

SACE PR010/T test unit annex



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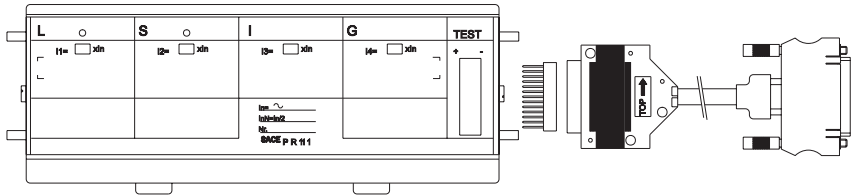
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1. Specifications about SACE PR010/T (SW release 6.1) functionality

Protection releases foreseen [usually named DUT(device under test)]:

- PR111 (in all IEC versions).
- PR112 (in all IEC versions).
- PR113 (in all IEC versions).
- PR111-A (in all UL versions).
- PR112-A (in all UL versions).
- PR212 (with test connector).

2. SACE PR111/P protection release



2.1. Default setting for PR111/P automatic test

To test the protection functions in automatic mode, first set the PR111 protection unit as follows:

Protection function	Setting	Curve
L	0.4xI _n	B
S	3xI _n	C; I ² t=k
I	8xI _n	-
G	0.8xI _n	B

2.2. Operation mode menu tree

1° ↴	2° ↴	3° ↴	4° ↴	5° ↴	6° ↴	7° ↴
1. Operation mode	1. Select DUT (PR111)	1. Protections	1. Automatic	Start test		Create a report
			2. Manual	Set parameters	Start test	
		2. Protection I inst	Start test			

2.3. Specifications about the functionality

In case of test with SACE PR010/T unit for G protection function, the maximum tolerance value is 35%. The minimum adjustable threshold for this function must be $0,6xI_n$ in case of manual test.

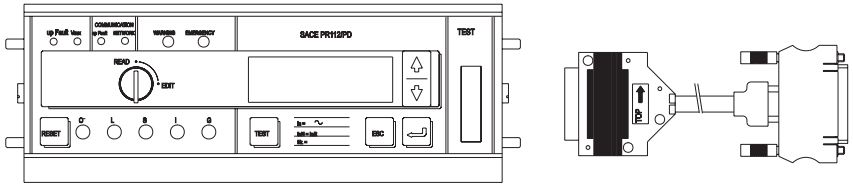
Automatic test example for unit PR111/LSI mounted on CB E1B12, with CT = 800A, Neutral = 50%.

1. Enter 1 in the main menu. (Operation mode)
2. Enter 1 to select the PR111 unit. (PR111)
3. Enter 2 to select the PR111 unit version. (PR111/LSI)
4. Enter 1 to select the Neutral setting (Neutral = 50%)
5. Enter 2 to select the type of CB. (E1B12)
6. Enter 3 to select the CTs' rated current. (800 A)
7. Enter 1 to select the type of test. (Protections)
8. Enter 1 to select the test mode. (Automatic)

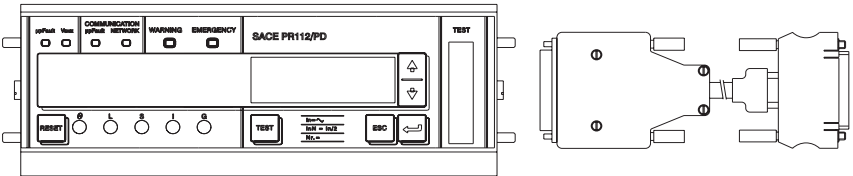
[Make sure the default setting is programmed for automatic testing as shown under the heading "Default setting for automatic PR111 testing"].

3. SACE PR112/P and SACE PR112/PD protection release

3.1. Version with key (last letter in serial number A-D)



3.2. Version without key (last letter in serial number M-Z)



3.3. Operation mode menu tree

1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	
1. Operation mode	2. DUT selection (PR112)	1. DUT selection (PR112 A : D) 2. DUT selection (PR112 M : Z)	1. Test	1. Protections	1. Automatic	Start test		Create report		
				2. Protection I inst	2. Manual	1. Default setting	Start test			
						2. User setting	Set parameters			Start test
					3. Trip test	Start test				
				2. Reading	1. Ammeter	Read current				
					2. Configuration parameters	1. DUT configuration	Read configuration parameters			
			2. DUT parameters			Read setting parameters				
			3. Parameters default			1. Only for test	1. Display DUT configuration and parameters 2. Display DUT configuration and parameters			
					2. For operation	1. Display DUT default configuration and parameters 2. Display DUT default configuration and parameters				
			3. Information		Reading the relay name, SW release and Serial Number					
			3. Programming		1. Change parameters	1. DUT configuration	Define configuration parameters			
						2. DUT parameters	Define DUT parameters			
					2. Parameters default	Default for operation				
				3. Define default	1. Only for test	1. DUT configuration	Define configuration parameters			
					2. For operation	2. DUT parameters	Define setting parameters			
		1. DUT configuration		Define configuration parameters						
		2. DUT parameters	Define setting parameters							

3.4. Specifications about the functionality

- SACE PR010/T test unit is suitable to be used:
 - In all of the protection releases SACE PR112/P and SACE PR112/PD in version “without key”.
 - In all of the protection releases SACE PR112/P and SACE PR112/PD, in version “with key”, having Sw version 2.20 or later and serial number later than No. xxxxx**03**x (for PR112/P) or No. xxxxx**05**x (for PR112/PD).

