SIA-B Specific CTs

Self & Dual Power Overcurrent Protection Relay

SELF POWERED

INSTALLATION & COMMISSIONING GUIDE

1. RECEIVING & INSTALLATION

1.1. Relay unpacking

Previously to any handling action examine that the relay carton box is in good condition, and that it is not broken or damaged due to the external manipulation or the storing or moving processes. If the packing is correct, proceed to unpack and you should find the following elements:

- SIAB Electronic protection relay.
- User Guide.
- Testing protocol.

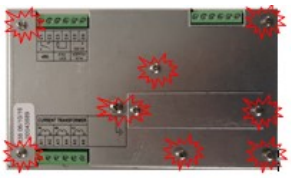

Testing protocol is a certificate wich ensures that the relay has passed all the factory testing processes with the correct results.

In case some fault is detected, consider putting the relay into quarantine period and contact FANOX for further instructions.

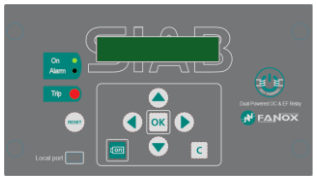
1.2. Relay verification

When the relay is unpacked, please take your time to confirm the following checklist to be sure that everything is ok:

- The metallic case is not damaged and is well assembled. There are no loose screws due to transport or movement conditions.

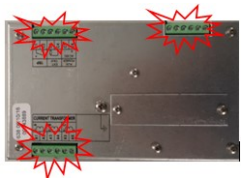



- The LCD and the front cover is not damaged or scratched.


- The quality sticker and the terminal sticker are correctly placed on.

- The rear terminals are in good condition thus being able to do a good wiring connection.




1.3. Powering the relay up

Thanks to the external battery KITCOM the powering and the adjusting process of the relay is very easy and it allows the user to test the relay.

The power comes from two AA batteries (IEC LR06) of 1.5 Volts placed on the bottom of the KITCOM. The equipment has a small Dc/Dc power supply that raises the voltage to the required 5 volts to operate the equipment and it is plugged into the front USB communications port (KITCOM).

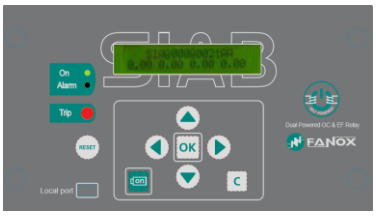
Once the KITCOM is connected, a relay will be turned on and an LED on the left side of the relay (LED on) will blink, indicating that the relay is powered on through an external battery (KITCOM).

The relay is totally maintenance free. This means there is no need for batteries to log the events and fault reports, and there is no need for batteries to maintain the date and time.

NOTE: The date and time must be correctly set the first time the relay is operative, and energy must be kept on at least for “1 hour” to maintain the RTC for 72 hours before the energy is lost.

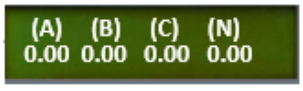
Using the external battery power and activating the trip contact from the test menu at the same time, allows the trip circuit to be tested before the transformer substation is powered up. So, the KITCOM is useful for cases like commissioning operations, discharges and repairs of the transformer substation.

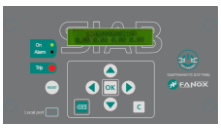
Using battery power does not block the USB communications port, as it can be used simultaneously.



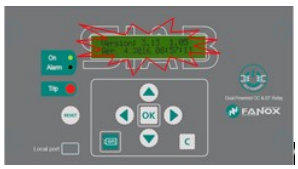
Once the relay is powered through the KITCOM, it is recommended to check:

- Model → Directly, complete model on top line and phases/neutral current measurement on bottom line are displayed. Once the “C” key, is pressed the name of the phase and neutral currents (instead of the complete model) will be displayed on the top of the LCD Standby screen.





- Serial number (8 digits long) and Firmware Version → HOLD ▲



1.3.1.Keypad & LCD

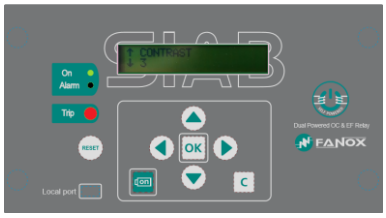
- Use the KEYPAD to ensure that all the pushbuttons work correctl. This should occur without any difficulties while pushing them. Check if the relay reacts by pushing each of the buttons.



- Use the KEYPAD to enter in the relay menu and make sure that no text is lost while going from one menu to another.

- Follow the sequence: Left ◄, Down ▼, Right ►, Up ▲, OK, C and RESET and the following screen should be displayed:

- If the contrast of the LCD is not the correct one, enter in the "CONTRAST" menu by holding "◄" for 3 seconds. Then, change it by using the up and down buttons to increase or decrease the contrast.

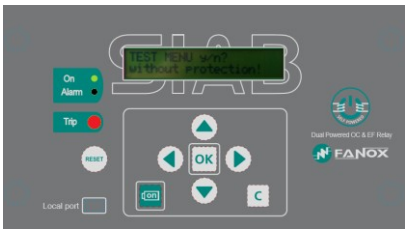
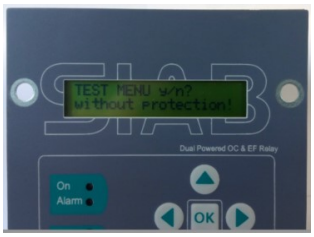



1.3.2.Test menu

NOTE: When performing the test menu, the protection will not be available and it will be possible to open the circuit breaker. Only authorized personnel can do this job.

Press ◄,▼,► sequentially and hold **OK**. The relay will ask for the password "5555" to be entered in the test menu (or other if the customer password by default is "5555" has been modified).

It will be checked that the LEDs, Magnetic indicator flags and Outputs are activated if the OK key is pressed and it will be deactivated if the OK key is pressed again. LEDs, Magnetic indicators and outputs will be checked to verify that the hardware is OK:

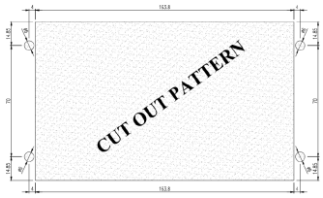



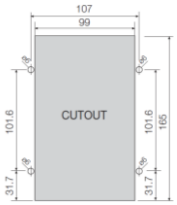
	Action	Checking
OK, **OK**	Led 1	LED ON activated
▼, **OK**	Led 2	LED ALARM activated
▼, **OK**	Bistable	Bistable activated
▼, **OK**	TripOutput	Trip Output activated
▼, **OK**	Output 2	Output 2 activated **(*)**
▼, **OK**	Output 3	Output 3 activated **(*)**
C	Skip from test menu	

(*) Depending on model

1.4. Relay intallation

To fix the relay to the switchgear, use the default holes in front of the relay with an appropriate fixing system. Do not manipulate the relay to fix it on the switchgear.

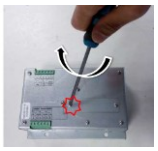


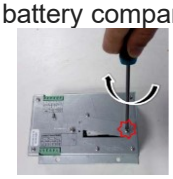


How to change the internal battery (DEPENDING ON MODEL)

1. Disconnect the relay. Switch the power supply off to avoid any dangerous situation.
2. Unscrew the 4 screws on the front of the relay to extract it from the RMU and access the rear side of the relay.

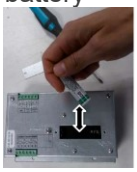
3. Unscrew the 2 screws to remove the cover from the battery compartment.





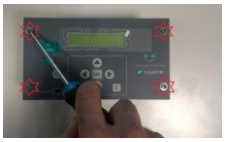
4. Remove the battery and replace it respecting the polarity (+ facing up):
   Battery characteristics:

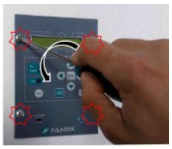
   - AA 3.6V lithium battery
   - Model LS14500 from SAFT
   - Do not use rechargeable batteries or other types of battery



5. Put on the battery cover and tighten the 2 screws.

6. Put the relay into the RMU again and tighten the 4 screws on the front to fix the relay.





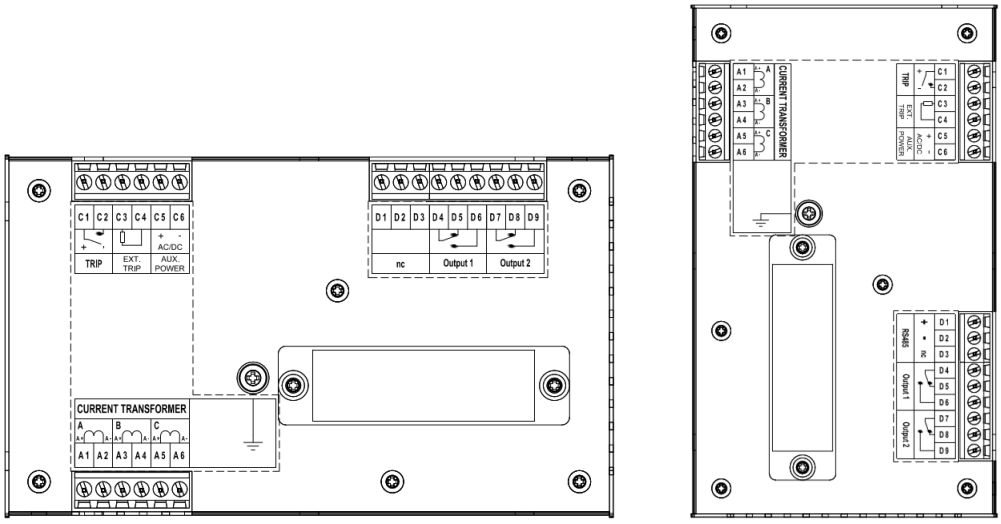
Warning HAZARD OF EXPLOSION

- Do not recharge the battery.
- Do not short circuit the battery.
- Do not crush the battery.
- Do not disassemble the battery.
- Do not heat the battery above 100ºC (212ºF)
- Do not throw the battery into the fire or water.

