	■

Shedding/reconnection	Off	On
current I	■	■
power P	■	■

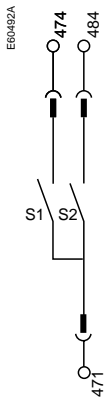
- history logging
 - Alarm mode: as soon as a given protection threshold is overrun, an alarm is recorded in the "Alarm history"
 - Trip mode: as soon as a given protection threshold is overrun, the circuit breaker trips and the fault is recorded in the "Trip history".
- the "Protection setup" menu under "History, maintenance and setup" is used to enable or disable the Trip mode that is displayed in the protection-setting screens. On leaving the factory, the protection functions are set to Alarm mode.
- the "M2C / M6C contacts" menu under "History, maintenance and setup" is used to link an M2C or M6C contact to an alarm. M2C and M6C contacts may not be used together. They require a 24 V external power supply.
- the COM communications module can be used to transmit alarms to a supervisor.

Optional M2C and M6C contacts

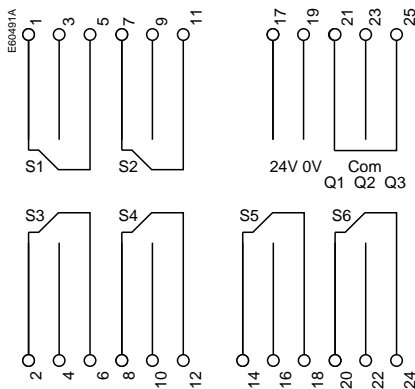
An alarm is issued if the Alarm or the Trip + Alarm mode was set for the given protection function.

Caution!
The M2C and M6C contacts require an auxiliary power supply. See the "Power supply" section in the technical appendix.

Wiring diagram for M2C contacts.



Wiring diagram for M6C contacts

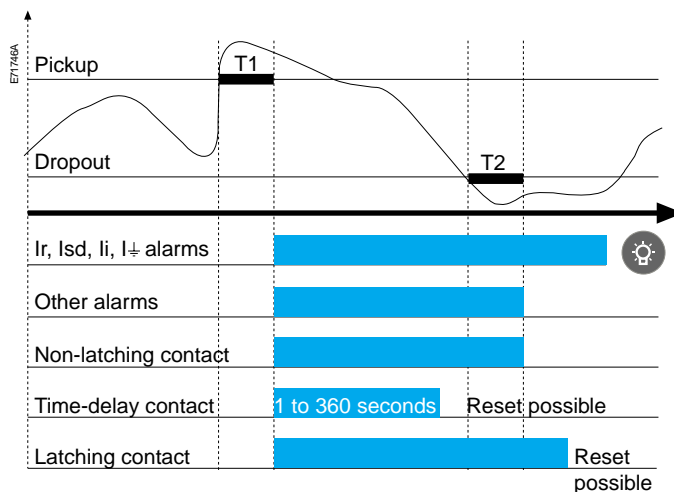


- available types of contacts:
 - M2C: up to two contacts maximum, S1 and S2
 - M6C: up to six contacts maximum, S1 to S6.
- M2C and M6C contacts may not be used together.

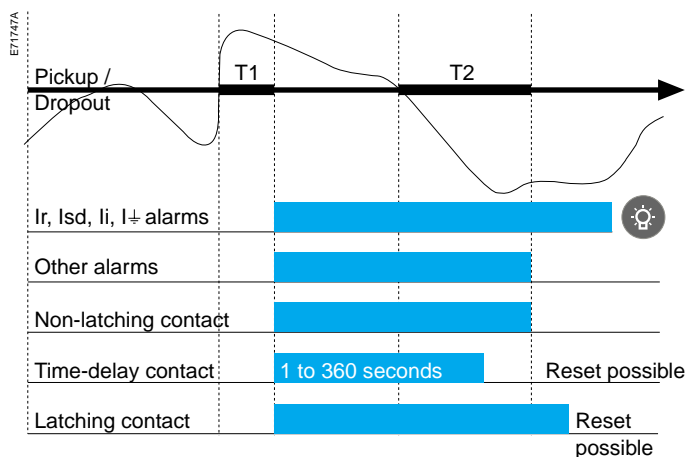
- current protection:
 - Ir
 - Isd
 - li
 - I_±
 - I_± Alarm
 - I unbal
 - I_{T1} max
 - I_{T2} max
 - I_{T3} max
 - I_{TN} max.
- voltage protection:
 - U min
 - U max
 - U unbal.
- other protection:
 - F min
 - F max
 - rP max
 - phase rotation.

- load shedding and reconnection:
 - current I
 - power P.
- latching settings:
 - non-latching contact: the contact remains activated as long as the fault that caused the alarm has not been cleared
 - latching contact: the contact remains activated until it is reset ("Reset menu")
 - time-delay contact: the contact remains activated for the duration of an adjustable time delay or until it is reset ("Reset menu"). The time-delay settings for time-delay latching are provided in the technical appendix.
 - locked to 1: the contact is forced to 1 for an automation test
 - locked to 0: the contact is forced to 0 for an automation test.

- contact operating diagram
- different pickup and dropout thresholds



- identical pickup and dropout thresholds



Trip history

- the trip history is the means to display at any time the parameters measured during the last ten trips.
- for each trip, the following parameters are recorded:
 - tripping cause
 - trip threshold
 - interrupted currents in amperes (only if an external power supply is present) for Ir, I_{sd}/I_i, I_g or I_{Dn} trips
 - date (only if an external power supply is present)
 - time (hours, minutes and seconds; only if an external power supply is present).

Alarm history

- the alarm history is the means to display at any time the parameters measured during the last ten alarms.
- for each alarm, the following parameters are recorded:
 - alarm cause
 - alarm threshold
 - date (only if an external power supply is present)
 - time (hours, minutes and seconds; only if an external power supply is present).

Operation counter

This function is available only via the COM communications option.

- Micrologic P:
 - stores and displays the total number of operations (incremented each time the circuit breaker opens) since the initial installation of the circuit breaker
 - stores and displays the total number of operations since the last reset.

Contact wear indication

This function can be used to:

- determine the condition of the most worn contact in the circuit breaker. A counter is displayed on the screen. The contacts must be inspected each time the counter reaches a hundred mark. The message "Not available or circuit breaker type not defined" is displayed if the type of circuit breaker has not been defined. In this case, see "Breaker selection" in the "Micrologic setup" menu under "History, maintenance and setup".
- reset the indicator after changing the main contacts. Reset is also carried out via "Breaker selection" in the "Micrologic setup" menu.

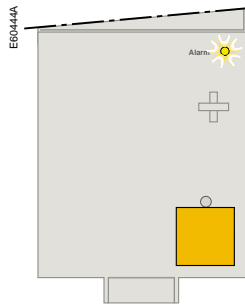
Note:

If the control unit is changed, the circuit breaker must be defined again. In this case, see "Breaker selection" in the "Micrologic setup" menu under "History, maintenance and setup".

LEDs and display screens

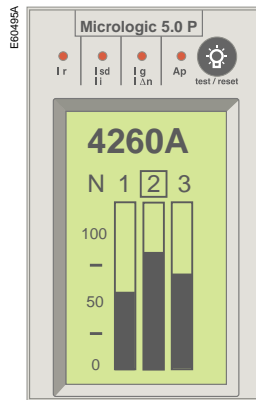
The procedure required to reclose the circuit breaker following a fault trip is presented in the circuit-breaker user guide.

LED indicator



Signals overrun of the long-time current setting ($1.125 \times I_r$).

Overload bargraph on the main screen



Signals the load level on each phase ($0\% \times I_r$, $50\% \times I_r$, $100\% \times I_r$).

If an external power supply is not available and the circuit breaker is closed, the system displays the main screen.

Concerning the presence or absence of an external power supply, see the "Power supply" section in the technical appendix.

Caution!
The battery maintains the trip indications. If no indications are displayed, check the battery.

Fault-trip indications

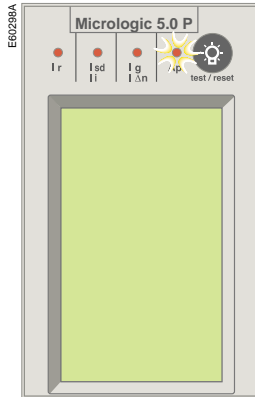
■ control-unit status

The circuit breaker has tripped.

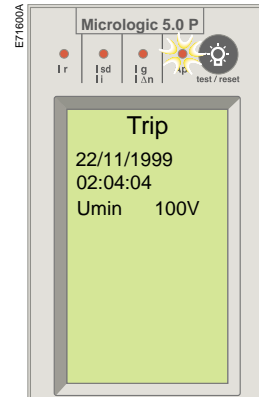
The display depends on whether the control unit is equipped with an external power supply.

□ control unit without an external power supply

□ control unit with an external power supply



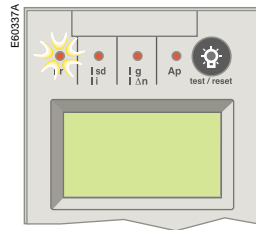
A LED signals the type of fault (I_r , I_{sd} , I_i , I_g , $I_{\Delta n}$ or A_p).



The type of fault is signalled by a LED and on the graphic display.

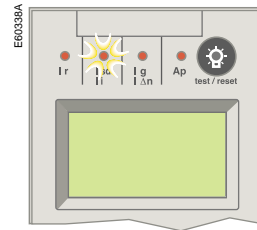
- fault-trip LEDs
- the LEDs indicate the type of fault that tripped the circuit breaker
- the LEDs are located in the upper part of the front panel (red Ir, Isd, li, Ig, I²n and Ap LEDs)
- when activated, a LED automatically goes ON and remains ON until it is locally reset.

■ Ir LED



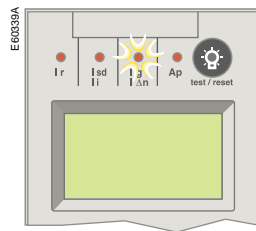
Signals tripping following overrun of the long-time current setting Ir.

■ Isd, li LED



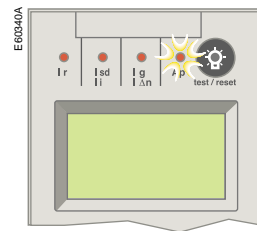
Signals tripping following overrun of the short-time pickup Isd or the instantaneous pickup li.

■ Ig, IΔn LED



Signals tripping following overrun of the earth-fault pickup Ig or the earth-leakage pickup IΔn.

■ Ap LED



Signals tripping due to:

- self-protection function:
 - temperature
 - ASIC power supply
 - instantaneous pickup for circuit-breaker self protection
- protection functions:
 - current unbalance I unbal
 - maximum current $\bar{I}1$ max, $\bar{I}2$ max, $\bar{I}3$ max, $\bar{I}N$ max;
 - voltage unbalance U unbal
 - maximum voltage U max
 - minimum voltage U min
 - reverse power rP max
 - maximum frequency F max
 - minimum frequency F min
 - phase rotation.

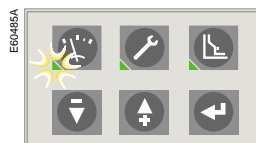
The self-protection function (excessive temperature or short-circuit greater than device capability) trips the circuit breaker and turns the Ap LED ON.

A number of simultaneous causes may result in tripping. For example, a short-circuit and a distribution-system voltage under a set value.

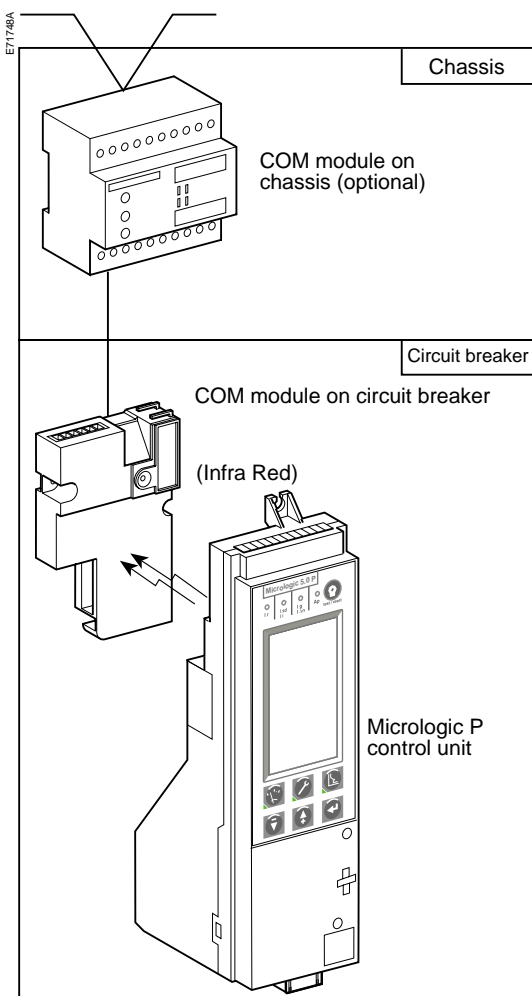
The LED signalling the last fault chronologically is the only one to remain ON. E.g., the Ap LED may signal a voltage drop under a set value where the voltage drop was caused by a short-circuit.

■ LEDs on buttons to access the menus

- The activated LED indicates the menu for which the screen is displayed:
- "Metering"
 - "History, maintenance and setup"
 - "Protection".



COM communications option



Communication options

Digipact and ModBus are the indispensable elements when integrating Micrologic P in the Digivision and SMS Powerlogic installation-management systems which communicate via the BatiBus and ModBus protocols.

External gateways are available for communication over other networks, including ProxiBus, Ethernet, etc.

The communications option makes possible the following remote functions:

■ device identification:

- address
- device type
- control-unit type
- type of long-time rating plug

■ settings:

- reading of the dial settings
- fine adjustments within the range determined by the dial
- protection and alarm settings.

Operating and maintenance aids

■ protection and alarm values:

- standard
- set.

■ measurement values:

- currents
- voltages, frequencies, power, etc.

■ fault values:

- fault type
- interrupted current.

■ histories and logs:


- trip history
- alarm history
- event history.

■ indicators:

- contact wear, counters, etc.
- maintenance register.

Setting up the optional M2C / M6C contacts

Select the command


 Contacts
 M2C / M6C
 Alarm
 type

Select an alarm

Note:

An alarm may be selected if the "Alarm" or "Trip + Alarm" mode was selected during setup of the given protection function, in the "Protection" menu.




E71601A

Alarm type

S1

S2

E71601A


 then 




Select a contact.

EB0146A

S2

Ir

EB0146A

 then 



Select an alarm.