P.S.: SACE PR112 software release can be read on the display choosing in sequence with the main menu:

 - Config/Program.
 - Information
- SACE PR112/PD electronic releases must be connected to SACE PR010/T auxiliary power supply.

Remarks for PR112 in version “with key”

- G protection function test:
 - in case of automatic mode the threshold for the G protection function must be set to a value higher than or equal to $0.4xI_n$ (if it's set at a lower value the PR010/T unit will reset it at $0.4xI_n$ during the test phase). The test current is equal to 2.5 times the threshold set.
 - In case of manual mode the test current is $1.5xI_n$.
 - It's possible that after a test (with trip) on G protection function other trips will occur during the next 2s.
- Contact wear for PR112:
 - During test on SACE PR112, with timing before trip higher than 10s, the contact wear and number of operation indications could increase (even up to 100% when several tests are performed) and the relative EMERGENCY message could appear. This indication can be reset by means of the following procedure:
 - choose in READ mode the page of the contact wear indication
 - choose EDIT mode by turning the key
 - keep pushed “up” and “down” buttons simultaneously for 5 seconds
 - contact wear and number of operations indications will be reset to zero



Connect the test wire provided (between the SACE PR010/T and the SACE PR112) the right way round (see the adhesive labels on the connectors).

Manual test example for unit PR112/P. (vers. “without key”)

Note: the data indicating the type of CB and protection, the rated current of the CTs and the Neutral setting are automatically identified by the PR010/T test unit. In this example, protection function “S” is tested with curve $t=k$, setting $I_2=1.20 \cdot I_n$, curve $t_2=0.5s$ supplying a fault current equivalent to 2 times the rated current (I_n).

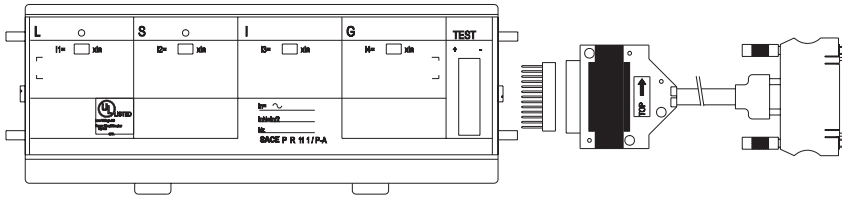
1. Enter 1 in the main menu. (Operation mode),
2. Enter 2 to select the PR112 unit. (PR112),
3. Enter 1 to select the M÷Z version. (PR112 (M÷Z)),
4. Enter 1 to select the type of activity. (Test),
5. Enter 1 to select the type of test. (Protections),
6. Enter 2 to select the test mode. (Manual),
7. Enter 2 to select the type of setting used to test the protections. (User setting),
8. Enter 3 to select the protection function to be tested. (I protection test),
9. Using the arrow keys, fill in the page displayed as follows:

I-PROT: $t=k$, ON I3: $1,5I_n \Rightarrow 3000A$ t3: Istantaneous I-f: $2,00I_n \Rightarrow 4000 A(*)$
--

(*) In this example, the automatically identified rated current of the current sensor is 2000A.

10. Select the phase (or phases) on which to simulate the fault current (L1+L2+L3),
11. Press ENTER to activate fault simulation.

4. SACE PR111/P-A protection release



4.1. Default setting for PR111/P-A automatic test

To test the protection functions in automatic mode, first set the PR111 protection unit as follows:

Protection function	Setting	Curve
L	0.4xI _n	B
S	3xI _n	C; I ² t=k
I	8xI _n	-
G	0.4xI _n	B

4.2. Operation mode menu tree

1°	2°	3°	4°	5°	6°	7°
1. Operation mode	4. Select DUT (PR111-A)	1. Protections	1. Automatic	Start test		Create a report
		2. Protection I inst	2. Manual	Set parameters	Start test	
			Start test			

4.3. Specifications about the functionality

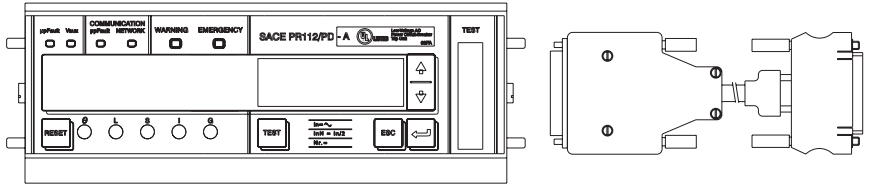
In case of test with SACE PR010/T unit for G protection function, the maximum tolerance value is 35%

Automatic test example for unit PR111/LSI mounted on CB E1B12, with CT = 800A, Neutral = 50%.