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

1.5. Relay rear part

Consider the wiring of the switchgear and connect the relay properly:



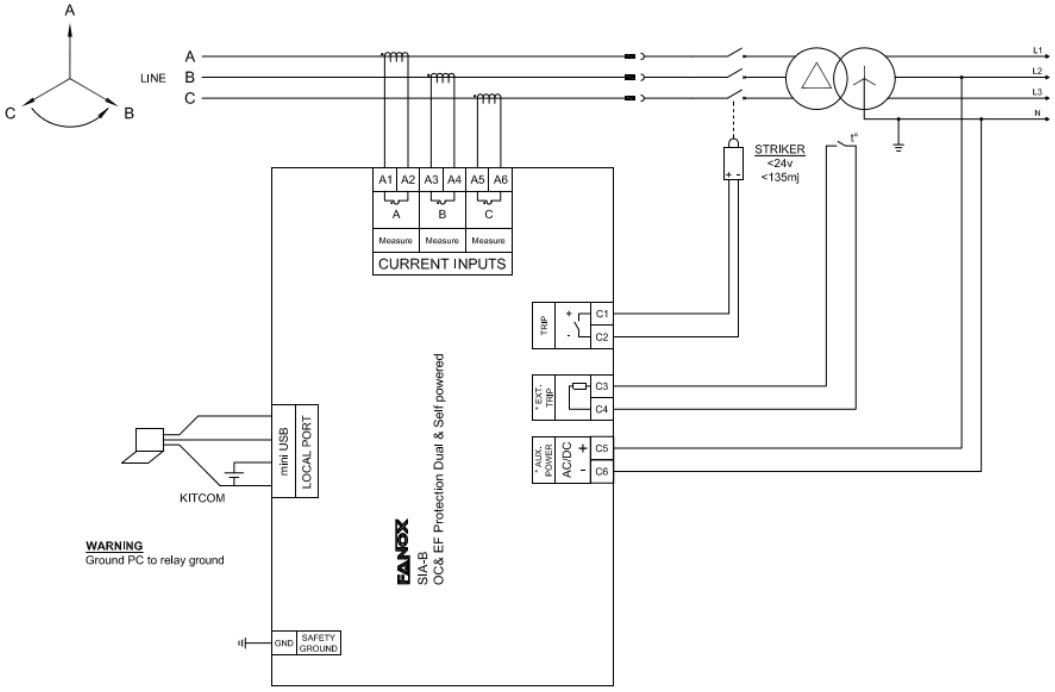
A1	Phase A current input for measurement and self-power
A2	Phase A current output for measurement and self-power
A3	Phase B current input for measurement and self-power
A4	Phase B current output for measurement and self-power
A5	Phase C current input for measurement and self-power
A6	Phase C current output for measurement and self-power
C1	Trip output +
C2	Trip output –
C3-C4 (*)	External trip

C5 (*)	Auxiliary power supply +
C6 (*)	Auxiliary power supply -
D1-D2-D3 (*)	RS 485 + RS485 – *RS485 NC*
D4 (*)	Digital 1 common output
D5 (*)	Digital output 1 NC
D6 (*)	Digital output 1 NO
D7 (*)	Digital 2 common output
D8 (*)	Digital output 2 NC
D9 (*)	Digital output 2 NO

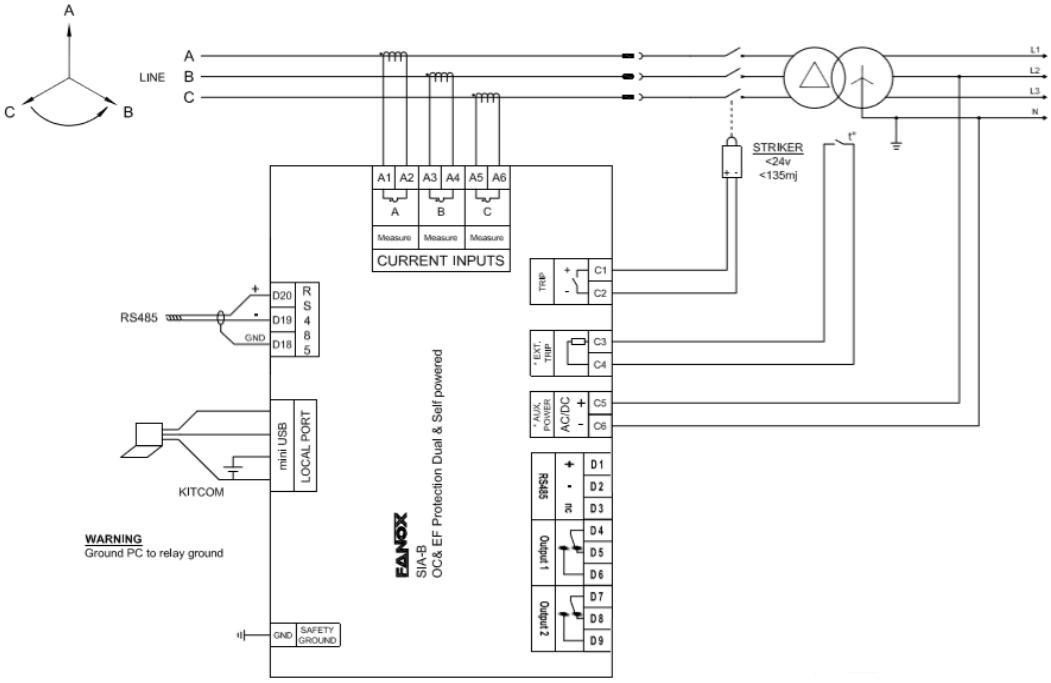
(*) Depending on model.

1.6. Connection diagram

1.6.1. Connection diagram. Three phase diagram, neutral internally calculated



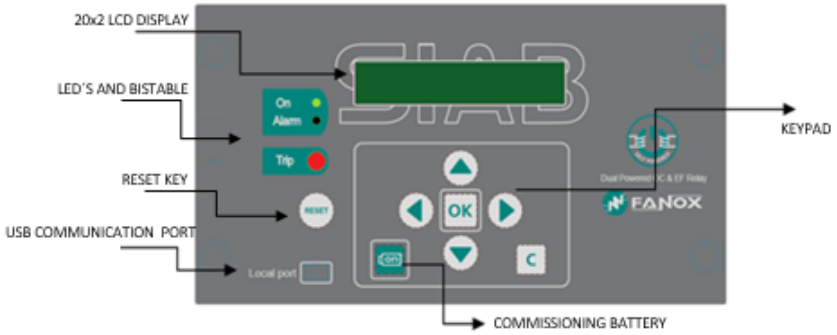
Without signaling outputs.

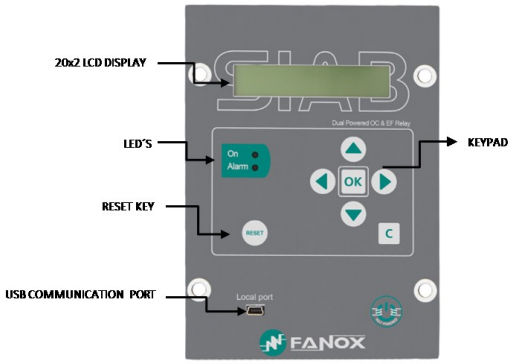


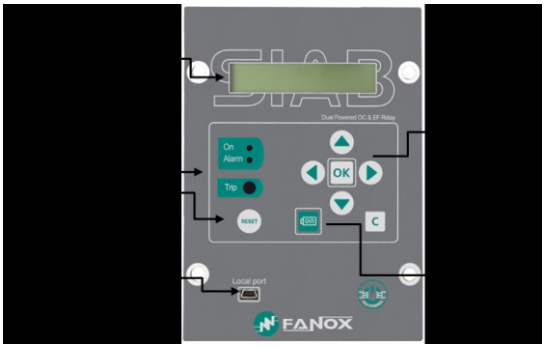
With signaling outputs

2. USER INTERFACE

2.1. Relay front part







2.2. Bistable magnetic indicator (Flag)

The front panel is equipped with 1 bistable magnetic indicator which indicates the general trip. The indicator remains in position even when the equipment loses power. Thus, the maintenance service can see the trip even though the equipment is not powered.

Once it has been activated, it is necessary to manually reset it by pressing the “RESET” button. The operation of the magnetic indicator can be checked from the test menu.

2.3. LED indicators

The SIA-B front panel has two not configurable LEDs. By default, they show the following statuses: ready (LED ON) and alarm (LED ALARM).

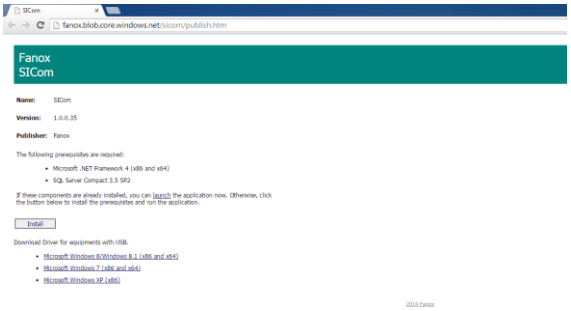
2.4. How to install SICOM software

To install SICom the following link is necessary:

http://fanox.blob.core.windows.net/sicom/publish.htm

The link will open the next screen, where the key “install” must be pressed:

The necessary drivers depending on the operating system can be downloaded from this page. The update of the software does not require any user action, that is, if the computer is connected to Internet, SICom updates itself when it is started.