EB0226A

S2


Ir

EB0226A



Confirm.

Select the command


 Contacts
 M2C / M6C
 Setup

Set up each contact

- select the latching mode




E71602A

Setup M2C / M6C

S1

S2

E71602A


 then 

Select a contact.




E71603A

S2

Mode

latching contact

E71603A

 then 


Select a latching mode.


E71604A

S2

Mode

latching contact

E71604A



Confirm.

■ set the time delay for time-delay latching

Select the time delay. Adjust. Confirm.

Select the command

Reset the contacts to 0

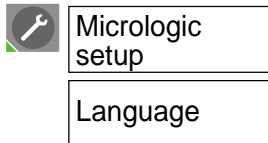
Reset the contacts to 0... or cancel the reset, then confirm.

Setting up the Micrologic control unit

Prior to setting up the protection functions or carrying out measurements, the following operations are required:

- selection of the display language
- entry of the date and time
- entry of the circuit-breaker type
- entry of the neutral current-transformer type
- selection of the transformation ratio between the primary and secondary windings if an auxiliary voltage transformer is installed
- entry of the rated frequency.

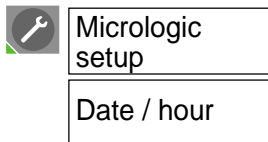
Select the command



Select the display language



Select the command



Caution!

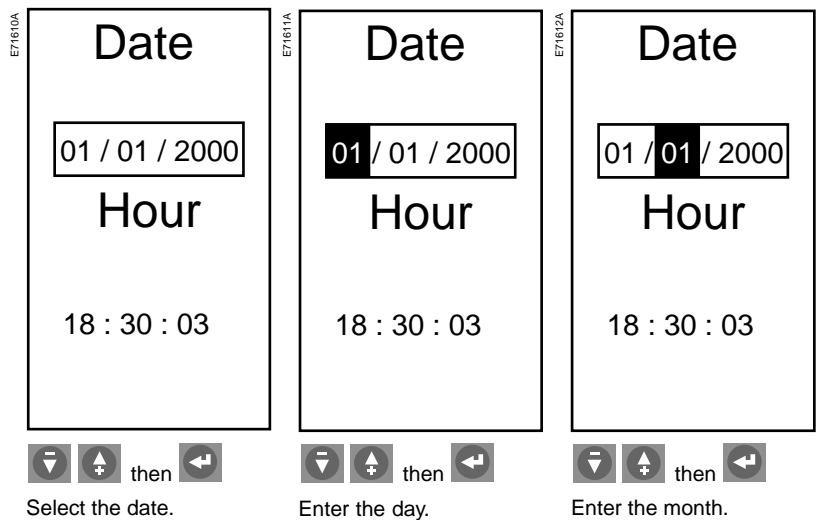
If the date and time are not displayed, see the "Power supply" section in the technical appendix.

Enter the date and time for time-stamping purposes in the trip and alarm histories. The resolution of the time setting is 20 ms.

If the time is set via a communications module, any previous manual setting is automatically erased.

If the time value is not synchronised by a supervisor via the communications option, the maximum possible drift is one hour per year.

Set the date and time



Date

01 / 01 / 2000

Hour

18 : 30 : 03

then

Enter the year.

Date

01 / 01 / 2000

Hour

18 : 30 : 03

then

Set the time in the same manner.

Select the command

Micrologic setup

Breaker selection

The circuit-breaker code is required to identify the device and activate the contact-wear counter.

Note this code if the control unit must be changed (example 03E7).

Enter this code when setting up a new control unit on the circuit breaker.

When the main circuit-breaker contacts are replaced, this code must be reset to zero.

Circuit-breaker selection

Breaker selection

Standard

UL

Circuit breaker

Masterpact

type

NT08N

0 3 E 7

v=07.002

then

Select the standard.

Breaker selection

Standard

IEC

Circuit breaker

Masterpact

type

NT H1

0 3 E 7

v=07.002

then

Choose and confirm.

Breaker selection

Standard

IEC

Circuit breaker

Masterpact

type

NT H1

0 3 E 7

v=07.002

then

Select the circuit breaker.

Breaker selection

Standard

IEC

Circuit breaker

Compact NS

type

630b

0 3 E 7

v=07.002

then

Choose and confirm.

Breaker selection

Standard

IEC

Circuit breaker

Compact NS

type

630b

0 3 E 7

v=07.002

then

Select the type.

Breaker selection

Standard

IEC

Circuit breaker

Compact NS

type

800

0 3 E 7

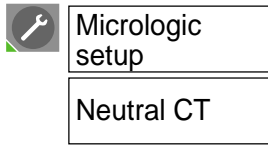
v=07.002

then

Choose and confirm.

Setting up the Micrologic control unit

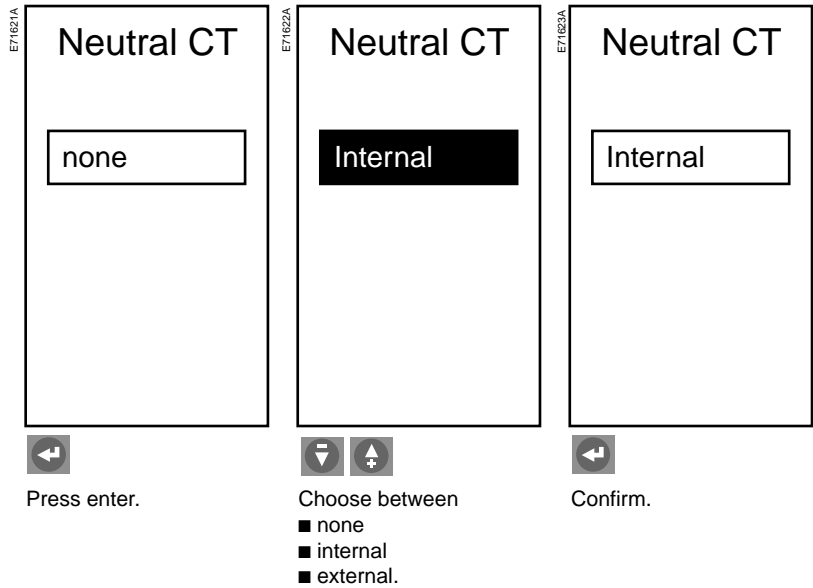
Select the command



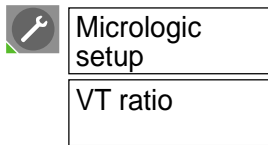
If the "none" option is selected, the neutral current is not displayed.

Caution!
On a four-pole circuit breaker, the "Internal" option must be selected to eliminate the 2xN setting for the neutral.

Select the neutral-CT type



Select the command

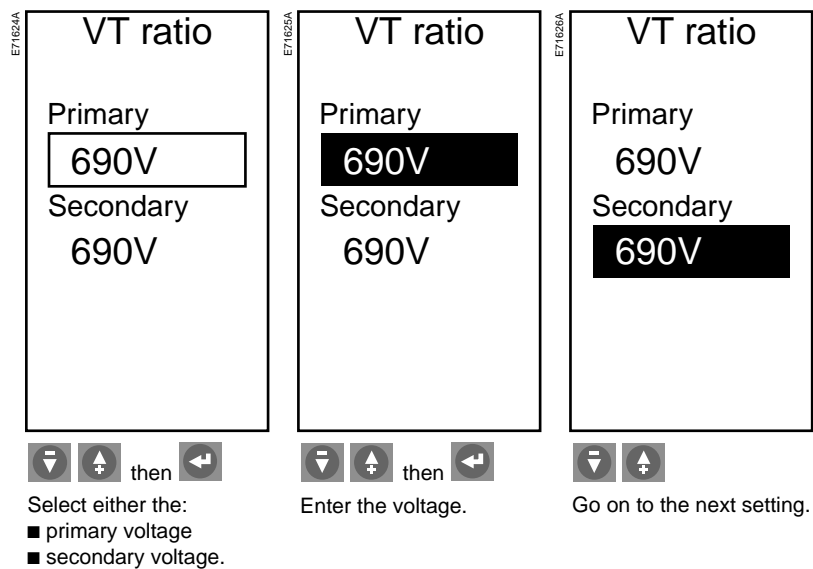


If the supply voltage for the control unit exceeds 690 V, an external voltage transformer must be installed.

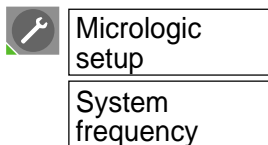
To display the true voltage values, enter the transformation ratio between the primary and secondary voltages of the transformer.

Note that if Digipact display modules are used, the rated distribution-system voltage must be entered.

Enter the voltage-transformation ratio

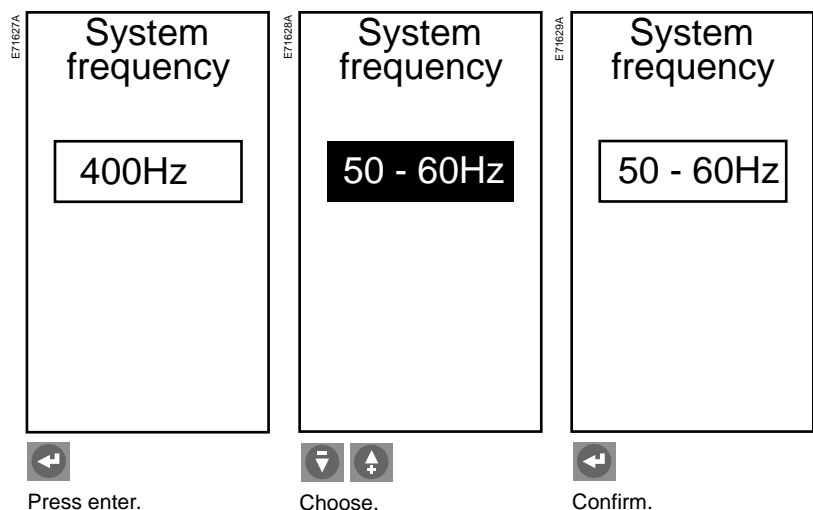


Select the command



Phase rotation is the only protection function deactivated when a frequency of 400 Hz is selected.

Enter the rated frequency

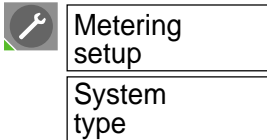


Setting up the metering functions

Prior to setting up the protection functions or carrying out measurements, the following operations are required:

- entry of the system type
- selection of the calculation mode for the demand current
- selection of the calculation mode for the demand power
- selection of the sign convention for the active power P.

Select the command



Caution!

The neutral current I_N cannot be measured with the "3-phase, 3-wire, 3-CT" and "3-phase, 4-wire, 3-CT" types.

To measure the neutral current, select "3-phase, 4-wire, 4-CT" and connect the neutral (using a voltage-measurement input if necessary).

See the "Overview of functions" section for information on the available types of measurements.

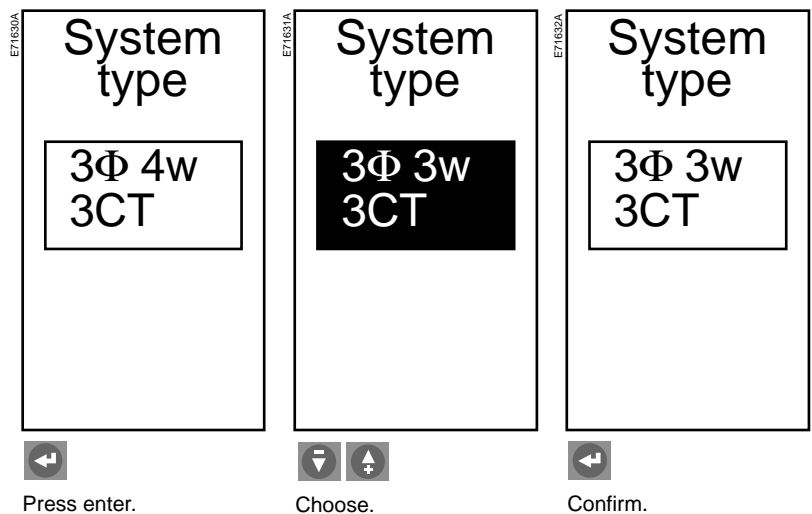
Select the system type

The Micrologic P control unit offers three measurement options:

- 3 phases, 3 wires, 3 CTs: method using two wattmeters:
 - measurement of phase-to-neutral voltages (rms, unbalance and average values disabled), power measurements (P, Q and S) and power factor per phase disabled
 - measurement of I1, I2 and I3
 - IN disabled (rms, demand)
- 3 phases, 4 wires, 4 CTs: method using three wattmeters:
 - measurement of I1, I2, I3 and IN
- 3 phases, 4 wires, 3 CTs: method using three wattmeters:
 - system with neutral
 - measurement of I1, I2 and I3
 - IN disabled (rms, demand).

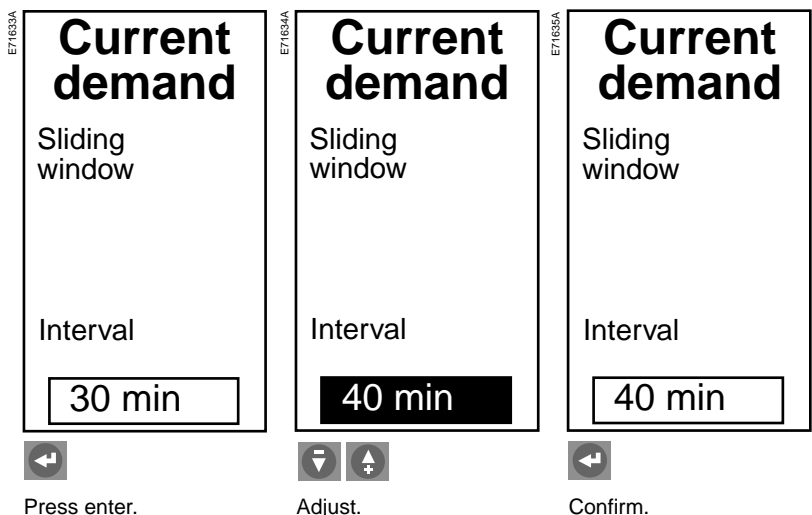
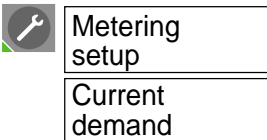
Note:

It is advised not to use the "3-phase, 4-wire, 4-CT" type of measurement unless the neutral is effectively connected to the control unit (four-pole circuit breaker with an external voltage-measurement input).

