CB1

USER ´s

MANUAL

Rev. M-2.07-299

INDEX

TECHNICAL DATA

Current output:

0…200A RMS continuos and 1000A for a short period of time, 6 ranges, 0…100% output adjustment for each range through a variable transformer

Current overload:

The output at the rear are 50A, 100A and 200A and the maximal overload is:

Until 100%	continuos test
Until 200%	5 minutes ON, 15 minutes OFF
Until 300%	2 min ON, 20 minutes OFF
Until 400%	30 seconds ON, 20 minutes OFF
Until 500%	5 seconds ON, 30 minutes OFF

These are the recommended intervals of time and they are subject under other factors like ambient temperature, duration of the test, power needed in each test, etc.

The circuit breaker test set CB1 does not control the duration and number of overloads.

The front outputs are 2,5A, 5A and 10A. The maximum overload is 13A.

As a safety there is an extra thermal protection.

Overload protection:

An acoustic alarm beeps when output current is greater than 200A in any rear output. The test ends automatically when output is over 1000A.

An acoustic alarm beeps when output current is greater than 12A in any front output. The test ends automatically when output is over 13A.

Maximum voltage output:

Depending on the output terminals used:

0…2,5A	(0…400V maximum)
0…5A	(0…200V maximum)
0…10A	(0…100V maximum)
0…50A	(0…12V maximum)
0…100A	(0…6V maximum)
0…200A	(0…3V maximum)

Test Voltage:

0…400V AC adjustable, power 800 VA
0…200V AC adjustable, power 400 VA
0…100V AC adjustable, power 200 VA

Maximal current is 2A. Overload when 125% is reached (and acoustic alarm beeps when output is over 2,5A). End of test occurs at 150% (over 3A). Short circuit protection.

Timer:

Digital readout, range 0…9999s. Automatic range. 1% accuracy. Resolution from 100us to 1s.

Range 0…999,9 ms	resolution 0,1ms (0,0001 s)
Range 0... 9,999 s	resolution 1 ms (0,001 s)
Range 0…99,99 s	resolution 10 ms (0,01 s)
Range 0… 999,9 s	resolution 100 ms (0,1 s)
Range 0… 9999 s	resolution 1000 ms (1 s)

The timer will keep the measured value until a manual reset or new test occurs.

Current meter:

Four digits, range 0…99,99 (maximum display 13,00 Amps RMS) and range 0… 999,9 Amps RMS. Automatic range. Accuracy is 2% full scale until 200 Amps.

Measuring time is 200ms. When testing breakers that stop the timer when the breaker trips and test current disappears note that if the measuring time has been under 200ms then the ammeter readout could show small values and even could be a wrong indication. Retains the maximal measured value until a reset or a new test occurs.

Voltage meter:

Four digits, range 0…999,9 (maximum display 450,0 Volts RMS). Accuracy is 2% full scale until 400 Volts.

Measuring time is 200ms. This is a no relevant data since when testing relay voltage, the output does not extinguish immediately and the voltage meter has enough time to make the measure.

Retains the measured value until a reset or a new test occurs.

Timer Accuracy:

1% full scale + 3 ms for current test or voltage test where the timer stops through external contacts.

1% full scale + 20ms for current test where the timer stops by interruption of the current.

Auxiliary power supply (option)

In the rear panel are five outputs: common, 12V, 24V, 48V and 110V. Maximum current is 0,3 Amps. Internal fuse protect against short circuits.

Power supply: 220V ±10% 50-60Hz

Fuses: DC power supply, fuse 0,3A
Auxiliary power, fuse 10A

Consumption: 1500VA aprox. @ 220V AC 50 Hz

Size: 378 x 202 x 294 mm aprox.

Weight: 30 kg. Aprox.

Accessories: Power supply cord, users manual, high current leads.

PROCEDURE

Be sure that the equipment do not show visible damages

Connect the equipment to a 220V 50Hz net with at least 5kVA capability and earth protection.