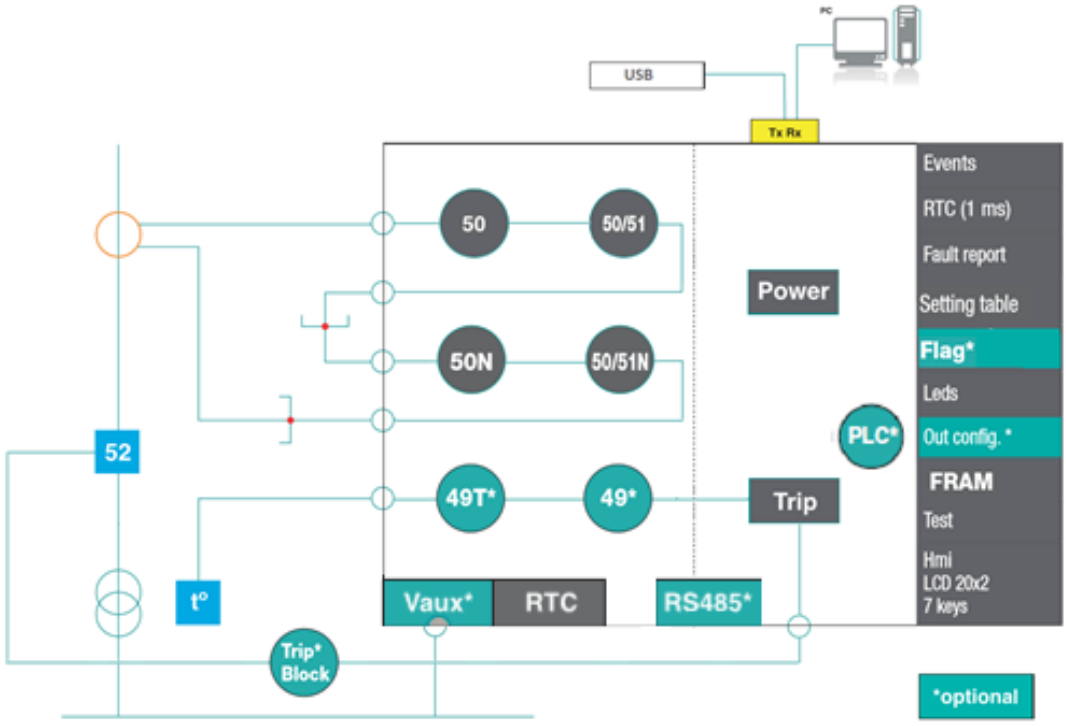


2.5. Setting-up the session: Password and access levels

Users must identify themselves with a password to start communications and to change the equipment settings or the configuration using the HMI.

By default, the password is 5555 and it can be changed from the general settings menu.

3. FUNCTIONAL DIAGRAM



4. SPECIFIC CURRENT TRANSFORMERS

SIA-B relay requires specific CTs to achieve not only the line current measurement but also the power to keep the relay switched on with tripping capability.

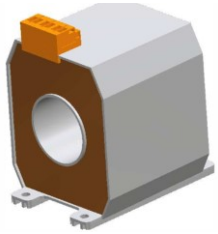
Depending on the requirements there are the following primary currents:

Is Range	In range	CT Ratio	CT type
8-28 (A)	3-33 (A)	7.2/0.075	CT008-5
16-56 (A)	6-65 (A)	14.4/0.075	CT016-5 CT016-10
32-112 (A)	12-130 (A)	28.8/0.075	CT032-5
64-224 (A)	25-260 (A)	57.6/0.075	CT064-5
128-448 (A)	51-520 (A)	115.2/0.075	CT128-5
256-896 (A)	102-1040 (A)	230.4/0.075	CT256-5

4.1. Epoxy resin specific CT

Technical specifications:

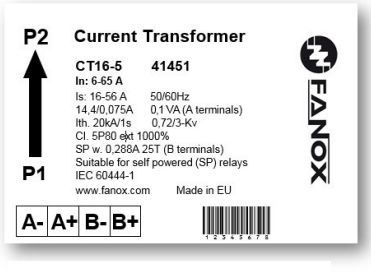
Application **Class of insulation** **Frequency**	Indoor use E 50-60 Hz
Primary conductor **Material** **Sec. Wire Diameter**	Cable max. ∅ 50 mm PU & PA6.6 6 mm^2 solid / 4 mm^2 strand
Test Winding	0.288 A nominal



- **Connections**:

Three transformers are needed, one per each phase. In the following picture, it is possible to see the label corresponding to CT016, where the connecting terminals are showed.

P1	Primary Input
P2	Primary output
A-	Output for current measurement
A+	Input for current measurement
B+ B-	Test winding terminals



Current transformer

Suitable for self powered (SP) relays.

4.2. Taped specific CT

- **Technical specifications**:

Nominal Current	6-65 A
Ratio	14.4/0.075 A
Isolation Class	Class A
Frequency	50/60 Hz
Protection	5P80
Sec. cable-diameter	2.5 mm^2 /500 mm
Test Winding	0.288 A nominal
Burden	0.05 VAs
Dimensions	75x115x80 (ID x OD x W)

- **Connection**:

Three transformers are needed, one per each phase. In the following picture, it is possible to see the label corresponding to CT16, where the connecting terminals are shown.

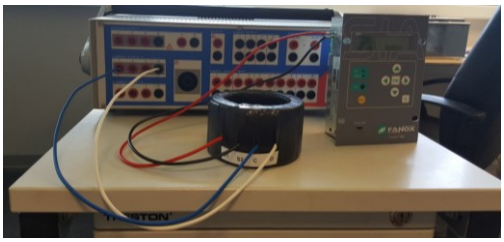
4.3. Test Winding

Unlike the standard current transformers that provide a nominal secondary current of 1A or 5A, these specific current transformers have a very low current on their secondary sides.

The SIA-B relay has been designed to work with these current levels. For this reason, it is not possible to do the same tests that are performed with relays that use standard CTs.

The testing consists on the injection of 1A in the test winding terminals, providing a simulated primary current value, that will have a different primary value depending on the selected CT.

CURRENT TRANSFORMER	INJECTED CURRENT	PRIMARY INDUCED CURRENT
CT08	1 A	25 A
CT16	1 A	50 A
CT32	1 A	100 A
CT64	1 A	200 A
CT128	1 A	400 A
CT256	1 A	800 A



5. SELECTION & ORDERING CODES

SIAB											**Protection Functions** 50 + 50/51 + 50N + 50/ 51N
	0										**Phase Measurement** Defined by General Settings
		0									**Neutral Measurement** Internal measurement
			0								**Net Frequency** Defined by General Settings
				0 **1** **2** **3** **A** **B** **C** **D**							**Power Supply** Self-powered Self-powered + 230 Vac (Dual) Self-powered + 110 Vac (Dual) Self-powered + 24 Vdc (Dual) Self-powered + Commissioning battery Self-powered + 230 Vac (Dual) + Commissioning battery Self-powered + 110 Vac (Dual) + Commissioning battery Self-powered + 24 Vdc (Dual) + Commissioning battery
					0 **1** **B**						**Additional Functions** - + 49 + Trip Block for switch disconnector
						0 **1**					**Communications** USB (Modbus RTU) USB (Modbus RTU) + RS485 (Modbus RTU)
							0 **1** **2**				**Inputs and Outputs** Trip (striker) Trip (striker) + External trip input (49T) + 1 magnetic indicator Trip (striker) + External trip input (49T) + 1 magnetic indicator + 2 Outputs
								0 **1**			**Mechanics** Vertical Assembly Horizontal Assembly
									A **B** **C** **D**		**Languages** English, Spanish and German English, Spanish and Turkish English, Spanish and French English, Spanish and Russian
										A	**Adaptation** -

6. TECHNICAL SPECIFICATIONS

Function 50	Permission: yes/no
	Operating range: 0.20 to 20 x Is (step 0.01 x Is)
	Operating time: 0.02 to 300 s (step 0.01 s)
	Activation level 100%
	Deactivation level 90%
	Instantaneous deactivation
	Timing accuracy: ± 40 ms or ± 0.5% (whichever is greater)
Function 50N	Permission: yes/no
	Operating range: 0.20 to 20 x Is (step 0.01 x Is)
	Operating time: 0.05 to 300 s (step 0.01 s)
	Activation level 100%
	Deactivation level 90%
	Instantaneous deactivation
	Timing accuracy: ± 40 ms or ± 0.5% (whichever is greater)
Function 50/51	Permission: yes/no
	Operating range: 0.20 to 7 x Is (step 0.01 x Is)
	Curves: IEC 60255-151 and IEEE
	Operating time: IEC Inverse curve, IEC very inverse curve, IEC extremely inverse curve IEC long time inverse, IEEE Inverse curve, IEEE very inverse curve, IEEE extremely inverse curve. Defined time: 0.02 to 300 s (step 0.01 s)
	Dial: 0.05 to 1.25 (step 0.01)
	Curve, activation level 110%
	Curve, deactivation level 100%
	Defined time, activation level 100%
	Defined time, deactivation level 90%
	Instantaneous deactivation
	Timing accuracy: ± 5% or ±30 ms (whichever is greater) when the protection works with inverse time and ± 40 ms or ± 0.5% (whichever is greater) when it works with definite time
Function 50/51N	Permission: yes/no
	Operating range: 0.20 to 7 x Is (step 0.01 x Is)
	Curves: IEC 60255-151 and IEEE
	Operating time: IEC Inverse curve, IEC very inverse curve, IEC extremely inverse curve IEC long time inverse, IEEE Inverse curve, IEEE very inverse curve, IEEE extremely inverse curve. Defined time: 0.02 to 300 s (step 0.01 s)
	Dial: 0.05 to 1.25 (step 0.01)
	Curve, activation level 110%
	Curve, deactivation level 100%
	Defined time, activation level 100%
	Defined time, deactivation level 90%
	Instantaneous deactivation
	Timing accuracy: ± 5% or ±30 ms (whichever is greater) when the protection works with inverse time and ± 40 ms or ± 0.5% (whichever is greater) when it works with definite time
Function 49T (*)	External trip. Charging time 7 seconds

Function 49 (*)	Permission: Yes/No
	Tap: 0.10 to 2.40 Is (step 0.01)
	ζ heating: 3 to 600 minutes (step 1 min)
	ζ cooling: 1 a 6 x ζ heating (step 1)
	Alarm level: 20 a 99% (step 1 %)
	Trip level: 100%
	Trip reset: 95% of alarm level
	Timing accuracy: ± 5% regarding theoretical value
Trip Block (*)	Blocking: Yes/No
	Blocking limit: 1.5 to 20 x In (step 0.01)
Programmable logic control (PGC)	OR4, OR4_LATCH, OR4_PULSES, OR4_TIMERUP, OR4_PULSE, NOR4, AND4_LATCH, NOR4_TIMERUP, NOR4_PULSE, AND4, AND4_PULSES, AND4_TIMERUP, AND4_PULSE, NAND4, NAND4_TIMERUP, NAND4_PULSE, NOR4_PULSES
Trip output contact	For Striker: 24 Vdc – 135 mJ
Signalling outputs contacts (*)	2 configurable outputs (output 2 and output 3): 220 Vdc – 8 A (30 W max) 250 Vac – 8 A (62,5 VA max)
Frequency	50/60 Hz
Current measurement	True RMS
	Sampling: 16 samples/cycle
	Accuracy depending on the used CT: <±5% with CT-5 type and <±10% with CT-10 type
Fault reports	4 fault reports, 24 events each
Communication	USB port: Modbus RTU
	Rs485: Modbus RTU **(*)**
Battery and power supply	Externally, with adapter (KITCOM) USB port
	V aux. **(*)**
	Commissioning battery **(*)**
Self-power from current	Three phase self-power level: I > 0,4 x Is min
Environment	Operating temperature: -40 to 70ºC
	Storage temperature: -40 to 80 ºC
	Humidity: 95%
Transformers	Power supply and measurement specific CTs
Mechanical features	Metallic box
	Panel Mounting

	Height x Width: Vertical model:167.8 x 120.65 (mm) Horizontal model: 185.8 x 102.7 (mm)
	Depth: Vertical model:56.2 mm Horizontal model: 59.7 mm
	IP-54 when panel mounted
Thermal resistance	10 x Ismin or 2´85xIsmax: Continuously
	20 x Ismin or 5´7 x Ismax for 60 seconds
	25 xIsmin or 7´14 x Ismax for 10 seconds.