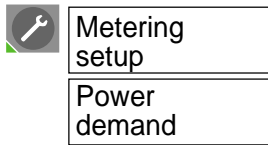


Select the time interval for calculation of the demand current

Select the command

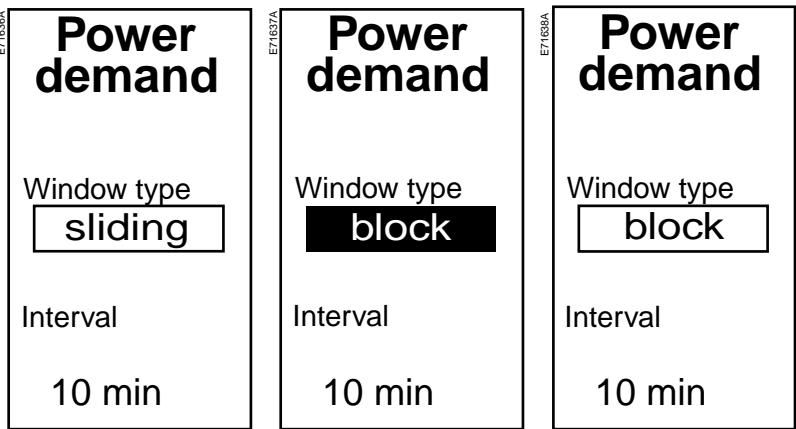


Select the command

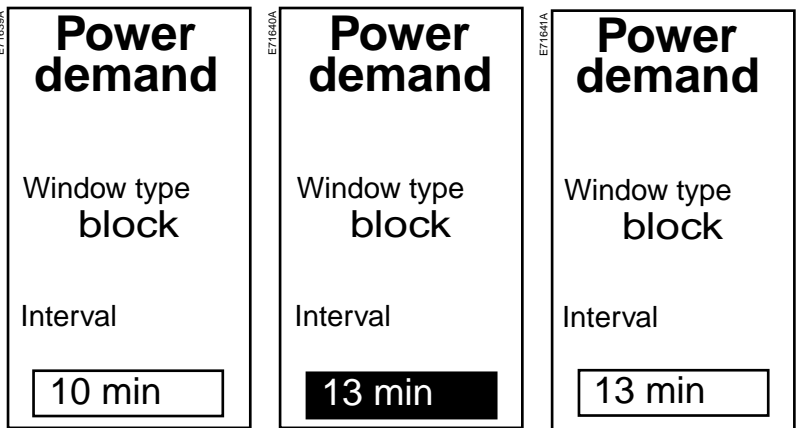


If the settings are changed, any previously stored measurements are erased.

Select the calculation mode for the demand power

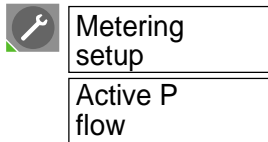


▼ Select the existing window type.
▼ ▲ Choose either the sliding or block window.
← Confirm.



▼ ▲ then ← Select the existing interval.
▼ ▲ Adjust.
← Confirm.

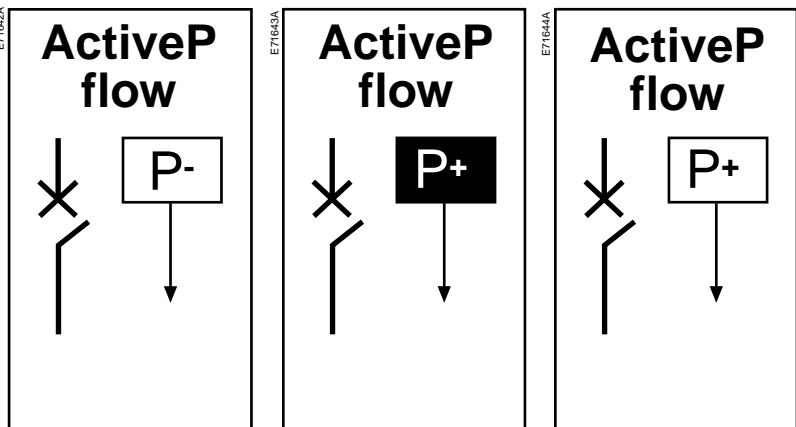
Select the command



By default, Micrologic P uses P+ for the power flowing from top to bottom terminals. The selected direction of flow is valid for:

- measurement of power and the power factor
- measurement of energy
- load shedding and reconnection depending on power.

Select the sign convention for the active power



↵ Press enter.
▼ ▲ Choose.
← Confirm.

Select the command

- Metering setup
- Sign convention

Set up the power-factor calculation

E71845A

Sign convention

IEEE

E71846A

Sign convention

IEEE alt.

E71847A

Sign convention

IEEE alt.



Press enter.




Choose between IEEE, IEEE alternate or IEC.



Confirm.

Setting up the COM communications option

Select the command

 Com. setup

Com. parameter

As soon as the BBus or ModBus communications option is connected, the control unit recognises it and displays the type of module on the graphic screen. Automatic time updates are possible only with the ModBus system.

When a COM communications option is used, it is necessary to:

- set up the COM communications option
- authorise remote setting of the Micrologic control unit
- authorise remote control of the circuit breaker.

View and set up the communications option

E71728A

Modbus Com

Address




47

Baud-rate

9600

Parity

None

  then 

Select an existing parameter.

E71728A

Modbus Com

Address



45

Baud-rate

9600

Parity

None

Adjust.

E71728A

Modbus Com

Address


45

Baud-rate

9600

Parity

None




Confirm.

Adjust all the other parameters for the communications option in the same manner.

	B BUS	MODBUS
	(read only)	(read and set up)
Address	1 - 255	1 - 47
Baud rate		9 600 bauds 19 200 bauds
Parity		Even None

Select the command

 Com. setup

Remote settings

The access code is a password that must be provided by the supervisor prior to accessing the Micrologic settings.

Authorise remote setup of Micrologic

E71728A




Remote settings

Access permit

No

Access code

0 0 0 0

  then 

Select existing setting.

E71728A



Remote settings

Access permit

Yes

Access code

0 0 0 0

Choose.

E71728A


Remote settings

Access permit





Yes

Access code


0 0 0 0



Confirm.





E71729A	Remote settings Access permit Yes Access code <input type="text" value="0 0 0 0"/>	E71730A	Remote settings Access permit Yes Access code <input type="text" value="1 0 0 0"/>	E71731A	Remote settings Access permit Yes Access code <input type="text" value="1 0 0 0"/>
	 Select the existing access code setting.		  Enter the first digit.		 Confirm and proceed in the same manner for the other digits.

Select the command

	Com. setup
	Remote control

Circuit-breaker control may be locked in local mode (Manual) or remote mode (Auto).

Authorise remote control of the circuit breaker

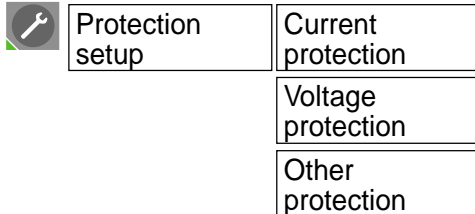
E71732A	Remote control <input type="text" value="Manual"/>	E71733A	Remote control <input type="text" value="Auto"/>	E71734A	Remote control <input type="text" value="Auto"/>
	 Press enter.		  Select Auto or Manual.		 Confirm.

Setting up the protection functions

Prior to setting up the protection functions, the following operations are required:

- set up the alarm mode alone or the alarm with tripping for the:
 - current protection
 - voltage protection
 - other protection
- select the normal direction of power flow.

Select the desired menu

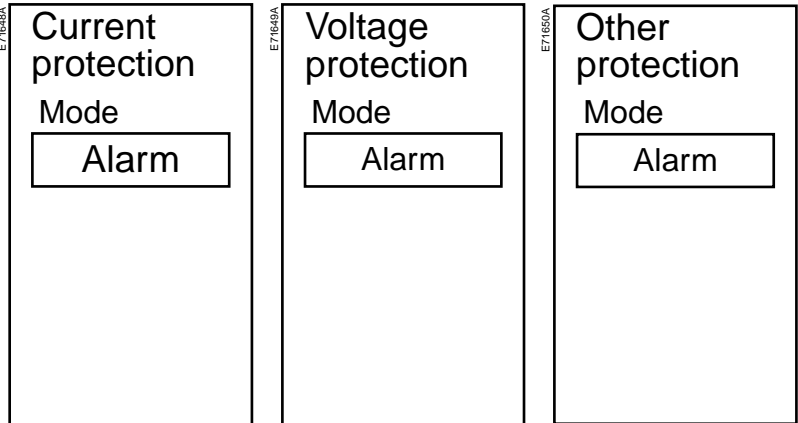


Following detection of a fault by the:

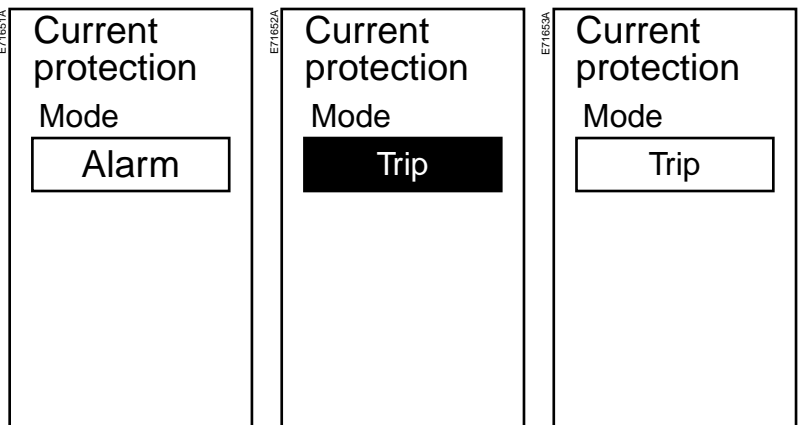
- current protection
- voltage protection
- other protection.

Micrologic P can implement two different modes:

- "Alarm" mode: an alarm may be selected during setup of the current, voltage or other protection functions
- "Trip" (Trip + Alarm) mode: an alarm and circuit-breaker tripping may be selected during setup of the current, voltage or other protection functions.



Select the operating mode



Press enter.

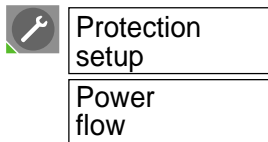


Select the operating mode.



Confirm.

Select the command

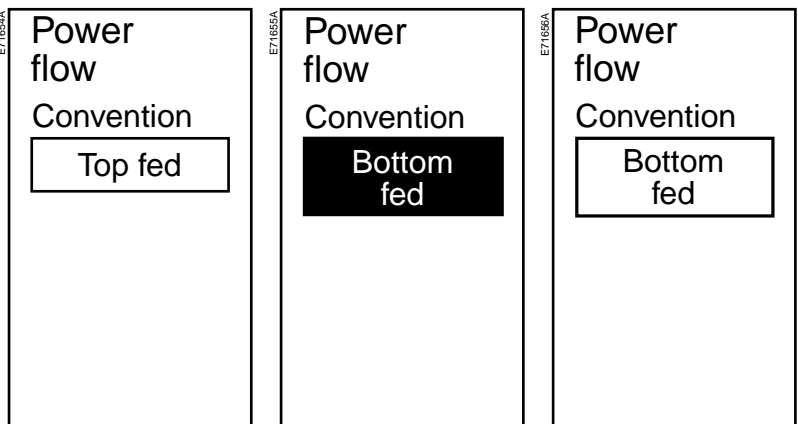


Selection of the normal direction of power flow makes it possible to define the sign convention used for the reverse power rP protection function.

Select one of the two directions:

- "Top fed" corresponds to the normal flow from the top terminals to the bottom terminals
- "Bottom fed" corresponds to the reverse direction of flow.

Select the normal direction of power flow



Press enter.



Select the direction.

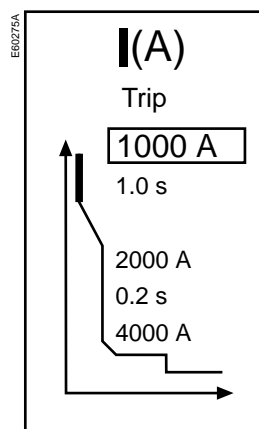
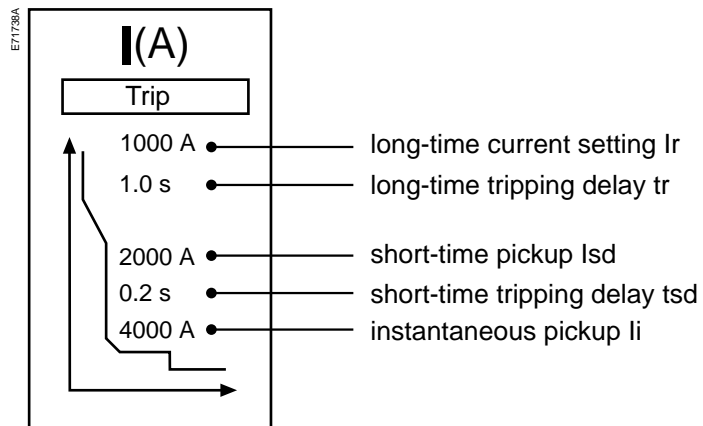
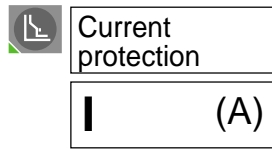


Confirm.

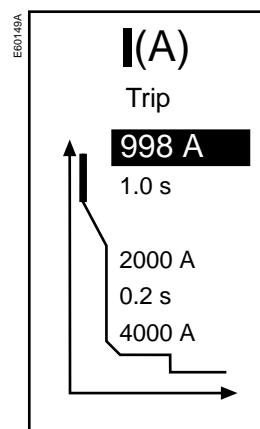


Fine adjustment of the long-time I^2t , short-time and instantaneous settings using the keypad

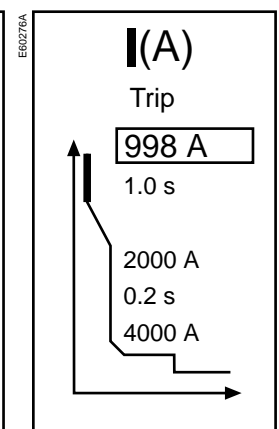
Select the command.



Select a setting.

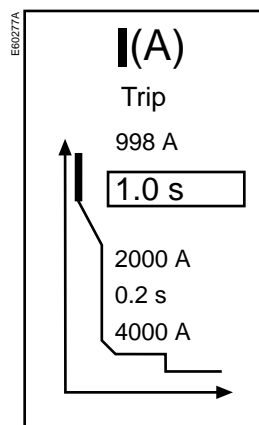


Adjust the value.