Turn on the equipment with the main bipolar switch locate in the rear.

The equipment will perform a segment test.

VOLTAGE TEST

With the EnerLaB CB1 it is possible to adjust a voltage from 0 to 400V AC. The voltage output is present in the safety connectors located in the front panel. (Common, 100V, 200V and 400V.

The user will choice the connector 100V, 200V or 400V depending on the maximum voltage needed. The voltage output can be adjusted from zero to the rated output. Thus provides fine regulation.

Note that maximum voltage can be a little bit lower than the specified in each connector due to the variations of the power supply.

TAKE CARE THAT WHEN USIGN THE FRONT PANNEL TERMINAL, THE REAR OUTPUTS MUST BE UNUSED.

The voltmeter has an unique scale of 450V and will display the voltage only if the front test leads are connected.

The maximum current of test is 2 Amps. If the consumption is over 2 Amps and acoustic signal will beep until the consumption decrease under 2A, otherwise when current is over 3A, the test will end automatically. The digital meter will display 9999.

This protection is active during the following test:

Voltage source
Voltage pulses test
Actuation time in voltage relays

VOLTAGE SOURCE

With this test the EnerLaB CB1 can be used as a voltage source.

To proceed plug-in the test leads in the front panel “common” and one of the outputs “100”, “200” or “400” depending on the voltage output that is needed.

If the led of “V” key is off, push the key and the led will be on. The digital meter on the left side will display the voltage.

If we try to obtain voltage without the led of “V” key in on state then the CB1 will make a beep as a indication that we missed to choose between “V” or “A” key.

If we choose “A” key the left display will show the consumption.

Make sure than the regulator is in zero position and then push the “TEST” key to obtain voltage in the output.

If the regulator is not in zero position when we push the “TEST” key, one beep and the display flashing “0000” will indicate that before push the key is necessary to return the regulator to the zero position.

The user can cancel the zero start interlock function setting the special code “0060”

To end the test just push again the “TEST” key.

VOLTAGE PULSES TEST

The EnerLaB CB1 is able to make pulses of voltage where the user can set the number of pulses and the width.

To proceed plug-in the test leads in the front panel “common” and one of the outputs “100”, “200” or “400” depending on the voltage output that is needed.

If the led of “V” key is off, push the key and the led will be on. The digital meter on the left side will display the voltage.

If we push the “PULSES” key when the led of “V” key and “A” are still off, then we enter in the settings for the pulses mode (Ton, Toff and number of pulses). To modify these parameters proceed as per “Settings in pulses mode”

When testing in pulses mode the zero start interlock remains inoperative, so it is crucial to be sure that the regulator is adjusted to the desired value.

To start the test push the “PULSES” key, the left display will show the voltage, while the display in the right hand will display the time in seconds (count up) that the voltage will be on (pulse width). Once the time on is equal to the value in the set point, the voltage does down and will remain in this state until time off is accomplished. Now the right display will count down and the voltmeter (left display) will display zero volts.

This pulse of voltage will be repeat as times as we have programmed the number of pulses.

Also it is possible to display the number of cycles in course when pushing the “TEST” key while the test is active. Pushing “A” or “V” or “START” key the display will indicate again the width of the pulse.

The test ends when the number of pulses is accomplished or the external relay contacts change its state or if the “PULSES” key is pushed.

ACTUATION TIME IN VOLTAGE RELAYS

This test allows to apply the desired voltage to the sample under test (relay for instance) and to know the time that it will take before the contacts of the relay under test change its state.

To proceed plug-in the test leads in the front panel “common” and one of the outputs “100”, “200” or “400” depending on the voltage output that is needed.

Connect the contact of the relay to the terminals for this purpose “relay contacts” located in the front panel.

The circuit breaker test set CB1 acknowledge automatically if the contacts of the relay are normally close or normally open type. This allows that the user just connect the contacts and do not worried about the type of circuit (N.O or N.C.)