(*) Optional depending on model

6.1. IEC60255-151 Curves

The SIA-B relay complies with the curves shown in standard IEC 60255-151:

- Inverse Curve
- Very Inverse Curve
- Extremely Inverse Curve
- Long time Inverse Curve

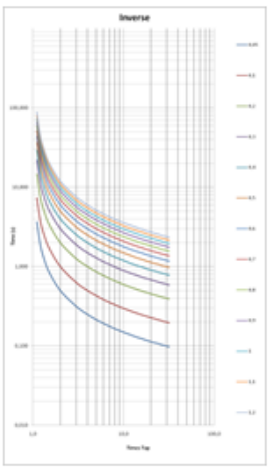
There is a general mathematical equation that defines the time in seconds as a function of the current:

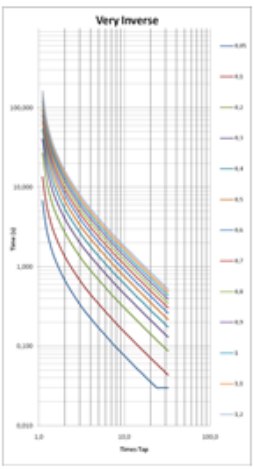
$$t = \frac{A \times D}{V^P - Q} + B \times D + K \qquad V = \frac{I}{I_{adjusted}}$$

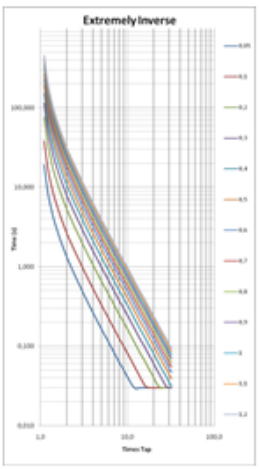
Parameters	A	P	Q	B	K
Long time Inverse	120	1	1	0	0
Ext. Inverse	80	2	1	0	0
Very Inverse	13,5	1	1	0	0
Inverse	0,14	0,02	1	0	0

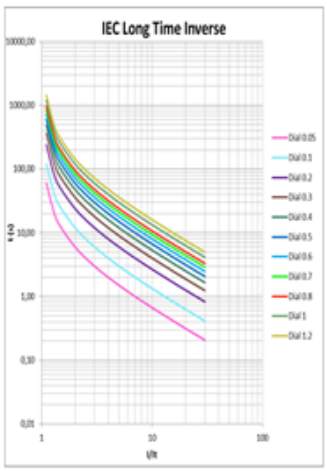
The curve can move from its axis using the D time selection device, which the user can adjust.

$I_{adjusted}$ is the initial operating current set by the user.









6.2. IEEE Curves

The IEEE curves follow the following mathematical equation:

$$t = (TD) \times \left[\left(\frac{A}{V^P - 1} \right) + B \right] \qquad V = \frac{I}{I_{adjusted}}$$

And we have the following curves:

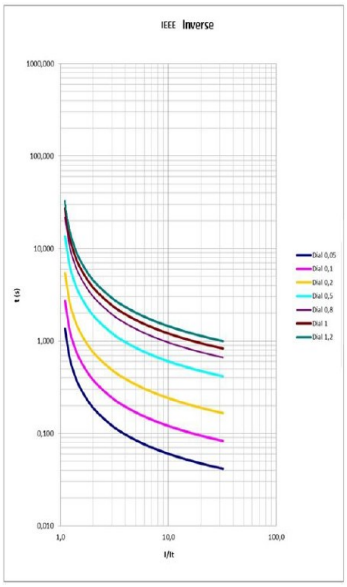
- Inverse Curve
- Very Inverse Curve
- Extremely Inverse Curve

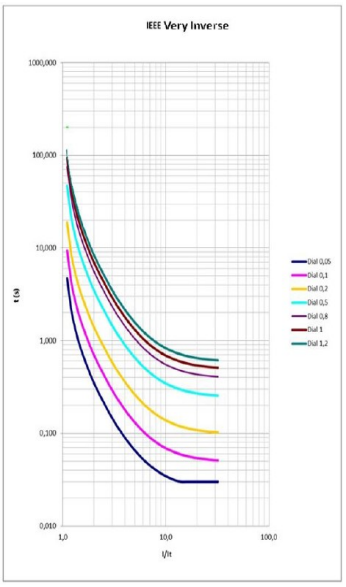
Which relate to the parameters figuring in the following table:

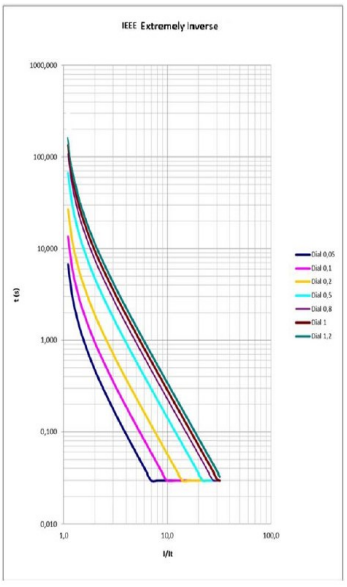
Parameters	A	P	B
Ext. Inverse	28,2	2	0,1217
Very Inverse	19,61	2	0,491
Inverse	0,0515	0,02	0,114

The curve can move from its axis using the TD time selection device, which the user can adjust.

$I_{adjusted}$ is the initial operating current set by the user.







7. OPENING MECHANISM

The trip is associated to a striker. The type of trip is a polarized trip. There are a lot of models of strikers in the market, with different trip energies, for example 50 mJ (0,05W·s) and 6V operation voltage, or 135 mJ (0,1W·s) and 24 V operation voltage.

The opening mechanism is activated by means of a striker. The activation of the trip generates a pulse train.

The **Trip Voltage Level** setting allows adjusting the trip voltage level required by the selected striker. The default value is 17 Vdc, although there are several options:

- 12 Vdc
- 17 Vdc
- 22 Vdc
- 24 Vdc

The equipment will allow the trip when it reaches the selected trip voltage. So if a lower level that is required by the striker is adjusted, it may result on tripping without enough energy and not activating the striker.

On the other hand, if a higher level that is required by the striker is selected, the activation of the striker is guaranteed. However, the fault trip time during the start-up may be increased. FANOX encourages selecting the correct value of this critical setting and offers its expertise at any time.

Striker

The striker is a bistable device with a simple action. The striker shaft is moved by a spring. The striker is activated by a polarized low-power electrical signal, supplied by the relay if a fault occurs. Resetting the shaft to its position is done manually. Resetting the striker has to be done in such a way as to guarantee that the opening mechanism is closed. This is normally done manually.

Due to the existing variety on the market, it is important to check the voltage and the necessary energy for its activation.

8. PROGRAMABLE LOGIC CONTROL (*)

Physical outputs are the real outputs of the Device. SIA-B has a trip output (not configurable) and up to 2 digital outputs (Output 2 and Output 3).

PHYSICAL OUTPUTS (*)	Trip Output (**NOT CONFIGURABLE**)
	Output 2 (*)
	Output 3 (*)

(*) Optional depending on model

LOGICAL GATE	HMI SYMBOL
OR4	+
NOR4	τ
OR4_LACTH	Ю
AND4_LACTH	Ф
OR4_PULSES	∫
AND4	&
NAND4	§
AND4_PULSES	$
OR4_TIMER_UP	O
NOR4_TIMER_UP	P
AND4_TIMER_UP	Q
NAND4_TIMER_UP	R
OR4_PULSE	o
NOR4_PULSE	p
AND4_PULSE	q
NAND4_PULSE	r
NOR4_PULSES	t

NOTE: Despite it is possible to configure the Trip Output with the SICOM software, the relay does not consider this configuration since the output must adapt to how it works to the associated trip mechanism.

NOTE: As it is described above, the options NOR_LATCH and NAND_LATCH are not available in the relay. Although, using SICOM software allows the user to configure these options. The relay will not recognize them and it will not work properly.