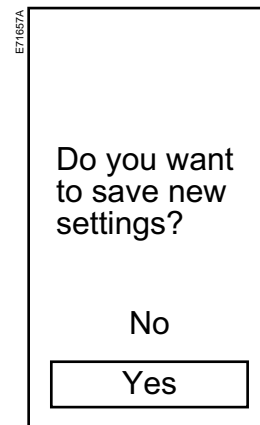


Confirm.

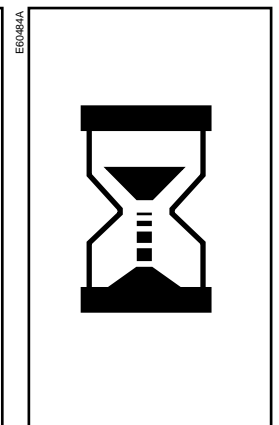
When all the settings have been adjusted, quit the screen by pressing one of the menu-access buttons. This saves the new values.



Adjust the other settings and confirm.



Confirm.



Fine adjustment of the long-time Idmtl, short-time and instantaneous settings using the keypad

Select the command



Current protection

Idmtl (A)

E71739A

Idmtl (A)

- Trip
- 1000 A • long-time current setting I_r
- 1.0 s • long-time tripping delay t_r
- EIT** • Idmtl protection: DT, SIT, VIT, EIT, HVF
- 2000 A • short-time pickup I_{sd}
- 0.2 s • short-time tripping delay t_{sd}
- 4000 A • instantaneous pickup I_i

E71718A

Idmtl (A)

Change I(A) settings with Idmtl(A)?

No

Yes



Select yes.

E60278A

Idmtl (A)

Trip

- 1000 A
- 1.0 s
- EIT**
- 2000 A
- 0.2 s
- 4000 A



Select a setting.

E60157A

Idmtl (A)

Trip

- 1000 A
- 1.0 s
- VIT**
- 2000 A
- 0.2 s
- 4000 A



Change the setting.

E60278A

Idmtl (A)

Trip

- 1000 A
- 1.0 s
- VIT**
- 2000 A
- 0.2 s
- 4000 A



Confirm.

E60280A

Idmtl (A)

Trip

- 1000 A
- 1.0 s**
- VIT
- 2000 A
- 0.2 s
- 4000 A



Adjust the other settings.

E71657A

Do you want to save new settings?

No



Yes



Confirm.

Fine adjustment of the earth-fault and earth-leakage protection setting using the keypad

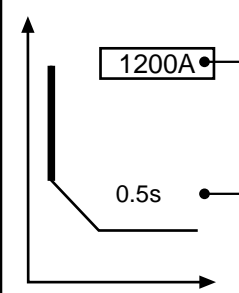
Select the command


Current protection
 (A)

E71750A

I_{Δn} (A)

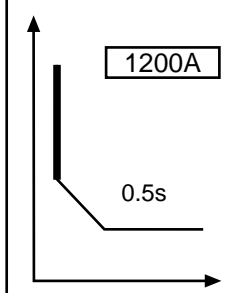
Trip



E60252A

I_{Δn} (A)

Trip



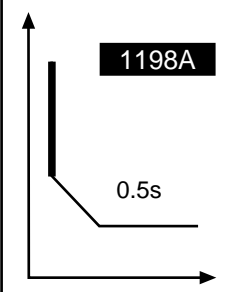


Select a setting.

E60283A

I_{Δn} (A)

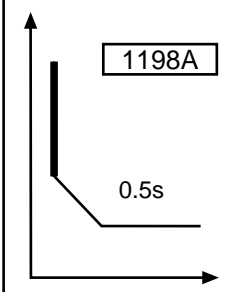
Trip



E60284A

I_{Δn} (A)

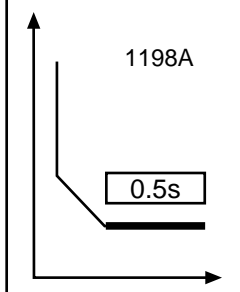
Trip



E60285A

I_{Δn} (A)

Trip





Adjust the value.



Confirm.



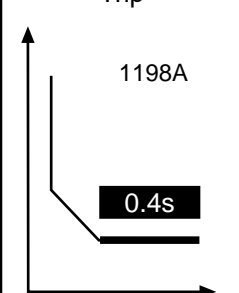
Go to the next setting.

When all the settings have been adjusted, quit the screen by pressing one of the menu-access buttons. This saves the new values.

E60286A

I_{Δn} (A)

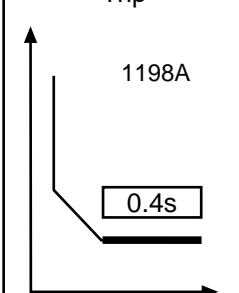
Trip



E60287A

I_{Δn} (A)

Trip



E71657A

Do you want to save new settings?

No

Yes



Adjust the value.



Confirm.



Confirm to save new settings.

Setting the neutral protection

Select the command



Current protection

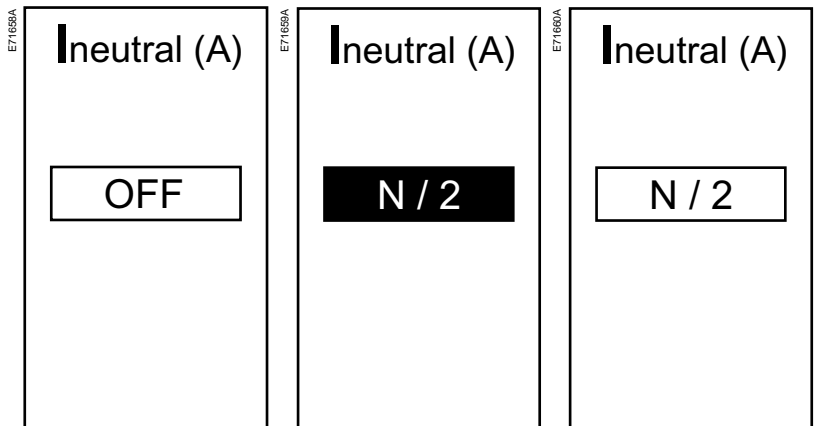
Ineutral (A)

Using the keypad on the control unit

Type of circuit breaker	Possibles choices
four-pole	OFF: no neutral protection N / 2: half neutral protection N: full neutral protection
three-pole	OFF: no neutral protection N / 2: half neutral protection N: full neutral protection N x 2: double neutral protection

Note:

On four-pole circuit breakers, setting of the neutral using the keypad is limited by the dial setting.



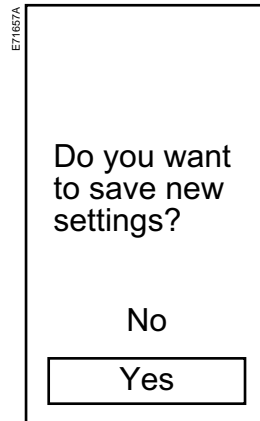
Press enter.



Select the type of neutral protection.



Confirm.



Confirm.

Setting the I_{\neq} , I_{unbal} , $\bar{I}_1 \max$, U_{min} , U_{max} , U_{unbal} , $rP \max$, F_{min} , F_{max} , and phase-rotation protection functions using the keypad

Select the corresponding menu

Current protection

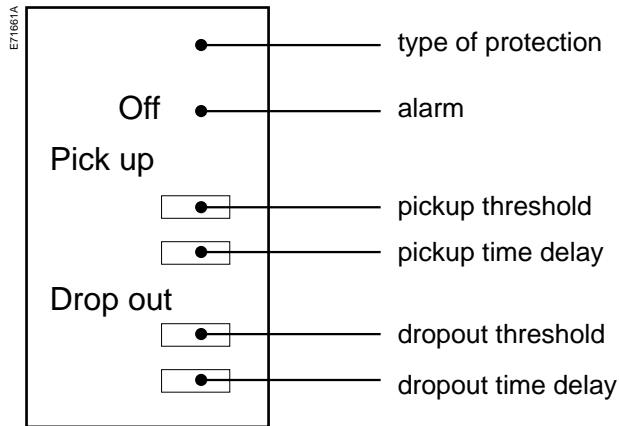
- I_{\neq} Alarm
- I_{unbal} (%)
- $\bar{I}_1 \max$ (A)
- $\bar{I}_2 \max$ (A)
- $\bar{I}_3 \max$ (A)
- $\bar{I}_N \max$ (A)

Voltage protection

- U_{min} (V)
- U_{max} (V)
- U_{unbal} (%)

Other protection

- rP_{max} (W)
- F_{min} (Hz)
- F_{max} (Hz)
- Phase rotation



Trip mode is available if the given protection function was set to trip mode in the "Protection setup" menu under "History, maintenance and setup".

Specific case for I_{\neq} alarm

Only the following choices are available:

- On: activation of the alarm without fault tripping by the circuit breaker
- Off: alarm disabled.

For example, take the U_{max} setting.

Select the first setting.

Select OFF, Alarm or Trip.

Confirm.

For protection tripped by a maximum value, the dropout threshold is always less than or equal to the pickup threshold.

For protection tripped by a minimum value, the dropout threshold is always greater than or equal to the pickup threshold.

When all the settings have been made, quit the screen by pressing one of the menu-access buttons. This saves the new values.

E71665A

Umax (V)

Alarm

Pick up

690V

5.00s

Drop out

0.50s



Select the existing dropout threshold setting

E71666A

Umax (V)

Alarm

Pick up

690V

5.00s

Drop out

0.50s



Adjust.

E71667A

Umax (V)

Alarm

Pick up

690V

5.00s

Drop out

0.50s



Confirm.

E71668A

Umax (V)

Alarm

Pick up

690V

5.00s

Drop out

685V



Make another setting or exit the menu and confirm.

E71667A

Do you want to save new settings?

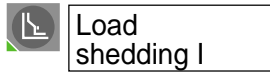
No



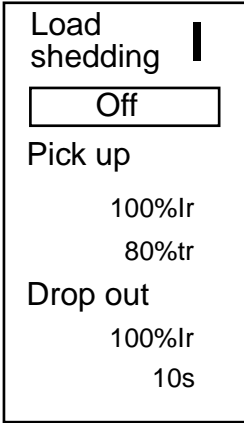
Confirm.

Setting load shedding / reconnection

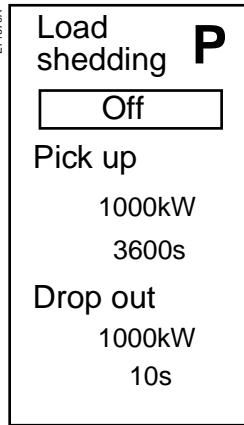
Select the command



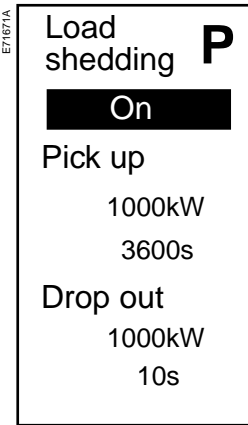
depending on current



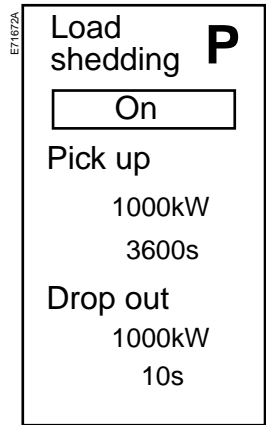
For example, take load shedding / reconnection depending on power.



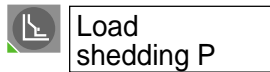
Select the first setting.



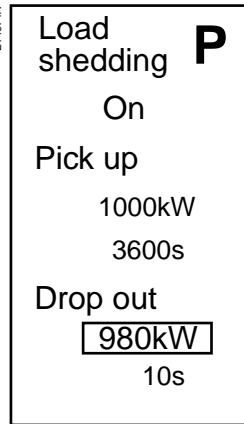
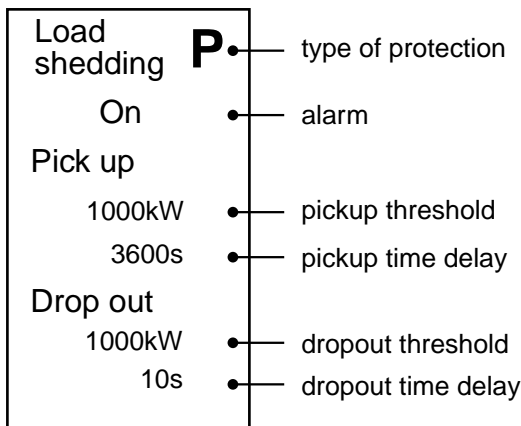
Select:
 ■ Off: load shedding disabled
 ■ On: load shedding enabled.



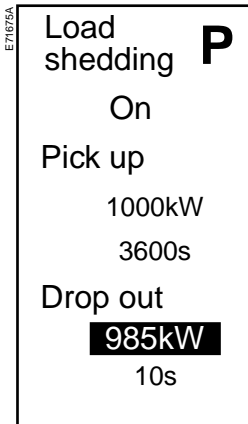
Confirm.



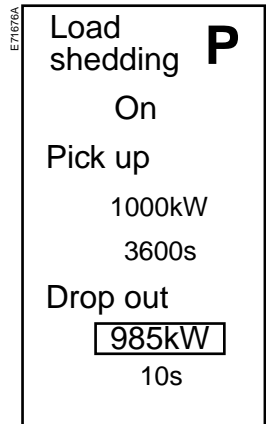
depending on power



Select the existing dropout threshold.

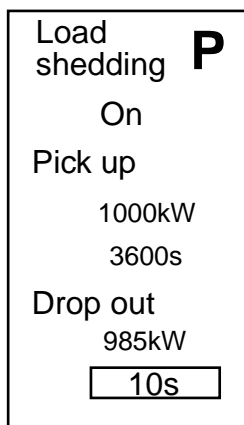


Adjust.

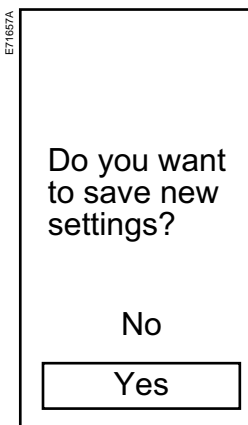


Confirm.

When all the settings have been made, quit the screen by pressing one of the menu-access buttons. This saves the new values.



Make another setting or exit the menu and confirm.