If the led of “V” key is off, push the key and the led will be on. The digital meter on the left side will display the voltage.

When testing in actuation time mode the zero start interlock remains inoperative, so it is crucial to be sure that the regulator is adjusted to the desired value.

To start the test push the “START” key, the left display will show the voltage, while the display in the right hand will display the delay time in milliseconds and afterwards in seconds (count up) until the sample under test change the state of its contacts.

The test ends when the sample under test change the state of its contacts or if the “START” key is pushed.

CURRENT TEST

With the EnerLaB CB1 it is possible to adjust a current from 0 to 200 Amps AC. 1000 Amps overload allow only in the 200 Amps terminal.

The voltage output is present in the safety connectors located in the front panel. (Common and 2,5 Amps, 5 Amps and 10 Amps) and in the terminals on the rear (Common and 50 Amps, 100 Amps and 200 Amps).

The user will choice right terminal depending on the maximum current needed for the test. The current output can be adjusted from zero to the rated output. Thus provides fine regulation.

Note that maximum current available in each output is dependent of the load and the maximum current output for each terminal can be reached with just some small adjustment of the regulator. The user must take care of the maximum current supplied for each terminal.

TAKE CARE THAT WHEN USIGN THE FRONT PANNEL TERMINALS, THE REAR OUTPUTS MUST BE UNUSED.

The ammeter has two ranges. First range is active when using the front terminals (0…13,00) and the second range when using the rear terminals (0…200.0)

The EnerLaB CB1 detects when we are using the front terminals and the range of the ammeter change accordingly.

The maximum current of test is 13 Amps for the front terminals and 1000A for the rear terminals. User must take care to do not overload the 2,5A and 5A terminals over 13A since overload of 13A is only allowed for the 10A terminal. Also do not overload the 50A and 100A terminals over 1000A since overload of 1000A is only allowed in the 200A terminal.

When the current is over 12A in the front terminals a buzzer will beep. If current is greater that 13A automatic end of test will occur. The display will flash “9999” as a indication of overload.

If the current is over 200A in the rear panel terminals a buzzer will beep. If current is greater than 1000A automatic end of test will occur. The display will flash “9999” as a indication of overload.

This protection is active during the following test:
Current source
Current pulses test
Actuation time in current relays

CURRENT SOURCE

With this test the EnerLaB CB1 can be used as a current source.

To proceed plug-in the test leads in the front panel “common” and one of the outputs “2,5A”, “5A” or “10A” or the common terminal in the rear panel and one of the outputs “50A”, “100A” or “200A” depending on the current output that is needed.

If the led of “A” key is off, push the key and the led will be on. The digital meter on the left side will display the current in amps.

If we try to obtain current without the led of “A” key in on state then the CB1 will make a beep as a indication that we missed to choose between “A” or “V” key.

If we choose “V” key the left display will show the voltage applied when using the front terminals.

Make sure than the regulator is in zero position and then push the “TEST” key to obtain current in the output.

If the regulator is not in zero position when we push the “TEST” key, one beep and the display flashing “0000” will indicate that before push the key is necessary to return the regulator to the zero position.

The user can cancel the zero start interlock function setting the special code “0060”. Nevertheless is highly recommended the use of the zero start interlock by activating the “0070” to avoid untimely output of current.

To end the test just push again the “TEST” key.

CURRENT PULSES TEST

The EnerLaB CB1 is able to make pulses of current where the user can set the number of pulses and the width.

To proceed plug-in the test leads in the front panel “common” and one of the outputs “2,5A”, “5A” or “10A” or the common terminal in the rear panel and one of the outputs “50A”, “100A” or “200A” depending on the current output that is needed.

If the led of “A” key is off, push the key and the led will be on. The digital meter on the left side will display the current in amps.