By default, the outputs configuration is:

	OUTPUT	*LOGICAL GATE*	BINARY STATES
PHYSICAL OUTPUTS	Trip output **(NOT CONFIGURABLE)**	OR4_PULSES	• General Trip
	Output 2 **(*)**	*AND4*	• Ready
	Output 3 (*)	*AND4*	• General Trip

(*) Optional depending on model

A minimum current is needed to activate the Outputs, as follows:

- Single-phase→0.62xIn
- Three-phase→1.62xIn

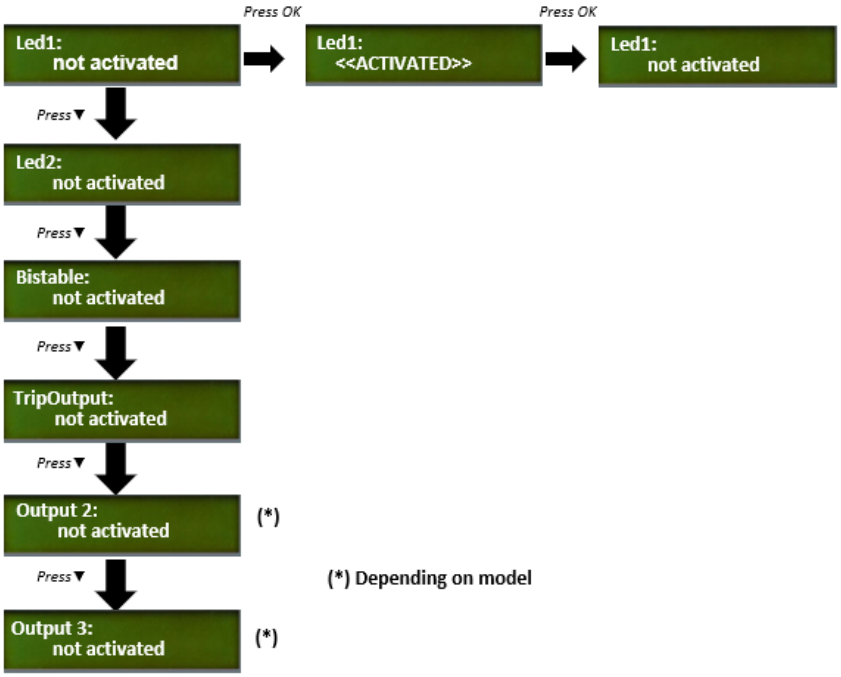
9. FLOWCHART (EXAMPLE)

9.1. Test menu

From the main menu, press the keys “◄”, “▼”, and “►” in sequence and then press and hold the "OK" key until the "Test menu" appears on the display. The test menu is accessed by pressing the "OK" key again and the “▲” and “▼” keys can be used to navigate through the different menu items. Each item can be activated or deactivated by pressing "OK" on it (if the item is deactivated, it is activated by pressing OK; if the item is activated, it is deactivated by pressing “OK”). Press the “C” key to exit the test menu.

Once “Led 1” appears, pressing “OK” will activate the LED and pressing “OK” again will deactivate it.

To go through all options, press “▼”. To activate and deactivate the options follow the same steps as in the case of the LED 1.



9.2. Direct Access

Version

The equipment versions menu can be accessed from the standby mode screen by holding the "▲" key.

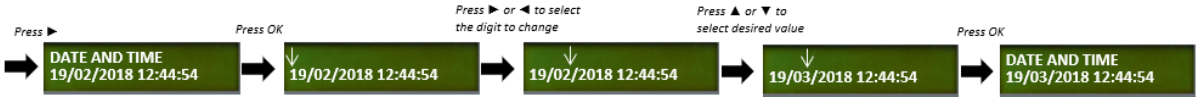
Press the "C" key to return to the standby mode screen.

Date and time

Press the "►" key from the standby mode screen to access the date and time menu.

Press the "OK" key to access the date-time modification screen. Use the "►" and "◄" keys to position the cursor over the digit that you want to change and assign a value to this digit using the "▲" and "▼" keys. Once the date-time has been entered, press "OK" to change the device date.

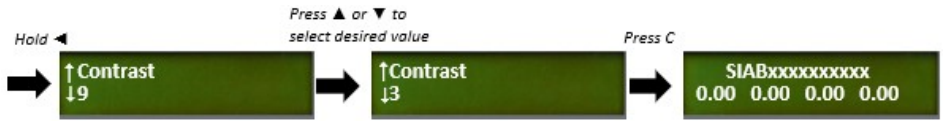
Press the "C" key to return to the standby mode screen.



Contrast

Hold down the "◄" key from the standby menu to access the Contrast menu. Use the "▲" and "▼" keys to select the desired value.

Press the "C" key to return to the standby mode screen.



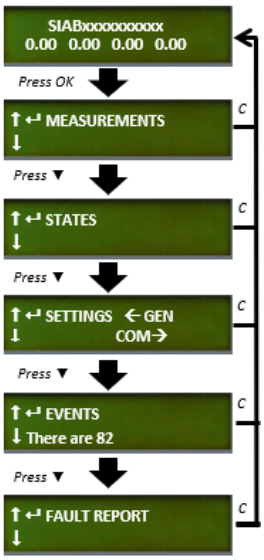
Communication parameters

Hold down the "▼" key from the standby menu to access the communication parameters menu.

Press the "C" key to return to the standby mode screen.

(*)**Remote communication depending on model**

9.3. Menus



The information in the SIA-B relay is organized through the following menus:

- Measurements
- States
- Settings
- Events
- Fault Report

From the standby screen press the “OK” key to access the first menu “MEASUREMENTS” and press the “▼” key to overview the rest of the menus in the relay.

To return to the standby screen, press the “C” key.

It is also possible to access the Fault reports by pressing the “◄” key.

9.3.1. Measurements menu

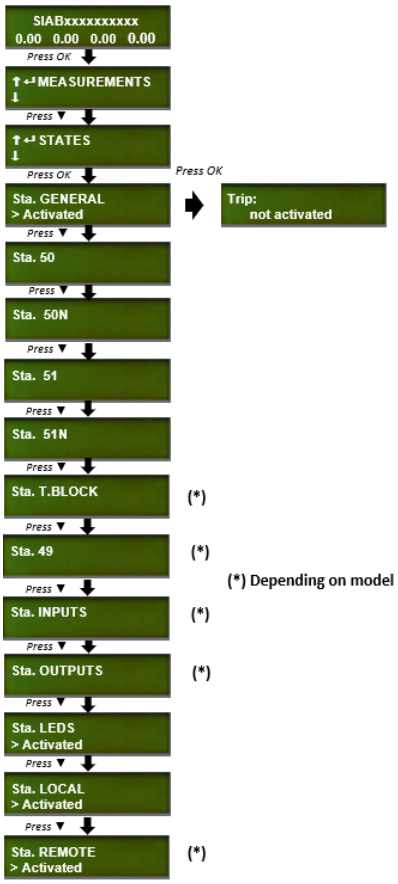
From the standby mode screen, press the “OK” key to access the first line of menus.

Use the “▲” and “▼” keys to position the cursor over the “MEASUREMENTS” screen and press “OK”.

Use the “▲” and “▼” keys to position the cursor over the measurement and to see its value.

Press the “C” key to return to the standby mode screen.

9.3.2.States menu



The States menu indicates the status of the relay (activated or deactivated) on real time.

From the standby mode screen, press the “OK” key to access the first line of menus.

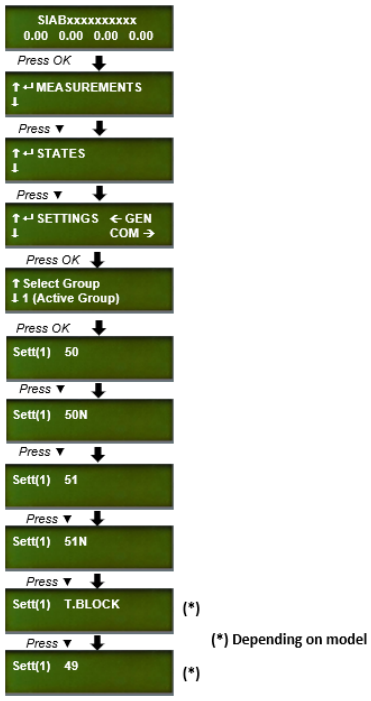
Use the “▲” and “▼” keys to position the cursor over the “STATES” screen and press “OK”. This takes you to the status groups’ line.

Move the cursor over a group of statuses and press the “OK” key to access the statuses that belong to this group. Use the “▲” and “▼” keys to browse through the different statuses.

The information shows if each status is active. The message “>Activated” appears under the name of the group in the status group menus if any of the statuses in that group are active.

Press the “C” key to return to the standby mode screen.

9.3.3.Settings menu



From the standby mode screen, press the “OK” key to access the first line of menus.

Use the “▲” and “▼” keys to position the cursor over the “SETTINGS” screen and press “OK”. This takes you to the settings groups’ line.

Use the “▲” and “▼” keys to position the cursor over a settings group and press the “OK” key to access the settings that belong to this group.

Use the “▲” and “▼” keys to move through the different settings. The information that appears underneath the setting name is its value.

50P protection function

The parameters to adjust are:

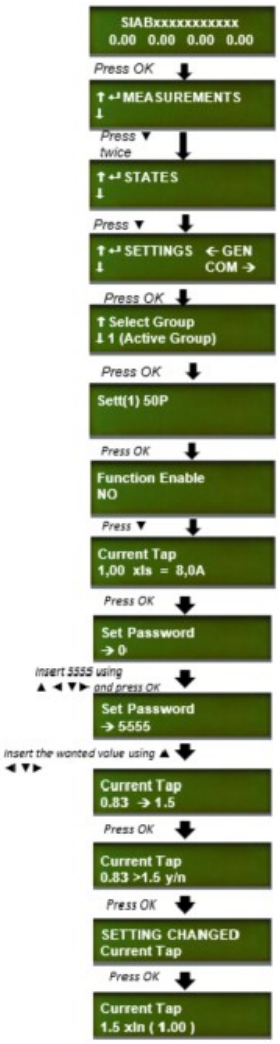
- **Permission**: The function is available to trip only if the permission is "YES". When this permission is showing "NO" the function will never BE ACTIVATED AND THE RELAY WILL NOT TRIP.
- **Tap**: It is the threshold. Once it is exceeded the function picks-up.
- **Time Delay**: If the function is picked-up during the adjusted value the relay will trip.

By pressing the "OK" key from the standby screen the MEASUREMENT menu is displayed.