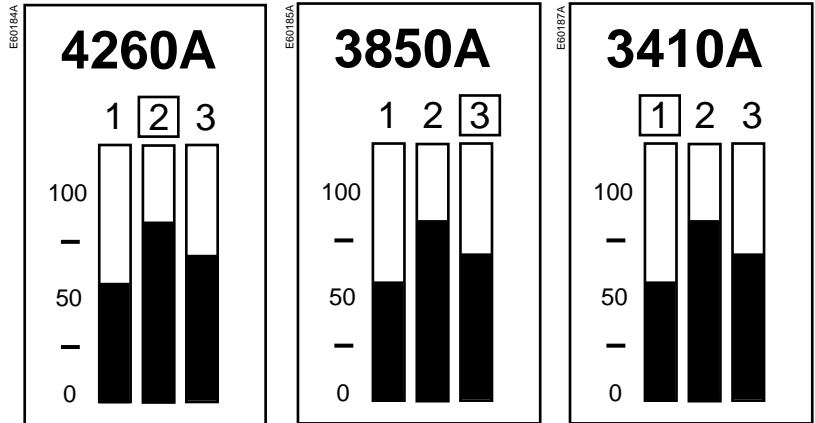
Confirm.



Only the measurements for the phase (1, 2, 3) and neutral currents are displayed on the main screen.

Continuous current measurement

The bargraph displays the value in amperes of the most heavily loaded phase.



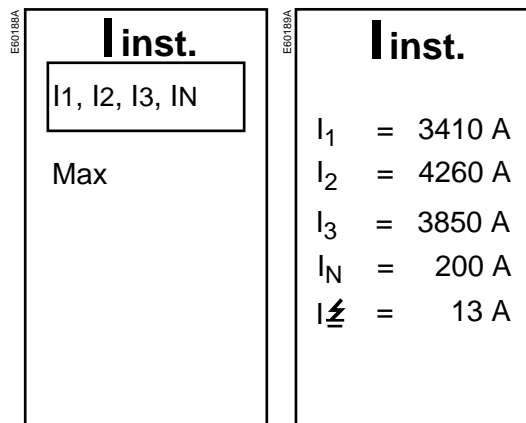
The and buttons may be used to display the currents on the three phases. If the operator no longer uses the buttons for a few seconds, the bargraph returns to the display of the most heavily loaded phase.

Select the command

I (A)
Instant.

Measure all the instantaneous-current values

■ measure the instantaneous currents

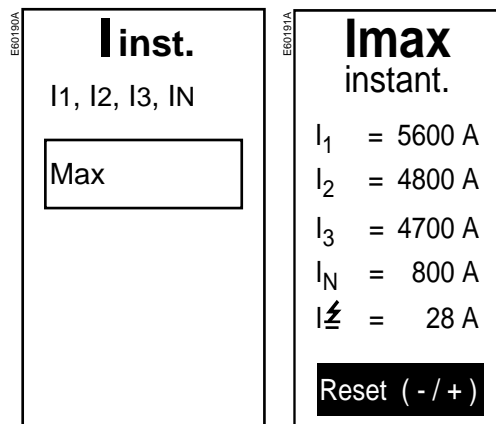


then

Select.

View.

■ check the instantaneous-current maximeter



then

Select.

View.

■ reset the maximeter

EB0192A

I_{max}
instant.

$I_1 = 0\text{ A}$

$I_2 = 0\text{ A}$

$I_3 = 0\text{ A}$

$I_N = 0\text{ A}$

$I_{\Sigma} = 0\text{ A}$

Reset (- / +)

EB0191A

I_{max}
instant.

$I_1 = 5600\text{ A}$


$I_2 = 4800\text{ A}$


$I_3 = 4700\text{ A}$

$I_N = 800\text{ A}$

$I_{\Sigma} = 28\text{ A}$


Reset (- / +)





Reset the maximeter or... cancel the reset.

Select the command



I (A)

Demand.

Measure all the demand-current values

■ measure the demand currents

EZ1675A

Demand

$\bar{I}_1, \bar{I}_2, \bar{I}_3, \bar{I}_N$

Max

EZ1675A

Demand


13min


$\bar{I}_1 = 3950\text{ A}$

$\bar{I}_2 = 4270\text{ A}$


$\bar{I}_3 = 3890\text{ A}$

$\bar{I}_N = 340\text{ A}$





then



Select.

View.

- check the demand-current maximeter

E71680A

Demand

$\bar{I}_1, \bar{I}_2, \bar{I}_3, \bar{I}_N$

Max

E71681A

Imax Demand

15min

$\bar{I}_1 = 4020 \text{ A}$

$\bar{I}_2 = 4450 \text{ A}$

$\bar{I}_3 = 4300 \text{ A}$

$\bar{I}_N = 600 \text{ A}$

Reset (- / +)



Select.

View.

- reset the maximeter

E71682A

Imax Demand

15min

$\bar{I}_1 = 0 \text{ A}$

$\bar{I}_2 = 0 \text{ A}$

$\bar{I}_3 = 0 \text{ A}$

$\bar{I}_N = 0 \text{ A}$

Reset (- / +)

E71683A

Imax Demand

15min

$\bar{I}_1 = 4020 \text{ A}$

$\bar{I}_2 = 4450 \text{ A}$

$\bar{I}_3 = 4300 \text{ A}$

$\bar{I}_N = 600 \text{ A}$

Reset (- / +)



Reset the maximeter or...



cancel the reset.

Voltage measurements

Select the command



U (V)

Measure the instantaneous-voltage values (U or V)

<p>U(V)</p> <p>Instant.</p> <p>Average 3Φ</p> <p>Unbal 3Φ</p>	<p>Uinst.</p> <p>$U_{12} = 400 \text{ V}$</p> <p>$U_{23} = 404 \text{ V}$</p> <p>$U_{31} = 401 \text{ V}$</p> <p>$U_{1N} = 230 \text{ V}$</p> <p>$U_{2N} = 229 \text{ V}$</p> <p>$U_{3N} = 233 \text{ V}$</p>
--	---



Select.

View.

Measure the average voltage U avg

<p>U(V)</p> <p>Instant.</p> <p>Average 3Φ</p> <p>Unbal 3Φ</p>	<p>Uavg.</p> <p>3Φ</p> <p>402 V</p>
--	---



Select.

View.

Measure the voltage unbalance U unbal


<p>U(V)</p> <p>Instant.</p> <p>Average 3Φ</p> <p>Unbal 3Φ</p>	<p>Uunbal</p> <p>3Φ</p> <p>1 %</p>
--	--



Select.

View.

Select the command

 **P** (kW)
Instant.

To ensure that the power and power-factor measurements are reliable, the power sign convention must first be set in the "History, maintenance and setup" menu.

Measure the instantaneous-power values

<p>Pinst.</p> <p>P, Q, S</p> <p>Power factor</p>	<p>Pinst.</p> <p>P (kW) +2180</p> <p>Q (kvar) -650</p> <p>S (kVA) +2280</p>
---	--


  then  Select. View.

Measure the power factor

<p>Pinst.</p> <p>P, Q, S</p> <p>Power factor</p>	<p>Power factor</p> <p>1.00</p>
---	--

  then  Select. View.

Select the command

 **P** (kW)
Demand

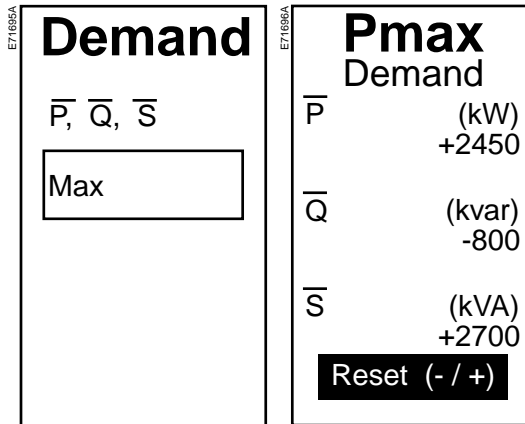
Measure the demand-power values

■ measure the demand power

<p>Demand</p> <p>\bar{P}, \bar{Q}, \bar{S}</p> <p>Max</p>	<p>Demand</p> <p>\bar{P} (kW) +2350</p> <p>\bar{Q} (kvar) -820</p> <p>\bar{S} (kVA) +2640</p>
---	---

  then  Select. View.

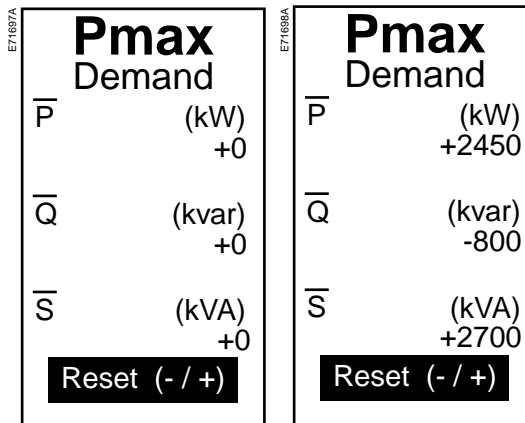
■ check the demand-power maximeter



Select.

View.

■ reset the maximeter



Reset the maximeter or...



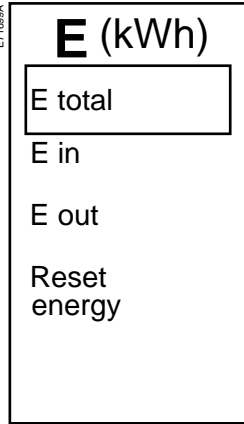
cancel the reset.

Select the command



To ensure that the energy measurements are reliable, the energy sign convention first be set in the "History, maintenance and setup" menu.

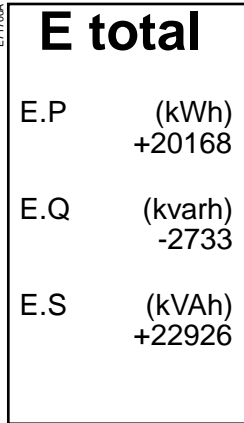
Measure the energy values



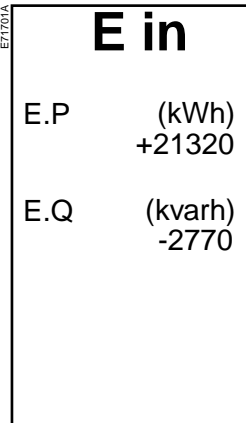
- Select the energy value to be measured:
- total energy
 - energy in (positive component in the total energy)
 - energy out (negative component in the total energy).



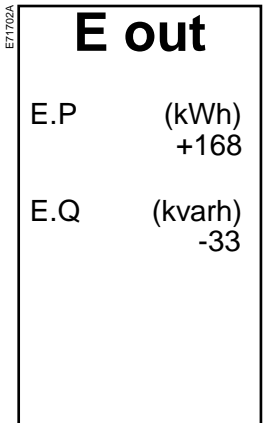
Select.



View the total energy values.

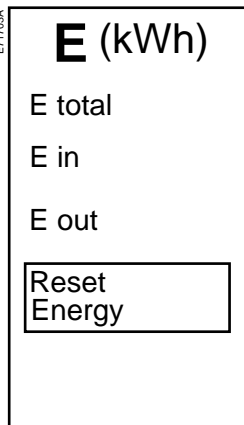


View the energy in values.

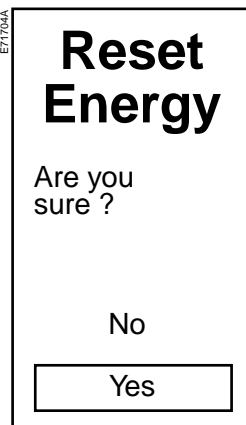


View the energy out values.

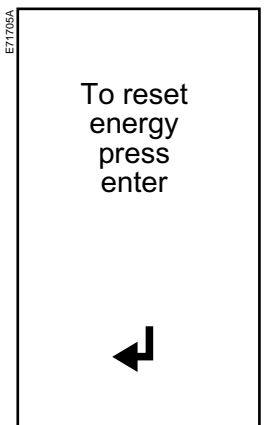
Reset the energy values



Select.



Select yes or no.



If yes, confirm.

Frequency measurements

Select the command



F (Hz)

EB0110A

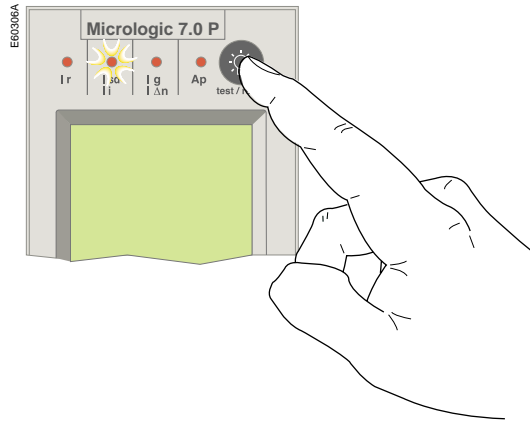
F (Hz)

60.0

View.

Caution!
If the circuit breaker remains closed and the Ap LED remains ON after the reset, open the circuit breaker and contact the after-sales support department.

The fault indication is maintained until it is reset on the control panel.
Press the reset button.



Viewing the event histories

Select the command



Event history

Trip history

Trip history

E717086A

Trip history

U min
27/01/1999

Ir
27/06/1998

Ir
18/02/1998



then



Select a fault.

E71707A

Trip

22/11/1999

02:04:04

Umin 160V

View.

Select the command



Event history

Alarm history

Alarm history

E717088A

Alarm history

I2 max
27/01/1999

In max
23/03/1998

U max
12/02/1998



then



Select an alarm.

E71708A

Alarm

27/01/1999


13:06:09

I2 max 3400A

View.

Operation counter and contact-wear indicator

Select the command

 Event history

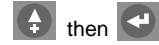
Operation counter

View and/or reset the operation counter

<small>E71736A</small> Number of operations Total 17824 Operations since last reset 6923 Reset (- / +)	<small>E71736A</small> Number of operations Total 17824 Operations since last reset 0 Reset (- / +)	<small>E71737A</small> Number of operations Total 17824 Operations since last reset 6923 Reset (- / +)
---	--	---



Reset.



Or cancel the reset, then confirm.