If we try to obtain current without the led of “A” key in on state then the CB1 will make a beep as a indication that we missed to choose between “A” or “V” key.

If we choose “V” key the left display will show the voltage applied when using the front terminals.

If the led of “A” key is off, push the key and the led will be on. The digital meter on the left side will display the current applied.

If we push the “PULSES” key when the led of “V” key and “A” are still off, then we enter in the settings for the pulses mode (Ton, Toff and number of pulses). To modify these parameters proceed as per “Settings in pulses mode”

When testing in pulses mode the zero start interlock remains inoperative, so it is crucial to be sure that the regulator is adjusted to the desired value.

To start the test push the “PULSES” key, the left display will show the current through the circuit, while the display in the right hand will display the time in seconds (count up) that the current will be on (pulse width). Once the time on is equal to the value in the set point, the current does down and will remain in this state until time off is accomplished. Now the right display will count down and the ammeter (left display) will display zero amps.

This pulse of current will be repeat as times as we have programmed the number of pulses.

Also it is possible to display the number of cycles in course when pushing the “TEST” key while the test is active. Pushing “A” or “V” or “START” key the display will indicate again the width of the pulse.

The test ends when the number of pulses is accomplished or the external relay contacts change its state or the current going through the circuit becomes zero or experience a decrease the 50% of the adjusted value and of course if the “PULSES” key is pushed.

ACTUATION TIME IN CURRENT RELAYS

This test allows to apply the desired current to the sample under test (relay for instance) and to know the time that it will take before the contacts of the relay under test change its state.

To proceed plug-in the test leads in the front panel “common” and one of the outputs “2,5A”, “5A” or “10A” or the common terminal in the rear panel and one of the outputs “50A”, “100A” or “200A” depending on the current output that is needed.

If the led of “A” key is off, push the key and the led will be on. The digital meter on the left side will display the current in amps.

If we try to obtain current without the led of “A” key in on state then the CB1 will make a beep as a indication that we missed to choose between “A” or “V” key.

If we choose “V” key the left display will show the voltage applied when using the front terminals.

If the led of “A” key is off, push the key and the led will be on. The digital meter on the left side will display the current applied.

Connect the contact of the relay to the terminals for this purpose “relay contacts” located in the front panel.

The circuit breaker test set CB1 acknowledge automatically if the contacts of the relay are normally close or normally open type. This allows that the user just connect the contacts and do not worried about the type of circuit (N.O or N.C.)

When testing in actuation time mode the zero start interlock remains inoperative, so it is crucial to be sure that the regulator is adjusted to the desired value.

To start the test push the “START” key, the left display will show the current through the circuit, while the display in the right hand will display the delay time in milliseconds and afterwards in seconds (count up) until the sample under test change the state of its contacts.

The test ends when the number of pulses is accomplished or the external relay contacts change its state or the current going through the circuit becomes zero or experience a decrease the 50% of the adjusted value and of course if the “START” key is pushed.

In case of testing devices that breaks the current flow instead having auxiliary contacts and with an actuation time lower that 200ms, the readout in the

ammeter could be lower than the real current applied to the sample under test because of the response time of the ammeter (minimum 200ms).

Also note that when testing devices like fuses, bimetal, etc.. with current several times higher than the nominal current, the actuation time of the sample under test will be so fast that it will be not time enough to adjust the desired value current.

In this cases the procedure is to try to adjust the value of current as fast as possible before the sample under test has time to break the current circuit or canceling the actuation of the contacts and then adjust the current.

Also replacing the sample under test by one resistor with the same impedance and making the proper adjustment of the regulator before connect the sample under test.

If the adjustment of the current has been make with the sample under test and overheating has occurred and it is necessary to wait for a period of time in order that the temperature of the sample under test becomes normal again.

The no observation will produce a false short actuation time.

TIME OFF BETWEEN TEST

The circuit breaker EnerLaB CB1 allows continuos test until 200A RMS and 1000A for a short period of time (only in the 200A rear terminal).