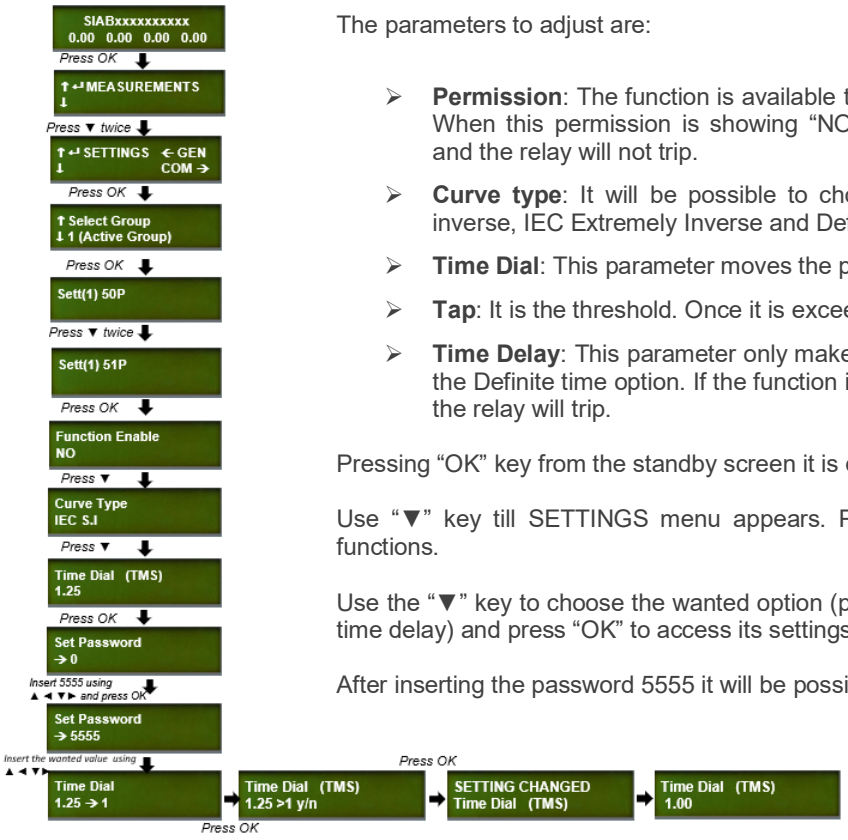
Use the "▼" key until the SETTINGS menu appears. Press "OK" to access the different functions.

Use the "▼" key to choose the wanted option (Permission, Tap or Time delay) and press "OK" to access its settings parameters.

After inserting the password 5555 it will be possible to adjust the wanted value.



51P protection function



The parameters to adjust are:

- **Permission**: The function is available to work only if the permission is "YES". When this permission is showing "NO" the function will never be activated and the relay will not trip.
- **Curve type**: It will be possible to choose between IEC Inverse, IEC Very inverse, IEC Extremely Inverse and Definite time.
- **Time Dial**: This parameter moves the previous curves along the "Y" axis.
- **Tap**: It is the threshold. Once it is exceeded the function picks-up.
- **Time Delay**: This parameter only makes sense if "Curve type" is selected for the Definite time option. If the function is picked-up during this adjusted value, the relay will trip.

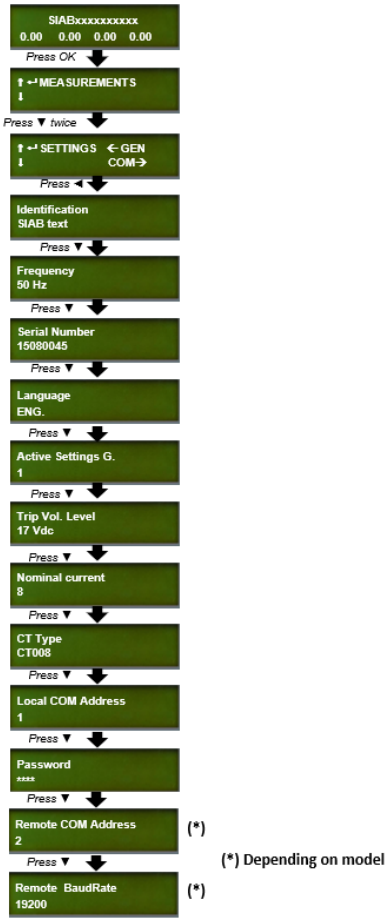
Pressing "OK" key from the standby screen it is displayed MEASUREMENT menu.

Use "▼" key till SETTINGS menu appears. Press "OK" to access to the different functions.

Use the "▼" key to choose the wanted option (permission, curve type, time dial, tap or time delay) and press "OK" to access its settings parameters.

After inserting the password 5555 it will be possible to adjust the wanted value.

General settings



From the standby mode screen, press the “OK” key to access the first line of menus. Use the the “▲” and “▼” keys to position the cursor over the “SETTINGS” screen. Press the “◄” key to access the general settings from the "SETTINGS" screen.

The general setting "Equipment name" can be viewed from the HMI, but it can only be modified by using the SICom program.

The “CT type” and the “Nominal Current” general settings, depend on which specific CT will be used in the application. For example: if a CT016 is used, the “Nominal Current” would be the nominal current of the installation (NOTE: the installation nominal current value must be inside the range of the CT´s working range).

The frequency is also selected by general settings.

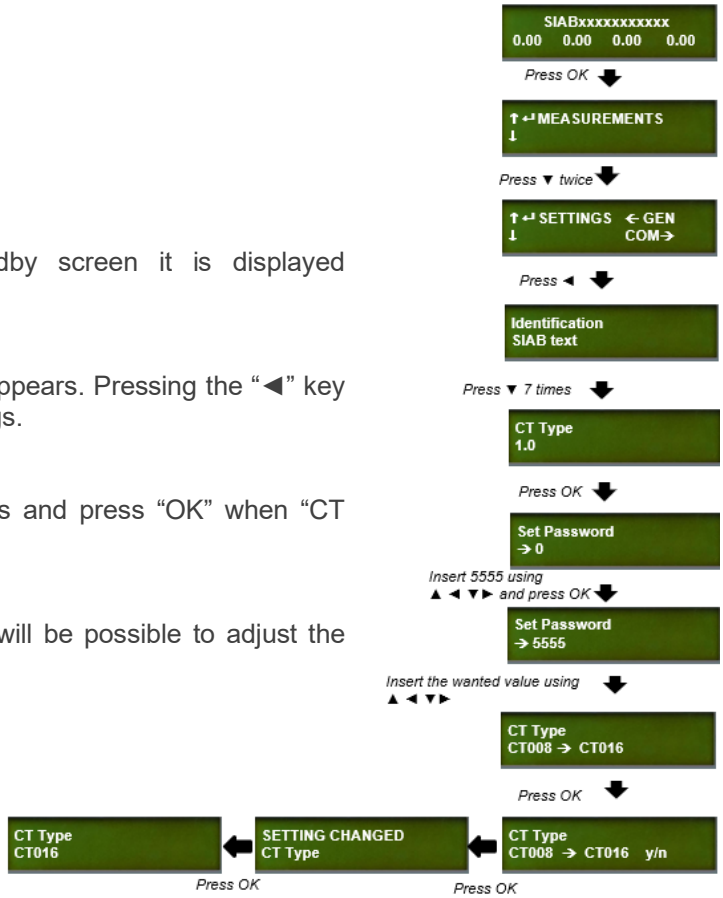
How to set CT type

Pressing “OK” key from the standby screen it is displayed MEASUREMENT menu.

Use “▼” key until SETTINGS menu appears. Pressing the “◄” key gives you access to GENERAL settings.

Use “▼” key to overview the options and press “OK” when “CT type” option appears.

After inserting the password 5555 it will be possible to adjust the wanted value.



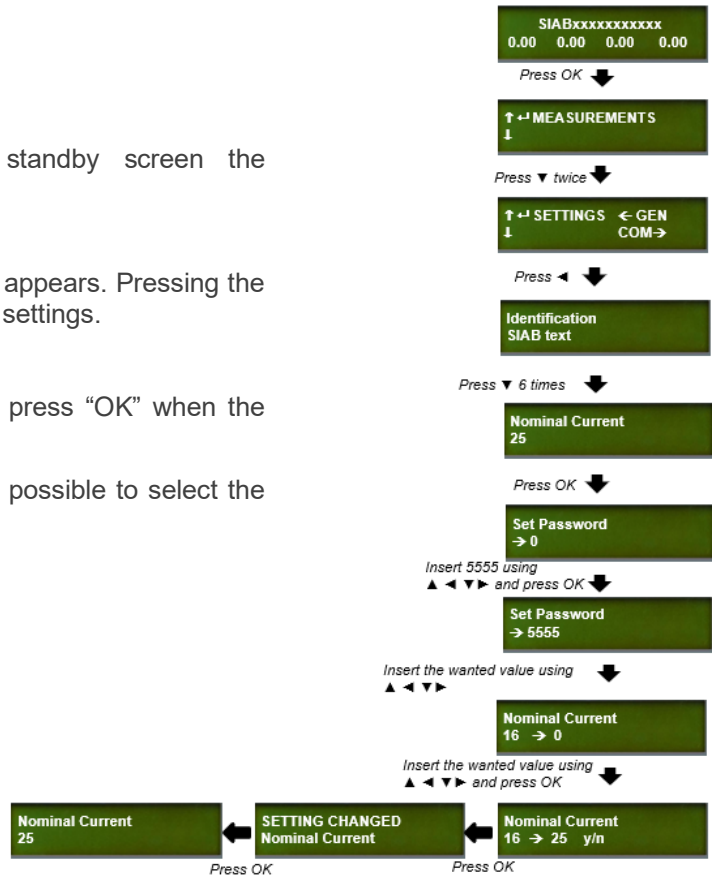
How to set Nominal Current

By pressing the “OK” key from the standby screen the MEASUREMENT menu is displayed.

Use the “▼” key until the SETTINGS menu appears. Pressing the “◄” key gives you access to the GENERAL settings.

Use “▼” key to overview the options and press “OK” when the “Nominal current” option appears.

After inserting the password 5555 it will be possible to select the desired value.