Select the command

 Event history

Contact wear

Check the wear of the contacts

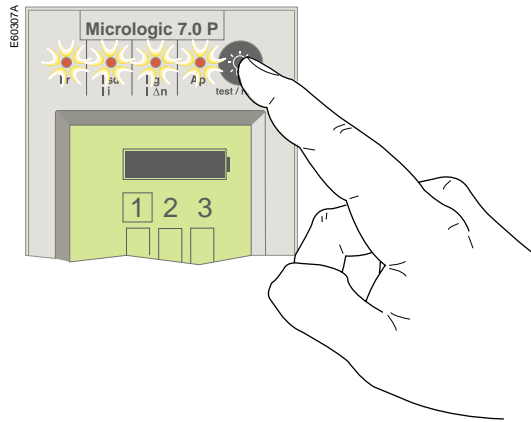
E71710A

Contact wear

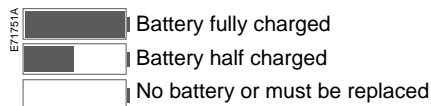
0

Checking the battery

Test the control-unit



Press and hold down the test button on the control unit to check the battery. Information is displayed if the circuit breaker is closed or if it is open and equipped with an external power supply.

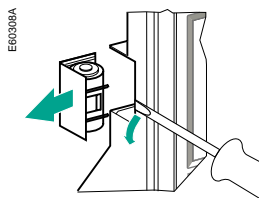


If no information is displayed, the control unit is operating under the conditions described in the "Power supply" section in the technical appendix.

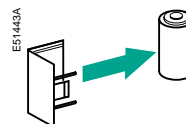
If the battery must be replaced, use a new battery with the Schneider part number 33593 (technical characteristics available on the battery-slot cover). Check its condition regularly by pressing and holding down the test button on the control unit for several seconds.

Replacing the control-unit battery

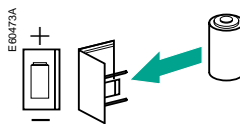
1. remove the battery cover



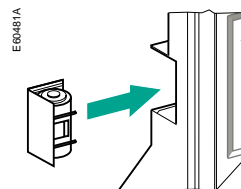
2. remove the battery



3. insert a new battery. Check the polarity.



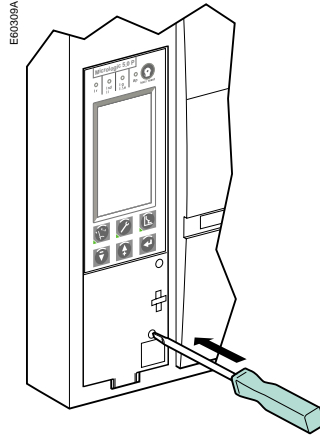
4. put the cover back in place. Press the battery-test button to check the new battery.



Test the earth-fault (Micrologic 6.0 P) and earth-leakage (Micrologic 7.0 P) protection functions

The circuit breaker must be supplied with power and closed for the test.

Press the TEST button. The circuit breaker should trip.

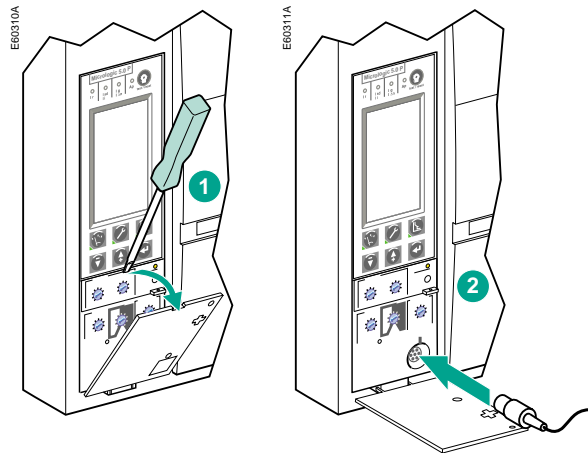


If the circuit breaker does not trip, contact the after-sales support department.

Refer to the manual that comes with the test kits.

Mini test kit and portable test kit

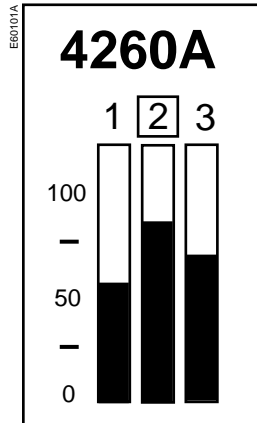
The test connector is used to connect the mini or the portable test kit to check that the control unit is operating correctly.





- The Micrologic P control unit offers access to the main screen and three menus:
- the main screen displaying the continuous measurement of the phase currents (I1, I2, I3) and the neutral current (In), if it exists
 - the "Metering" menu
 - the "History, maintenance and setup" menu
 - the "Protection" menu.

Main screen



As long as no functions are activated, Micrologic P control units display in real time the current on the most heavily loaded phase. The number for that phase is presented in a square.

When a menu button is pressed, a presentation screen is displayed and the green LED on the button goes ON.

"Metering", "History, maintenance and setup" and "Protection" menus

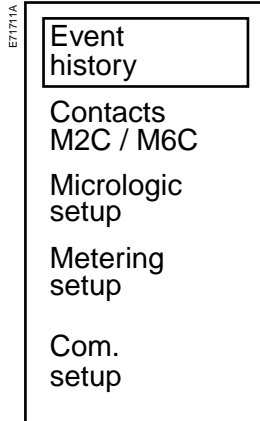
- "Metering" menu



I	(A)
U	(V)
P	(kW)
E	(kWh)
F	(Hz)

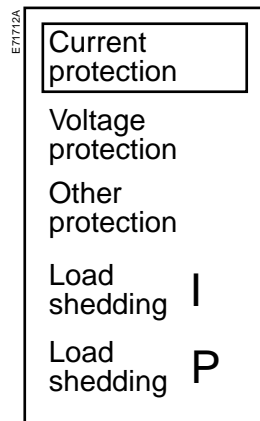
- press the or button to return to the main screen
- press the button to return to the previous screen
- whatever the screen displayed, if no further action is taken, the system returns to the main screen after a few minutes
- the LED goes OFF on exiting the menu.

■ "History, maintenance and setup" menu



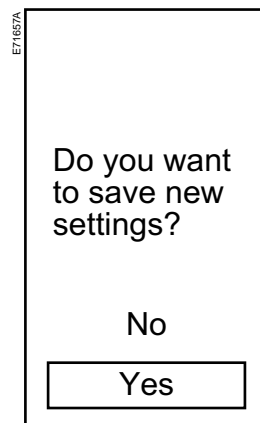
- press the or button to return to the main screen
- press the button to return to the previous screen
- whatever the screen displayed, if no further action is taken, the system returns to the main screen after a few minutes
- the LED goes OFF on exiting the menu.

■ "Protection" menu



- press the or button to return to the main screen
- press the button to return to the previous screen
- whatever the screen displayed, if no further action is taken, the system returns to the main screen after a few minutes
- the LED goes OFF on exiting the menu.


■ saving settings









When a setting is made in any of the three menus, the screen used to save the modification(s) may be accessed by pressing one of the three buttons



- select yes to save the modifications
- select no to cancel and maintain the previous settings
- this screen remains displayed until yes or no are selected.


Press the  button to select the "Metering" menu.



-  move the cursor down the screen or decrement a value.
-  move the cursor up the screen or increment a value.
-  select an option in a list, confirm a selection or the value of a setting.
-  indicates that the operator is in the "Metering" menu and returns to the previous screen.
-   return to the main screen.

E60105A

I	(A)
U	(V)
P	(kW)
E	(kWh)
F	(Hz)

Current measurements


I (A)  access to the following sections:

- Instant. 
 - I1, I2, I3, IN** I1, I2, I3, IN currents (depending on the type of system)
 - Max** Storing and reset of the maximeter
- Demand 
 - I $\bar{1}$, I $\bar{2}$, I $\bar{3}$, I \bar{N}** Demand current on the phases $\bar{I}_1, \bar{I}_2, \bar{I}_3$ and on \bar{I}_N (depending on the type of system).
 - Max** Storing and reset of the maximeter

E60391A

I	(A)
U	(V)
P	(kW)
E	(kWh)
F	(Hz)

Voltage measurements


U (V)  access to the following sections:


- Instant. Instantaneous phase-to-phase U12, U23, U31 and phase-to-neutral V1N, V2N, V3N voltages (depending on the type of system)
- Average 3 Φ Average voltage U average of the phase-to-phase voltages.
- Unbal 3 Φ Unbalance voltage U unbal. of the phase-to-phase voltages.

EG0392A

I	(A)
U	(V)
P	(kW)
E	(kWh)
F	(Hz)

Power measurements

P (kW)  access to the following sections:


Instant. 

P, Q, S,

Total active power P
Total reactive power Q
Total apparent power S

Power factor

Power factor PF

Demand 

\overline{P} , \overline{Q} , \overline{S}

Demand values for the:
■ total active power P
■ total reactive power Q
■ total apparent power S


Max

Storing and reset of the maximeter

EG0393A

I	(A)
U	(V)
P	(kW)
E	(kWh)
F	(Hz)

Energy measurements

E (kWh)  access to the following sections:

E total

Total active energy E.P
Total reactive energy E.Q
Total apparent energy E.S

E in

Positive component of:
■ the total active energy E.P
■ the total reactive energy E.Q

E out

Negative component of:
■ the total active energy E.P
■ the total reactive energy E.Q


Reset Energy

Reset all the energy values to zero


EG0394A







I	(A)
U	(V)
P	(kW)
E	(kWh)
F	(Hz)

Frequency measurement

F (Hz)  access to the frequency (F) measurement

History, maintenance and setup

Press the  button to select the "History, maintenance and setup" menu.

-  move the cursor down the screen or decrement a value.
-  move the cursor up the screen or increment a value.
-  select an option in a list, confirm a selection or the value of a setting.
-  indicates that the operator is in the "History, maintenance and setup" menu and returns to the previous screen.
-   return to the main screen.

E71711A

Event history

Contacts M2C / M6C


Micrologic setup

Metering setup

Com. setup

Event history

Event history

 access to the following sections:

- Trip history

 The last ten faults recorded following a trip
- Alarm history

 The last ten alarms activated
- Operation counter

 Number of operations (opening or closing)
- Contact wear

 Wear of the circuit-breaker main contacts

E71713A

Event history

Contacts M2C / M6C


Micrologic setup

Metering setup

Com. setup

M2C / M6C Contacts

Contacts M2C / M6C

 access to the following sections:

- Alarm type

 Assignment of a protection alarm set for each M2C or M6C contact
- Setup

 Latching mode for each M2C or M6C contact
- Reset

 Reset of the M2C or M6C contacts to zero following activation of an alarm

E71714A

Event history
Contacts M2C / M6C
Micrologic setup
Metering setup
Com. setup

Micrologic setup

Micrologic setup



access to the following sections:

Language

Selection of the display language

Date / hour

Setting of the date and time

Breaker selection

Indication of the circuit-breaker type

Neutral TC

Selection of the neutral-CT type

VT ratio

Selection of the voltage transformation ratio when an external voltage transformer is installed

System frequency

Indication of the rated system frequency

E71715A

Event history
Contacts M2C / M6C
Micrologic setup
Metering setup
Com. setup

Metering setup

Metering setup



access to the following sections:

System type

- 3 phases, 3 wires, 3 CTs: method using two wattmeters
- 3 phases, 4 wires, 3 CTs: method using three wattmeters
- 3 phases, 4 wires, 4 CTs: method using three wattmeters with measurement of the neutral current.

Current demand

Setting of the time interval for the calculation

Power demand

Setting of the parameters for the calculation

Active P flow

Setting of the normal direction of active-power flow

Sign convention

Setting of the sign convention for the power factor and reactive power

E71716A

- Event history
- Contacts M2C / M6C
- Micrologic setup
- Metering setup
- Com. setup**

E71717A

- Contacts M2C / M6C
- Micrologic setup
- Metering setup
- Com. setup
- Protection setup**

COM communications-option setup

Com. setup



access to the following sections:

Com. parameter

Setting of parameters for the COM communications-option (if installed)

Remote settings

Authorisation or refusal of access via the COM communications option.

Remote control

Access to the circuit-breaker ON and OFF commands.

Protection setup

Protection setup



access to the following sections:

Current protection

Selection of the Alarm or Trip mode for the current-protection functions

Voltage protection


Selection of the Alarm or Trip mode for the voltage-protection functions







Other protection

Selection of the Alarm or Trip mode for the other protection functions

Power flow

Selection of the power-flow sign convention (Top fed or Bottom fed).


Press the  button to select the "Protection" menu.

-  move the cursor down the screen or decrement a value
-  move the cursor up the screen or increment a value
-  select an option in a list, confirm a selection or the value of a setting
-  indicates that the operator is in the "Protection" menu and returns to the previous screen
-   return to the main screen

E71712A

Current protection	
Voltage protection	
Other protection	
Load shedding	I
Load shedding	P

Current protection

Current protection  access to the following sections:

- I** (A) View or fine settings of the long-time I^2t , short-time and instantaneous protection functions
- Idmtl** (A) View or fine settings of the long-time Idmtl, short-time and instantaneous protection functions
- I \neq** (A) View or fine settings of the:
 - earth-fault (Micrologic 6.0 P)
 - earth-leakage (Micrologic 7.0 P) protection functions
- Ineutral** (A) Selection of the neutral
- I \neq Alarm** Setting of the I \neq alarm.
- Iunbal** (%) Setting of the current-unbalance protection I unbal
- I $\bar{1}$ max** (A) Setting of the maximum-current protection I $\bar{1}$ max
- I $\bar{2}$ max** (A) Setting of the maximum-current protection I $\bar{2}$ max
- I $\bar{3}$ max** (A) Setting of the maximum-current protection I $\bar{3}$ max
- I \bar{N} max** (A) Setting of the maximum-current protection I \bar{N} max

E71719A

- Current protection
- Voltage protection
- Other protection
- Load shedding I
- Load shedding P

Voltage protection

Voltage protection

access to the following sections:

U_{min} (V)

Setting of the minimum-voltage protection U_{min}.

U_{max} (V)

Setting of the maximum-voltage protection U_{max}.

U_{unbal} (%)

Setting of the voltage-unbalance protection U_{unbal}.