The maximum overload for the rear terminals is:

Until 100% continuos test
Until 200% 5 minutes ON, 15 minutes OFF
Until 300% 2 min ON, 20 minutes OFF
Until 400% 30 seconds ON, 20 minutes OFF
Until 500% 5 seconds ON, 30 minutes OFF

These are the recommended intervals of time and they are subject under other factors like ambient temperature, duration of the test, power needed in each test, etc.
The circuit breaker test set CB1 does not control the duration and number of overloads.

The front outputs are 2,5A, 5A and 10A. The maximum overload is 13A.

As a safety there is an extra thermal protection and a input line fused.

GO / NO GO TEST

When testing the actuation time of the contacts of one voltage or current breaker the user must take the decision of whether the delay time is good or not depending on the applicable standards or declaration of the breaker manufacturer even the criteria is under the customer requirements.

ZERO START INTERLOCK

Depending on the test performed the zero start interlock is a necessary feature to avoid the erroneous application of high levels of voltage or current to the sample under test.

In other case like when performing actuation time measures the zero start interlock makes the test so difficult.

In order to cover both cases, the circuit breaker test set EnerLaB CB1 has the capability to switch on or to switch off this feature with the special code procedure.

To activate the zero start interlock:

1. Check that all the leds of the front keys are switch off.

2. Maintain pushed the “CODES” key (is the 2nd function of “A” key) at least one second until the displays switch off.

3. Push the “ENTER” key (is the 2nd function of “START” key) until the right display shows “0000” with the last digit flashing.

4. Set the code number “0070” through the “!” key and the “∃” key (2nd function of the “PULSES” and “TEST” keys).

5. Push the “ENTER” key (is the 2nd function of “START” key) and the equipment will perform the segment test as a indication that the setting is accepted and saved in the build-in non volatile memory.

To cancel the zero start interlock:

1. Check that all the leds of the front keys are switch off.

2. Maintain pushed the “CODES” key (is the 2nd function of “A” key) at least one second until the displays switch off.

3. Push the “ENTER” key (is the 2nd function of “START” key) until the right display shows “0000” with the last digit flashing.

4. Set the code number “0060” through the “!” key and the “∃” key (2nd function of the “PULSES” and “TEST” keys).

5. Push the “ENTER” key (is the 2nd function of “START” key) and the equipment will perform the segment test as a indication that the setting is accepted and saved in the build-in non volatile memory.

For those test where the EnerLaB CB1 cancels automatically the zero start protection interlock or when this is carry out by the users, still there is a feature that allows the application of the voltage or current with the zero crossing detector avoiding untimely peaks of current due to the coincidence with the maximum crest of the wave.

PERSONAL IDENTIFICATION NUMBER

Since the circuit breaker test set EnerLaB CB1 can generate lethal voltages a PIN number will protect the use of the equipment against not authorized personnel.

To set the PIN number proceed as follows:

1. Check that all the leds of the front keys are switch off.

2. Maintain pushed the “CODES” key (is the 2nd function of “A” key) at least one second until the displays switch off.

3. Push the “ENTER” key (is the 2nd function of “START” key) until the right display shows “0000” with the last digit flashing.

4. Set the code number “0050” through the “!” key and the “∃” key (2nd function of the “PULSES” and “TEST” keys).

5. Now the right display will show again “0000” with the last digit flashing.

6. Set the desired PIN through the “!” key and the “∃” key (2nd function of the “PULSES” and “TEST” keys).

7. Push the “ENTER” key (is the 2nd function of “START” key) and the equipment will perform the segment test as a indication that the setting is accepted and saved in the build-in non volatile memory.

To cancel the use of the PIN number proceed as follows:

1. Check that all the leds of the front keys are switch off.

2. Maintain pushed the “CODES” key (is the 2nd function of “A” key) at least one second until the displays switch off.

3. Push the “ENTER” key (is the 2nd function of “START” key) until the right display shows “0000” with the last digit flashing.