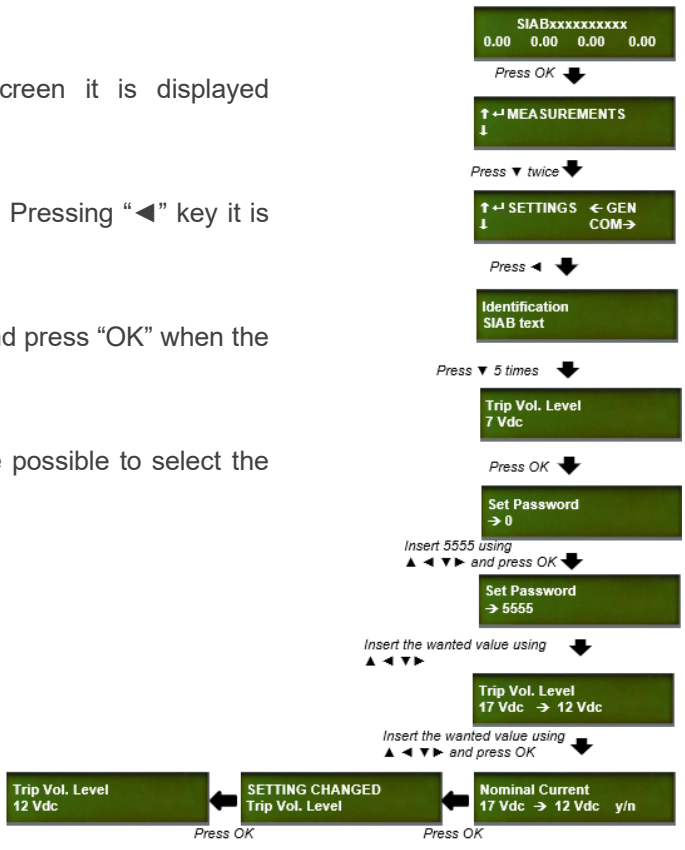
How to set Trip Voltage level

Pressing “OK” key from the standby screen it is displayed MEASUREMENT menu.

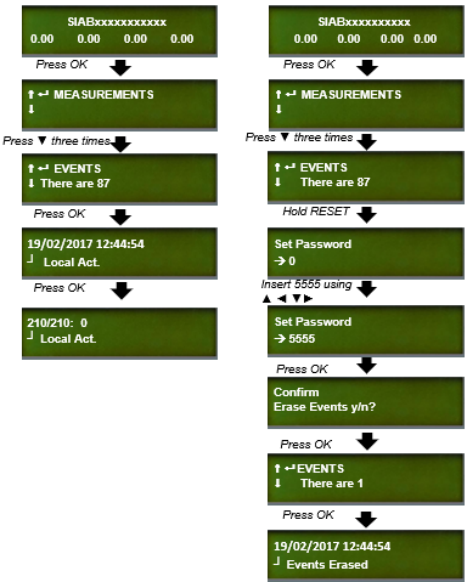
Use “▼” key till SETTINGS menu appears. Pressing “◄” key it is accessed to GENERAL settings.

Use the “▼” key to overview the options and press “OK” when the “Trip Voltage level” option appears.

After inserting the password 5555 it will be possible to select the desired value.



9.3.4.Events menu



From the standby mode screen, press the “OK” key to access the first line of menus. Use the “▲” and “▼” keys to position the cursor over the “EVENTS” screen and the number of events in the buffer will be displayed. Press "OK" and use the “▲” and “▼” keys to position the cursor over the events.

The “┘” and “┐” shows that the event has been caused by the activation or reset.

Each event contains the following information:

Date-time; Description of the event

Size of the events buffer; Position of the event within the list

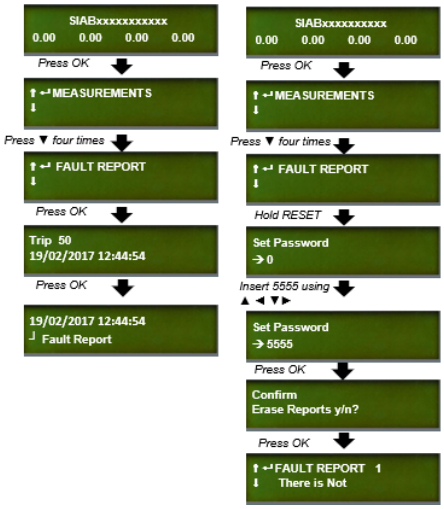
Caused by activation or reset; Associated measurement

How to delete the events

To delete the events from the relay, it is necessary to insert the password 5555 from the events menu.
After the erasing of the events there will appear that there is 1 event corresponding to “Events erased”.

NOTE: When the events are deleted, the fault reports persist in the relay to analyze the fault situation until these fault reports are deleted consciously by the user.

9.3.5.Fault reports menu



From the standby mode screen, press the “OK” key to access the first line of menus. Use the “▲” and “▼” keys to position the cursor over the “FAULT REPORT” screen. Press "OK" and use the “▲” and “▼” keys to position the cursor over the faults.

Once it is accessed to a fault report, press “OK” to visualize the cause which has originated the fault report.

Pressing “OK” again gives access to the registered events that are related with that fault report. The first event is the activation of the fault report. To visualize the rest of the events, use “▼” key.

How to delete the fault reports

To delete the fault reports from the relay it is necessary to insert the password 5555 from the fault report menu.

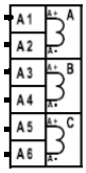
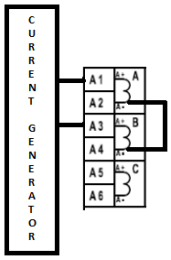
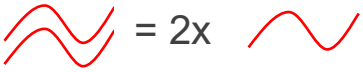
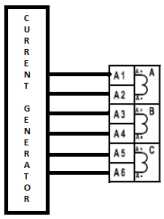
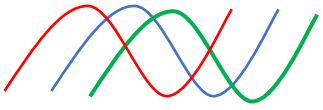
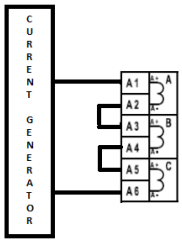
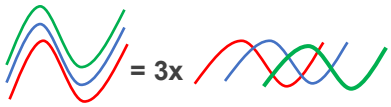
10. COMMISSIONING

10.1. Thermal resistance

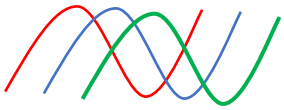
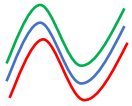
The relay can support, with a 3-phase balanced injection, the following values according to International Standards:

- 10 x Ismin or 2.85xIsmax continuously.
- 20 x Ismin or 5.7 x Ismax for 60 seconds.
- 25 x Ismin or 7.14 x Ismax for 10 seconds.

In the following table the different injection modes are described:

<table>
<tr><th>CURRENT GENERATION</th><th>INJECTION MODE</th><th>INJECTION SYSTEM</th><th>RELAY REAR CONNECTION</th><th>RELAY WITHSTAND ENERGY WAVEFORM</th></tr>
<tr><td rowspan="2">Single phase</td><td>Phase-Neutral</td><td rowspan="2">NOT APPLY</td><td>P-N:
  </td><td>  </td></tr>
<tr><td>Phase-Phase</td><td>P-P:
  </td><td>  </td></tr>
<tr><td rowspan="2">Three phase</td><td rowspan="2">Phase-Neutral</td><td>Balanced (120°)</td><td>P-N Balanced:
  </td><td rowspan="2">  </td></tr>
<tr><td>Unbalanced (0°)</td><td>P-N Unbalanced:
  </td></tr>
<tr><td colspan="4">  </td></tr>
</table>

Considering this description, the real thermal image that will support the relay depending on the injection mode and the injection system is shown below:

WAVE FORM	INJECTION MODE	THERMAL RESISTANCE
	SINGLE PHASE P-N	10xIsmin or 2.85xIsmax continuously 20xIsmin or 5.7xIsmax for 60 seconds 25xIsmin or 7.14xIsmax for 10 seconds
	3-PHASE BALANCED	10xIsmin or 2.85xIsmax continuously 20xIsmin or 5.7xIsmax for 60 seconds 25xIsmin or 7.14xIsmax for 10 seconds
	3-PHASE UNBALANCED	3xIsmin or 0.85xIsmax continuously 6.5xIsmin or 1.8xIsmax 60 seconds 8xIsmiin or 2.2xIsmax 10 seconds

NOTE: It is checked that thermal image values are re-defined not to exceed the declared value in the International Standard:

Commisioning recommendation:

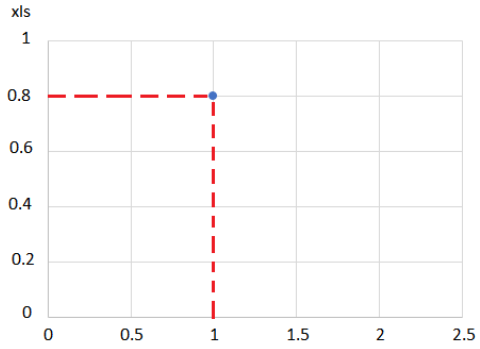
- It is recommended to use KITCOM accessory for relay protection functions settings. Connect it to settings and disconnect it for testing purposes.
- Adjust manually current generation value without injecting current to the relay and not stressing it during the adjustment process.
- Be sure that the relay output contact is connected to the generator tripping input in order to stop the generator and the current injection after reaching the adjusted tripping time. This way, the relay will only withstand the rated injected current during the adjusted time on the protection function settings, without maintaining the current injection constantly, avoiding a damaging situation for the relay. As in another case, the internally handled energy will be higher than the rated one.
- Do not perform repetitive trips continuously as the stress of the relay will be increased drastically, especially when high current is being injected on the relay.

By following these recommendations, the relay should pass the commissioning test successfully. If the commissioning test is not performed according to these recommendations, the manufacturer will not be responsible for the relay failure.

10.2. Self powering

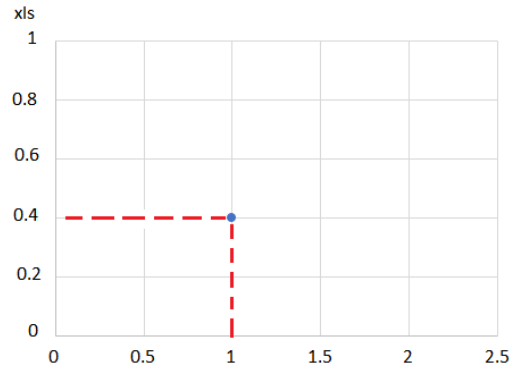
10.2.1. Single phase minimum self-powering checking

Adjust the Sverker current generator to HOLD 0.8xIs and quickly inject it to the relay, as it would happen in a real situation when the circuit breaker is closed and powering the network line.