E71720A

- Current protection
- Voltage protection
- Other protection
- Load shedding I
- Load shedding P

Other protection

Other protection

access to the following sections:

rP_{max} (W)

Setting of the reverse-power protection rP_{max}

F_{min} (Hz)

Setting of the minimum-frequency protection F_{min}

F_{max} (Hz)

Setting of the maximum-frequency protection F_{max}

Phase rotation

Setting of the phase-rotation protection

E71721A

- Current protection
- Voltage protection
- Other protection
- Load shedding I
- Load shedding P

Load shedding depending on current

Load shedding I

Access to load shedding and reconnection depending on current

E71722A

- Current protection
- Voltage protection
- Other protection
- Load shedding I
- Load shedding P

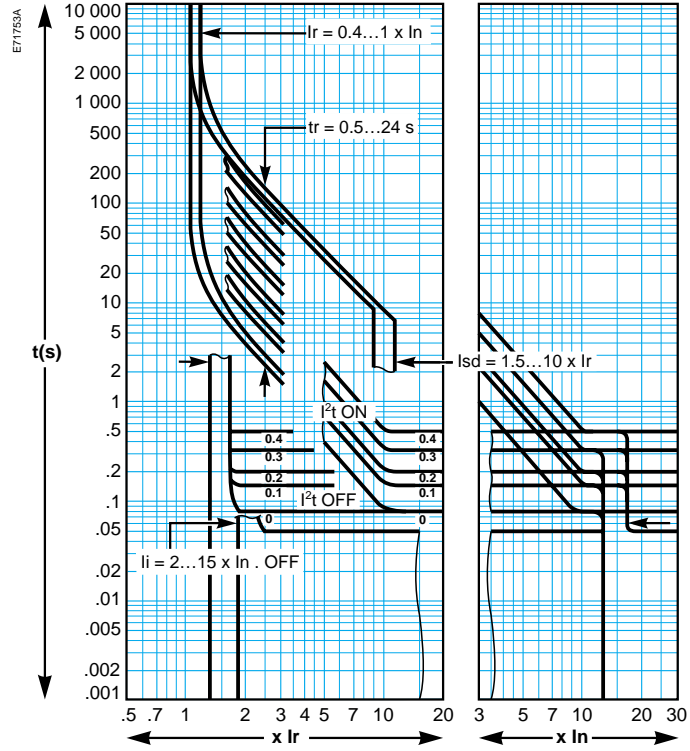
Load shedding depending on power

Load shedding P

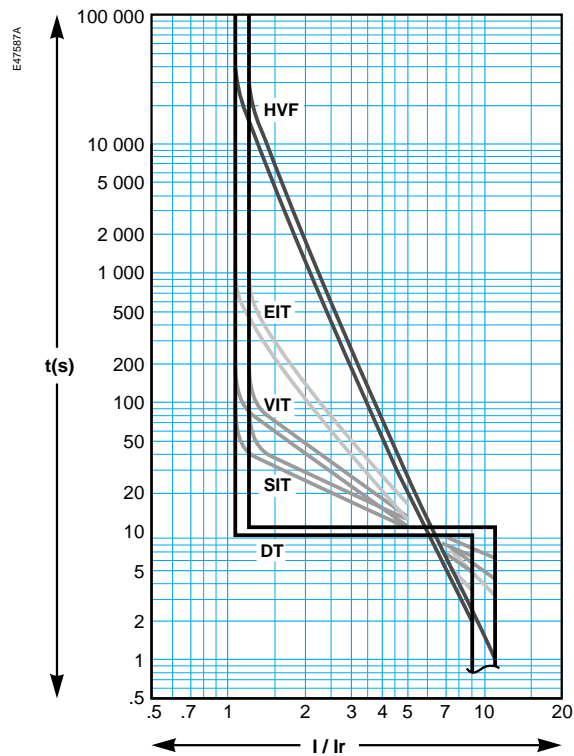
Access to load shedding and reconnection depending on power



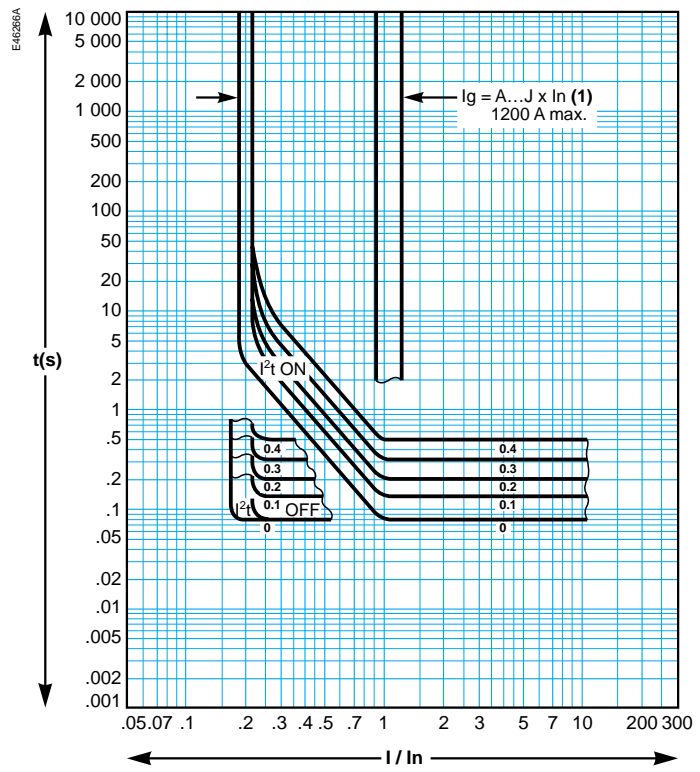
Long-time I^2t , short-time and instantaneous protection Micrologic 5.0 P, 6.0 P, 7.0 P

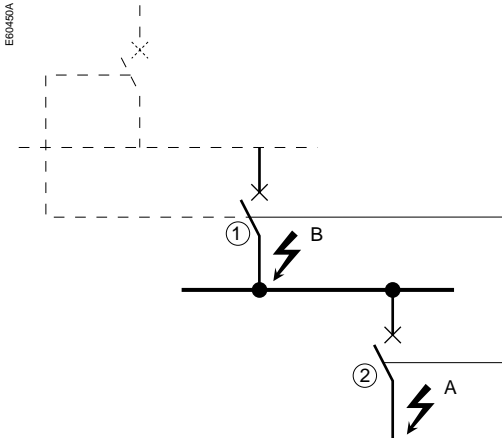


Long-time I_{dmtl} , short-time and instantaneous protection Micrologic 5.0 P, 6.0 P, 7.0 P



Earth-fault protection - Micrologic 6.0 P





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 t_{sd} or the earth-fault tripping delay t_g 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 t_{sd} or t_g setting.

Note:

It is advised to maintain a difference of at least one dial setting for the pickup and delay settings between any two devices and to use the I^2t OFF setting.

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.

An interface is also available for links to previous generations of trip units and to medium-voltage protection relays.

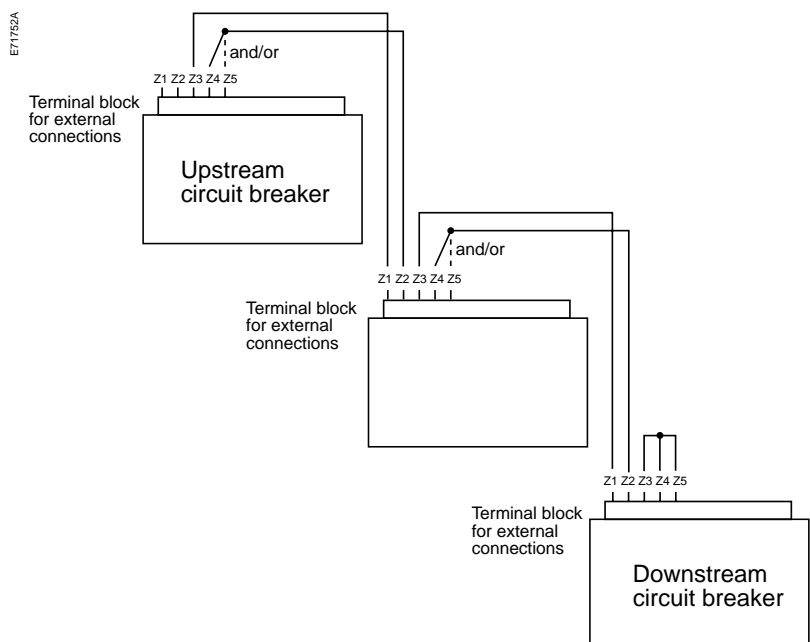
Caution:

If the protection function is not used on circuit breakers equipped for ZSI protection, a jumper must be installed to short terminals Z3, Z4 and Z5. If the jumper is not installed, the short-time and earth-fault tripping delays are set to zero, whatever the position of the adjustment dial.

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

Wiring

- maximum impedance: $2.7 \Omega / 300$ metres
- capacity of connectors: 0.4 to 2.5 mm^2
- maximum cross-sectional area of wires (including insulation): 3.5 mm^2
- 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 ten inputs
 - a maximum of 100 devices may be connected to an input ZSI - IN - ST (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.



Power supply

AD power-supply module

The AD power-supply module provides auxiliary power for the control-unit functions listed below:

■ graphic display:

- the display goes on as soon as the circuit breaker is closed
- display is possible even with the circuit breaker open if it is equipped with an auxiliary power source or an external voltage-measurement input
- the long-time, short-time, instantaneous and earth-fault protection functions operate under all circumstances on their own power

■ activation of an alarm and an output relay

An alarm may be linked with an output relay if the 24 V power-supply module is installed

■ date and time

If a communications module is not installed, a power-supply module should be installed to avoid having to enter the date and time following each circuit-breaker trip.

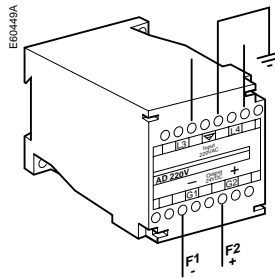
In conjunction with the BAT battery module, the AD power-supply module can be used to save data.

The AD power-supply module can supply the following voltages:

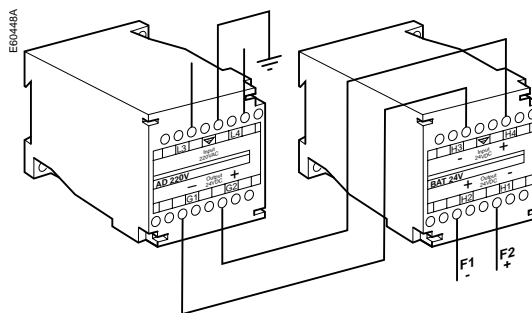
- 110 V AC
- 220 V AC
- 380 V AC
- 24 / 30 V DC
- 48 / 60 V DC
- 125 V DC.

■ wiring diagrams

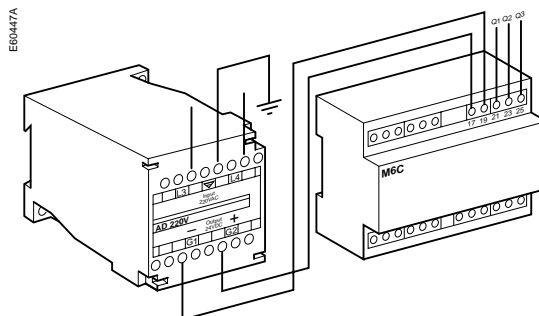
- reliable or backed-up auxiliary system



- auxiliary system without back-up



■ supply with the MC6 module



Using the AD power-supply module

None of the protection functions on the control unit require an auxiliary source. However, the 24 V DC external power-supply (AD module) is required for certain operating configurations as indicated in the table below.

circuit breaker	closed	open	open
voltage-measurement inputs	powered	powered	not powered
communications option	no	no	no
M2C, M6C programmable-contacts option	yes	yes	yes
protection function	no	no	no
display function	no ⁽¹⁾	no ⁽²⁾	yes
time-stamping function	no	no	yes ⁽³⁾
circuit-breaker status indications and control via communications bus	no	no	no
identification, settings, operation and maintenance aids via communications bus	no ⁽¹⁾	no ⁽²⁾	yes

(1) except for Micrologic A control units (if current < 20% I_n)

(2) except for Micrologic A control units

(3) the time setting is manual and can be carried out automatically by the supervisor via the communications bus.

- if the 24 V DC external power supply (AD module) is used, the maximum cable length between 24 V DC (G1, G2) and the control unit (F1-, F2+) must not exceed 10 metres.

- the communications bus requires its own 24 V DC power source (E1, E2).

This source is not the same as the 24 V DC external power-supply module (F1-, F2+).

- the BAT battery module, mounted in series upstream of the AD module, ensures an uninterrupted supply of power if the AD module power supply fails.

- the voltage-measurement inputs are standard equipment on the downstream connectors of the circuit breaker.

External connections are possible using the PTE external voltage-measurement input option. With this option, the internal voltage-measurement inputs are disconnected and terminals VN, V1, V2 and V3 are connected only to the Micrologic P control unit.

The PTE option is required for voltages less than 100 V and greater than 690 V (in which case a voltage transformer is required).

For three-pole devices, the system is supplied with terminal VN connected only to the Micrologic P control unit.

When the PTE option is implemented, the voltage-measurement input must be protected against short-circuits. Installed as close as possible to the busbars, this protection function is ensured by a P25M circuit breaker (1 A rating) with an auxiliary contact (cat. no. 21104 and 21117). This voltage-measurement input is reserved exclusively for the control unit and must not ever be used to supply other circuits outside the switchboard.

Changing the long-time rating plug

Select the long-time rating plug

A number of setting ranges for the long-time current setting are available on Micrologic P control units by changing the long-time rating plug. The available rating plugs are listed below.

Part number	Setting range for the I_r value	
33542	standard	0.4 to 1 x I_r
33543	low setting	0.4 to 0.8 x I_r
33544	high setting	0.8 to 1 x I_r
33545	without long-time protection	

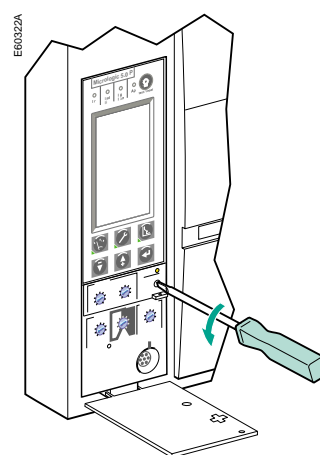
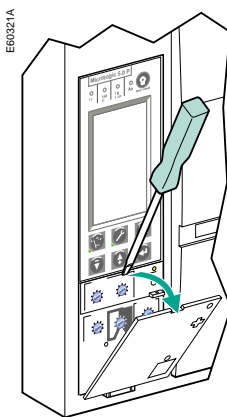
Caution!

Following any modifications to the long-time rating plug, all control-unit protection parameters must be checked.