4. Set the code number “0050” through the “!” key and the “∃” key (2nd function of the “PULSES” and “TEST” keys).

5. Now the right display will show again “0000” with the last digit flashing.

6. Set the number “0000” as a PIN number through the “!” key and the “∃” key (2nd function of the “PULSES” and “TEST” keys).

7. Push the “ENTER” key (is the 2nd function of “START” key) and the equipment will perform the segment test as a indication that the setting is accepted and saved in the build-in non volatile memory.

When the PIN number is active, each time that the unit is powered on the user will be required to enter the PIN number prior any operation with the EnerLaB CB1.

A wrong input of the PIN number will produce a beep and the display on the right side will remain displaying “000” with the last “0” flashing.

SETTINGS IN PULSE MODE

When using the EnerLaB CB1 either as a voltage or current source it is possible to set the time that the pulse will be active and the time that the output will be zero as well.

Furthermore the user can also set the number of cycles or pulses desired.

To modify the default settings follow the procedure below:

1. Check that all the leds of the front keys are switch off.

2. Push the “PULSES” key and the display on the right hand will shows the stored settings of T_{ON} in the non volatile memory while the display on the left hand will show the two decimal points at the most left as a indication that we are setting the T_{ON}.

3. Set the desired time on in seconds (between the range of 0.1 and 999,9 s) through the “!” key and the “∃” key (2nd function of the “PULSES” and “TEST” keys).

4. Push the “ENTER” key (is the 2nd function of “START” key) to enter the value.

5. Now the display on the right hand will shows the stored settings of T_{OFF} on in the non volatile memory while the display on the left hand will show the two decimal points at the right hand as a indication that we are setting the T_{OFF}.

6. Set the desired time off in seconds (between the range of 0.1 and 999,9 s) through the “!” key and the “∃” key (2nd function of the “PULSES” and “TEST” keys).

7. Push the “ENTER” key (is the 2nd function of “START” key) to enter the value.

8. Now the display on the right hand will shows the stored settings of number of cycles in the non volatile memory while the display on the left hand will show all the decimal points as a indication that we are setting the number of cycles.

9. Set the desired number of cycles between the range of 1 and 9999 pulses) through the “!” key and the “∃” key (2nd function of the “PULSES” and “TEST” keys).

10. Push the “ENTER” key (is the 2nd function of “START” key) to enter the value.

SPECIAL CODES LIST

CODE	DESCRIPTION
0010	Display the software version
0020	Recover the factory settings
0040	Sets the acoustic indication
0041	Cancel the acoustic indication
0050	Sets the identification pin number
0060	Cancels the zero start interlock
0070	Sets the zero start interlock
0080	Allows the calibration of the voltmeter
0090	Allows the calibration of the 10A range for the ammeter
0091	Allows the calibration of the 1000A range for the ammeter
0100	Non erasable register for the number of calibrations

The special codes 0081, 0090 and 0091 allows the calibration of the voltmeter and ammeter and it must be perform only by qualified personnel.

Calibration must be carry out only when the user has necessary standards or by a calibration laboratory. EnerLaB will supply the calibration procedure under request with no extra cost.

Each time that the calibration is performed the non erasable register is incremented. The user can read the number of calibrations by entering the code “0100”.

EnerLaB decline any liability as a consequence of the use of these special codes as well for a incorrect use of the equipment.

FACTORY SETTINGS

The circuit breaker test set EnerLaB CB1 is supplied with the standard parameters but the user can change as per his needs and save the new settings in the non volatile eeprom memory. The factory settings are always recoverable.

Factory settings are:

T_{ON}	=	**5.0 s**
T_{OFF}	=	**5.0 s**
Number of cycles	=	**1 cycle**
Buzzer	=	**Active**
Pin number	=	**Non active**
Zero start interlock	=	**Active**