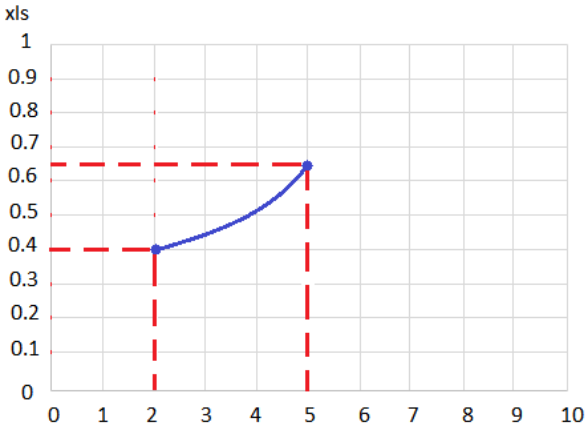
10.2.2. Three phase minimum self-powering checking

Adjust the Sverker current generator to HOLD 0.4xIs and quickly inject it to the relay, as it would happen in a real situation when the circuit breaker is closed and powering the network line.



10.2.3. Verification of LEDs/Signalling Outputs/LCD in self-powering conditions

Adjust the Sverker current generator to HOLD 0.4xIsmin and quickly inject it to the relay, as it would happen in a real situation when the circuit breaker is closed and powering the network line. Once the relay is switched up, increase the current injection until 0.65xIsmin is reached. At this value, the LEDs and LCD should be switched on:



10.3. Measurements

The accuracy of the measurement depends on the CT type:

- With CTxxx-5 type → < ± 5%.
- With CTxxx-10 type → < ± 10%

The relay is able to measure up to 20 times the maximum nominal current of the CT.

10.4. Protection functions

Current injection procedure:

The nominal current adjusted in general settings will be 16 and the CT type will be CT16.

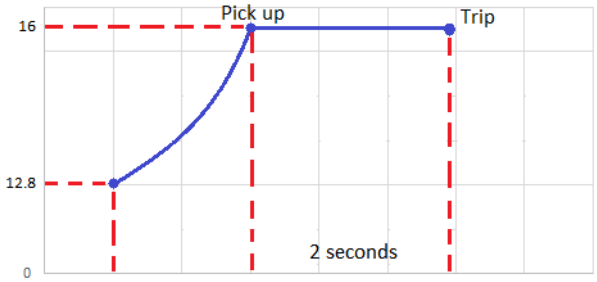
Adjust the Sverker current injector to HOLD 0,8xIsmin and quickly inject it to the relay, as it would happen in a real situation when the circuit breaker is closed and powering the network line. From this value, increase the current to achieve the function pick-up and the function trip.

10.4.1. Protection functions testing

- 50P instantaneous phase overcurrent protection:

Settings:

- Permission: YES.
- TAP: 1xIn.
- Time: 2 (sec)



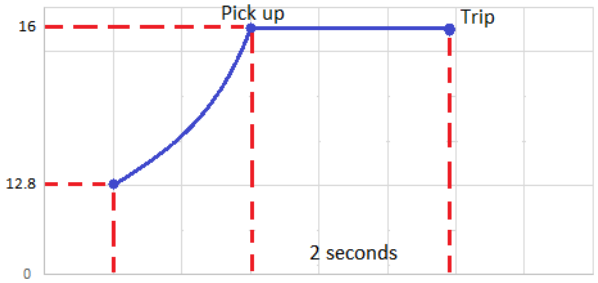
The following information will be checked:

- Pick-up at 100% of the tap
- Trip output is activated
- Output 2 is activated
- Trip flag is activated

- 50N instantaneous neutral overcurrent protection:

Settings:

- Permission: YES.
- TAP: 1xIn.
- Time: 2 (sec)



The following information will be checked:

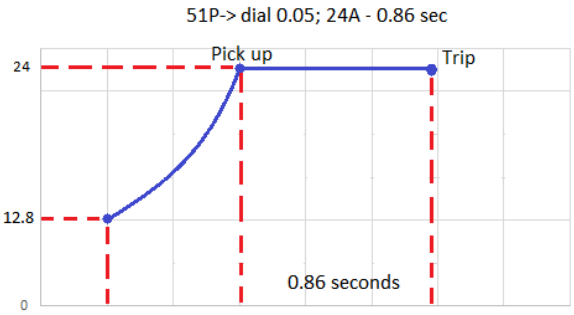
- Pick-up at 100% of the tap
- Trip output is activated
- Output 3 is activated
- Trip flag is activated

- 51P Inverse time phase overcurrent protection:

TEST 1:

Settings:

- Permission: YES.
- Curve: IEC Inverse.
- Dial: 0.05
- TAP: 16 xIn.
- Theoretical tripping time= 0.32 seconds (Fault current 24 A)



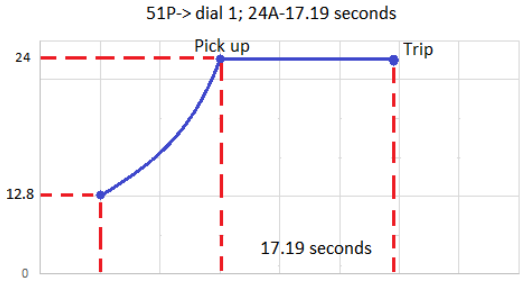
The following information will be checked:

- Pick-up at 110% of the tap
- Trip output is activated
- Output 2 is activated
- Trip flag is activated

TEST 2

Settings:

- Permission: YES.
- Curve: IEC Inverse.
- Dial: 1
- TAP: 16xIn.
- Theoretical tripping time = 17.19 seconds (fault current 24 A)



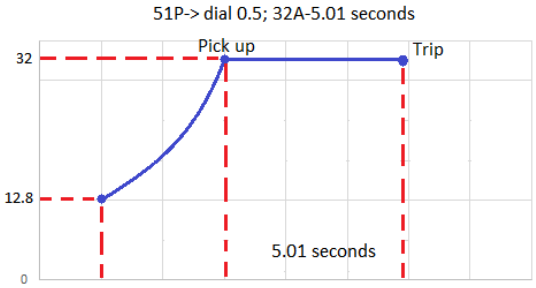
The following information will be checked:

- Trip output is activated
- Output 2 is activated
- Trip flag is activated

TEST 3

Settings:

- Permission: YES.
- Curve: IEC Inverse.
- Dial: 0.5
- TAP: 16xIn.
- Theoretical tripping time = 5.01seconds (Fault current 32)



The following information will be checked:

Trip output is activated

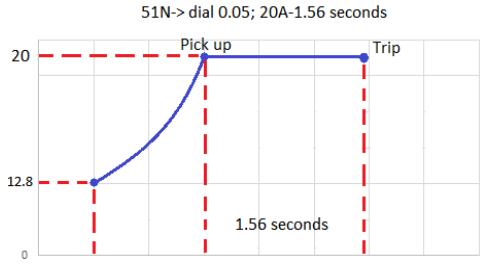
Output 2 is activated

Trip flag is activated

- 51N Inverse time neutral overcurrent protection:

TEST 1

Settings:



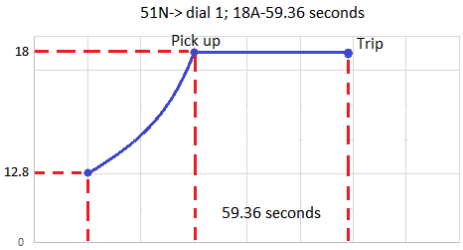
- Permission: YES.
- Curve: IEC Inverse.
- Dial: 0.05
- TAP: 16xIn.
- Theoretical tripping time= 1.56 seconds (Fault current 20A)

The following information will be checked:

- Pick-up at 110% of the tap
- Trip output is activated
- Output 3 is activated
- Trip flag is activated

TEST 2

Settings:



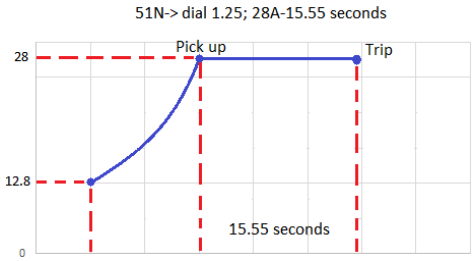
- Permission: YES.
- Curve: IEC Inverse.
- Dial: 1
- TAP: 16xIn.
- Theoretical tripping time = 59.36 seconds (fault current 18A)

The following information will be checked:

- Trip output is activated
- Output 3 is activated
- Trip flag is activated

TEST 3

Settings:



- Permission: YES.
- Curve: IEC Inverse.
- Dial: 1.25.
- TAP: 16xIn.
- Theoretical tripping time = 15.55seconds (Fault current 28A)

The following information will be checked:

- Trip output is activated
- Output 3 is activated
- Trip flag is activated

Note: In TEST 2 and TEST 3 for 51 and 51N, the fault current will be injected directly to check the theoretical tripping time. Take into account that this time is calculated through an equation and this time depends on the injected current. In doing this, a ramp is possible but the theoretical tripping time will not be checked.

11. SIABXXXXXXXXX REGISTRY

Model:			
Serial Number:			
Correct packing and unpacking	❒ OK		
Relay verification	❒ OK		
Installation process	❒ OK		
Connection process	❒ OK		
Test menu	❒ OK		
Model and Versions:	Reading LCD model:		
	Version:		
Wiring checking	❒ OK ❒ NOK		
USB communication port:	❒ OK ❒ NOK		
Signalling and Keypad	Led 1 ❒ OK	Led 2 ❒ OK	
	Trip bistable ❒ OK		
	Trip Output ❒ OK		
	Output 2 ❒ OK ❒ N/A		
	Output 3 ❒ OK ❒ N/A		
	Keypad ❒ OK		
Self-power 3P (SIAC>0.4Is)	Phase A ❒ OK	Phase B ❒ OK	Phase C ❒ OK
Commissioning battery checking	❒ OK		
Auxiliary power checking	❒ OK ❒ N/A		
Remote Communication	❒ OK ❒ N/A		
Settings and configuration	❒ OK		
Current measurements	❒ OK		
Protection Functions	50 phase A: ❒ OK	50 phase B: ❒ OK	50 Phase C: ❒ OK
	50N ❒ OK		
	51 phase A: ❒ OK	51 phase B: ❒ OK	51 phase C: ❒ OK
	51N ❒ OK		
	49T ❒ OK ❒ N/A		
	T. BLOCK ❒ OK ❒ N/A		
	49 ❒ OK ❒ N/A		
RTC	❒ OK		

NOTES:

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