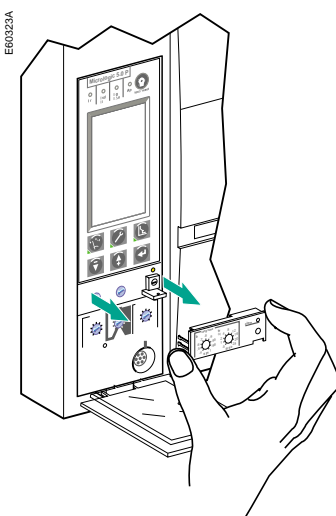
Change the long-time rating plug

Proceed in the following manner.

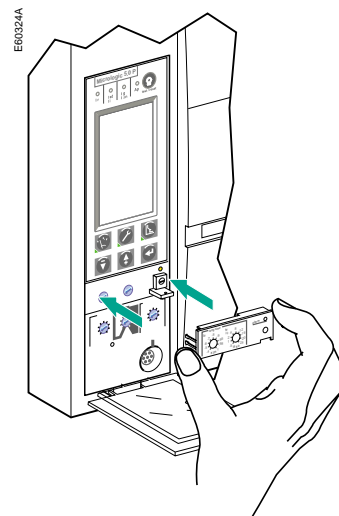
1. open the circuit breaker
2. open the protective cover of the control unit
3. completely remove the long-time rating plug screw



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 I_r is 0.4
- the long-time tripping delay t_r corresponds to the value indicated by the adjustment dial
- the earth-leakage protection function is disabled
- the voltage-measurement inputs are disconnected.

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.

Short-time protection and intermittent faults

For the short-time protection function, intermittent currents that do not provoke tripping are stored in the Micrologic P memory.

This information is equivalent to the long-time thermal memory and reduces the tripping delay for the short-time protection.

Earth-fault protection and intermittent faults

The earth-fault protection implements the same function as the short-time protection (see above).

Data available via the COM communications option

The COM communications option can be used to remotely access the Micrologic P measurement, setting, maintenance and protection values.

Measurements

- currents
 - instantaneous currents
 - maximum instantaneous currents
 - average instantaneous currents
 - instantaneous-current unbalance per phase
 - maximum instantaneous-current unbalance per phase
- demand current
 - demand current per phase
 - maximum demand current per phase since last reset
 - recommended demand current per phase
 - time-stamping of demand-current maximums
- voltages
 - phase-to-neutral and phase-to-phase voltages
 - average phase-to-neutral and phase-to-phase voltages
 - phase-to-neutral and phase-to-phase voltage unbalance
 - maximum phase-to-neutral and phase-to-phase voltage unbalance
- active power per phase
 - demand power
 - demand power per phase
 - maximum demand power per phase since last reset
 - maximum recommended demand power per phase
 - time-stamping of demand-power maximums
- energy
 - total active energy
 - positively incremented energy
 - negatively incremented energy
- system frequency
- interval between last update of real-time values and the current table
- update date of demand currents, demand power and energy

Setup

- setting of the control-unit date and time
- password for the measurement module
- control-unit ID code
- control-unit ID name
- selection of the measurement calculation algorithm
- sign convention for the active power
- total-energy measurement mode
- scale factors
- interval for the demand-current calculation window
- demand-power calculation mode
- interval for the demand-power calculation window
- battery-charge indication
- trip and alarm histories
- operation counter and contact-wear indicator

Protection

- circuit-breaker rated current
- type of neutral protection
- long-time I^2t protection settings
- long-time I_{dmtl} protection settings
- short-time protection settings
- instantaneous-protection settings
- earth-fault protection settings
- earth-leakage protection settings
- current-unbalance, I_{\neq} alarm and maximum-current protection settings
- voltage-protection settings
- setting for other protection functions

Long-time I²t and IdmtI protection

Type	Range	Factory setting	Step	Accuracy
I _r current setting	0.4 to I _n	maximum	1 A	1.05 to 1.20 I _r
t _r tripping delay	0.5 to 24 s	maximum	0.5 s	- 20 %, + 0 %

Short-time protection

Type	Range	Factory setting	Step	Accuracy
I _{sd} pickup	1.5 to 10 I _r	maximum	10 A	± 10 %
t _{sd} tripping delay	0 - 0.1 - 0.2 - 0.3 - 0.4 s	maximum	0.1 s	

Instantaneous protection

Type	Range	Factory setting	Step	Accuracy
I _i pickup	2 to 15 I _n or off	maximum	10 A	± 10 %

Earth-fault protection on Micrologic 6.0 P

Type	Range	Factory setting	Step	Accuracy
I _g pickup		maximum	1 A	± 10 %
t _g tripping delay	0 - 0.1 - 0.2 - 0.3 - 0.4 s	maximum	0.1 s	

Current protection

Type	Range	Factory setting	Step	Accuracy
current unbalance I unbal				
Pickup threshold	5% to 60%	60 %	1 %	-10 %, +0 %
Dropout threshold	5% of pickup threshold	pickup threshold	1 %	-10 %, +0 %
Pickup time delay	1 to 40 s	40 s	1 s	-20 %, +0 %
Dropout time delay	10 to 360 s	10 s	1 s	-20 %, +0 %
earth-fault I ↓ alarm				
Pickup threshold	20 to 1200 A	1200 A	1 A	+/- 15 %
Dropout threshold	20 A to pickup threshold	pickup threshold	1 A	+/- 15 %
Pickup time delay	1 to 10 s	10 s	0.1 s	-20 %, +0 %
Dropout time delay	1 to 10 s	1 s	0.1 s	-20 %, +0 %
earth-leakage I ↓ alarm				
Pickup threshold	0.5 to 30 A	30 A	0.1 A	-20 %, +0 %
Dropout threshold	0.5 A to pickup threshold	pickup threshold	0.1 A	-20 %, +0 %
Pickup time delay	1 to 10 s	10 s	0.1 s	-20 %, +0 %
Dropout time delay	1 to 10 s	1 s	0.1 s	-20 %, +0 %
maximum current \bar{I}_1 max, \bar{I}_2 max, \bar{I}_3 max, \bar{I}_N max				
Pickup threshold	0.2 to 10 In	In	1 A	± 6.6%
Dropout threshold	0.2 In to pickup threshold	pickup threshold	1 A	± 6.6%
Pickup time delay	15 to 1500 s	1500 s	1 s	-20 %, +0 %
Dropout time delay	15 to 3000 s	15 s	1 s	-20 %, +0 %

Voltage protection

Type	Range	Factory setting	Step	Accuracy
minimum voltage U min				
Pickup threshold	100 V to U max pickup threshold	100 V	5 V	-5 %, +0 %
Dropout threshold	pickup threshold to U max pickup threshold	pickup threshold	5 V	-5 %, +0 %
Pickup time delay	0.2 to 5 s	5 s	0.1 s	-0 %, +20 %
Dropout time delay	0.2 to 36 s	0.2 s	0.1 s	-0 %, +20 %
maximum voltage U max				
Pickup threshold	U min pickup threshold to 1200 V	725 V	5 V	-0 %, +5 %
Dropout threshold	100 V to pickup threshold	pickup threshold	5 V	-0 %, +5 %
Pickup time delay	0.2 to 5 s	5 s	0.1 s	-0 %, +20 %
Dropout time delay	0.2 to 36 s	0.2 s	0.1 s	-0 %, +20 %
voltage unbalance U unbal				
Pickup threshold	2 to 30%	30 %	1 %	-10 %, +0 %
Dropout threshold	2% to pickup threshold	pickup threshold	1 %	-10 %, +0 %
Pickup time delay	1 to 40 s	40 s	1 s	-20 %, +0 %
Dropout time delay	10 to 360 s	10 s	1 s	-20 %, +0 %

Other protection

Type	Range	Factory setting	Step	Accuracy
reverse power rP max				
Pickup threshold	5 to 500 kW	500 kW	5 kW	± 2.5%
Dropout threshold	5 kW to pickup threshold	pickup threshold	5 kW	± 2.5%
Pickup time delay	0.2 to 20 s	20 s	0.1 s	-0 %, +20 %
Dropout time delay	1 to 360 s	1 s	0.1 s	-0 %, +20 %
maximum frequency F max				
Pickup threshold	F min pickup threshold to 540 Hz	65 Hz	0.5 Hz	± 0.5 Hz
Dropout threshold	45 Hz to pickup threshold	pickup threshold	0.5 Hz	± 0.5 Hz
Pickup time delay	0.2 to 5 s	5 s	0.1 s	-0 %, +20 %
Dropout time delay	1 to 36 s	1 s	0.1 s	-0 %, +20 %
minimum frequency F min				
Pickup threshold	45 Hz to F max pickup threshold	45 Hz	0.5 Hz	± 0.5 Hz
Dropout threshold	pickup threshold to F max pickup threshold	pickup threshold	0.5 Hz	± 0.5 Hz
Pickup time delay	0.2 to 5 s	5 s	0.1 s	-0 %, +20 %
Dropout time delay	1 to 36 s	1 s	0.1 s	-0 %, +20 %
phase rotation				
Pickup threshold	Ph1, Ph2, Ph3 or Ph1, Ph3, Ph2	Ph1, Ph2, Ph3	none	none
Dropout threshold	pickup threshold	pickup threshold	none	none
Pickup time delay	0.3 s	0.3 s	none	+/- 20 %
Dropout time delay	0.3 s	0.3 s	none	+/- 20 %

Load shedding and reconnection

Type	Range	Factory setting	Step	Accuracy
current I				
Pickup threshold	50 to 100% Ir	100 % Ir	1 %	± 6 %
Dropout threshold	30% Ir to shedding threshold	shedding threshold	1 %	± 6 %
Pickup time delay	20 to 80% tr	80 % tr	1 %	-20 %, +0 %
Dropout time delay	10 to 600 s	10 s	1 s	-20 %, +0 %
power P				
Pickup threshold	200 to 10 000 kW	10 000 kW	50 kW	± 2.5 Hz
Dropout threshold	100 kW to shedding threshold	shedding threshold	50 kW	± 2.5 Hz
Pickup time delay	10 to 3600 s	3600 s	10 s	-20 %, +0 %
Dropout time delay	10 to 3600 s	10 s	10 s	-20 %, +0 %

Other settings

M2C / M6C contacts

Type	Range	Factory setting	Step
time-delay latching time delay	1 - 360 s	360 s	1 s

Micrologic setup

Type	Range	Factory setting	Step
language	English US English UK French German Italian Spanish	English	
date / hour			1 s
circuit-breaker selection	4 ASCII characters (A to Z, 0 to 9)	"set !"	
neutral TC		no TC	
voltage transformer			
primary voltage	min. 100 V, max. 1150 V	690 V	1 V
secondary voltage	min. 100 V, max. 690 V	690 V	1 V
system frequency	50/60 Hz or 400 Hz	50/60 Hz	

Measurement setup

Type	Range	Factory setting	Step
system type	3 Φ , 3 w, 3 CT 3 Φ , 4 w, 3 CT 3 Φ , 4 w, 4 CT	3 Φ , 4 w, 4 CT	
demand-current calculation interval	5 to 60 minutes	15 minutes	1 minute
demand-power calculation			
type of window	block or sliding	sliding	
calculation interval	5 to 60 minutes	15 minutes	1 minute
active power flow	P+ P-	P+ (flow from top to bottom)	
sign convention	IEEE IEEE alternate IEC	IEEE	

Communication setup

Type	Range	Factory setting
com parameter	MODBUS	
address	1-47	47
baud rate	9600 to 19 200 bauds	19 200 bauds
parity	even	even none
remote settings		
access authorisation	yes / no	yes
access code	0000 to 9999	0000
remote control	manual automatic	automatic

Protection setup

Type	Range	Factory setting
current protection voltage protection other protection	alarm / trip	alarm
power flow	top fed / bottom fed	top fed

Measurement setting ranges and accuracy

Measurement setting ranges and accuracy

Type	Range	Accuracy
instantaneous current		
I1	0 to 32 kA	± 1.5 %
I2	0 to 32 kA	± 1.5 %
I3	0 to 32 kA	± 1.5 %
IN	0 to 32 kA	± 1.5 %
$I_{\frac{1}{2}}$	0 to 32 kA	± 1.5 %
I1 max	0 to 32 kA	± 1.5 %
I2 max	0 to 32 kA	± 1.5 %
I3 max	0 to 32 kA	± 1.5 %
IN max	0 to 32 kA	± 1.5 %
$I_{\frac{1}{2}}$ max	0 to 32 kA	± 1.5 %
demand current		
\bar{I}_1	0 to 32 kA	± 1.5 %
\bar{I}_2	0 to 32 kA	± 1.5 %
\bar{I}_3	0 to 32 kA	± 1.5 %
\bar{I}_N	0 to 32 kA	± 1.5 %
\bar{I}_1 max	0 to 32 kA	± 1.5 %
\bar{I}_2 max	0 to 32 kA	± 1.5 %
\bar{I}_3 max	0 to 32 kA	± 1.5 %
\bar{I}_N max	0 to 32 kA	± 1.5 %
phase-to-phase voltages		
U12	0 to 1200 V	± 0.5 %
U23	0 to 1200 V	± 0.5 %
U31	0 to 1200 V	± 0.5 %
phase-to-neutral voltages		
U1N	0 to 1200 V	± 0.5 %
U2N	0 to 1200 V	± 0.5 %
U3N	0 to 1200 V	± 0.5 %
average voltage		
U avg	0 to 1200 V	± 0.5 %
voltage unbalance		
U unbal	0 to 100 %	± 0.5 %
instantaneous power		
P	0 to 32 MW	± 2 %
Q	0 to 32 Mvar	± 2 %
S	0 to 32 MVA	± 2 %
power factor		
PF	-1 to +1	± 0.01
demand power		
P	0 to 32 MW	± 2 %
Q	0 to 32 Mvar	± 2 %
S	0 to 32 MVA	± 2 %
P max	0 to 32 MW	± 2 %
Q max	0 to 32 Mvar	± 2 %
S max	0 to 32 MVA	± 2 %
total energy		
E.P	-10 ¹⁰ GWh to +10 ¹⁰ GWh	± 2 %
E.Q	-10 ¹⁰ Gvarh to +10 ¹⁰ Gvarh	± 2 %
E.S	-10 ¹⁰ GVAh to +10 ¹⁰ GVAh	± 2 %
total energy in		
E.P	-10 ¹⁰ GWh to +10 ¹⁰ GWh	± 2 %
E.Q	-10 ¹⁰ Gvarh to +10 ¹⁰ Gvarh	± 2 %
total energy out		
E.P	-10 ¹⁰ GWh to +10 ¹⁰ GWh	± 2 %
E.Q	-10 ¹⁰ Gvarh to +10 ¹⁰ Gvarh	± 2 %
frequency		
F	45 Hz to 440 Hz	0.1 Hz



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