1. Enter 1 in the main menu. (Operation mode)
2. Enter 4 to select the PR111-A unit. (PR111-A)
3. Enter 2 to select the PR111-A unit version. (PR111-A/LSI)
4. Enter 1 to select the Neutral setting (Neutral = 50%)
5. Enter 2 to select the type of CB. (E1B12)
6. Enter 3 to select the CTs' rated current. (800 A)
7. Enter 1 to select the type of test. (Protections)
8. Enter 1 to select the test mode. (Automatic)

[Make sure the default setting is programmed for automatic testing as shown under the heading "Default setting for automatic PR111/P-A testing"].

5. SACE PR112/P-A and PR112/PD-A protection release



5.1. Operation mode menu tree

1°	2°	3°	4°	5°	6°	7°	8°	9°		
1. Operation mode	5. Select DUT (PR112-A)	1. Test	1. Protections	1. Automatic	Start test				Create a report	
				2. Manual	1. Default setting	Start test				
				2. User setting	Set parameters	Start test				
			2. Protection 1 inst	Start test						
			3. Trip test	Start test						
			2. Reading	1. Ammeter	Read currents					
		2. Configuration parameters		1. DUT configuration	Display DUT configuration					
				2. DUT parameters	Display DUT protection parameters					
				3. Default parameters	1. Only for test	1. DUT configuration	Display DUT default configuration			
					2. DUT parameters	Display DUT default parameters				
				2. For operation	1. DUT configuration	Display DUT default configuration				
					2. DUT parameters	Display DUT default parameters				
		3. Information	Reading the relay name, SW release and Serial Number							
		3. Programming	1. Change DUT parameters	1. DUT configuration	Change DUT configuration parameters					
				2. DUT parameters	Change DUT protection parameters					
			2. Parameters default	Program DUT with default parameters for normal operation						
			3. Define default	1. Only for test	1. DUT configuration	Define DUT configuration parameters				
					2. DUT parameters	Define DUT protection parameters				
	2. For operation		1. DUT configuration	Define DUT configuration parameters						
		2. DUT parameters	Define DUT protection parameters							

5.2. Specifications about the functionality

- SACE PR010/T test unit is suitable to be used with all the SACE PR112/P-A and PR112/PD-A.
- SACE PR112/PD-A electronic releases must be connected to auxiliary power supply to be used with SACE PR010/T unit.

P.S.: SACE PR112/P-A software release can be read on the display choosing in sequence in READ mode starting with the main menu:

- Config. / Program
- Information



Connect the test wire provided (between the SACE PR010/T and the SACE PR112) the right way round (see the adhesive labels on the connectors).

Manual test example for unit PR112/P-A.

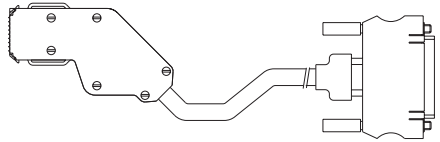
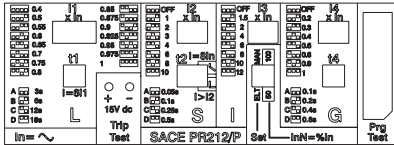
Note: the data indicating the type of CB and protection, the rated current of the CTs and the Neutral setting are automatically identified by the PR010/T test unit. In this example, protection function “S” is tested with curve $t=k$, setting $I_2=1.20 \cdot I_n$, curve $t_2=0.4s$ supplying a fault current equivalent to 2 times the rated current (I_n).

1. Enter 1 in the main menu. (Operation mode)
2. Enter 5 to select the PR112-A unit. (PR112)
3. Enter 1 to select the type of activity. (Test)
4. Enter 1 to select the type of test. (Protections)
5. Enter 2 to select the test mode. (Manual)
6. Enter 2 to select the type of setting used to test the protections. (User setting)
7. Enter 2 to select the protection function to be tested. (S protection test)
8. Using the arrow keys, fill in the page displayed as follows:

S-PROT: $t=k$, ON Test prot. S: $t=k$ L2: $1,2I_n \Rightarrow 2400 \text{ A}$ T2: 0,4s I-f: 2,00 $\Rightarrow 4000 \text{ A}^*$
--

- (*) In this example, the automatically identified rated current of the current sensor is 2000A. Check that I-F is lower than I3:
9. Select the phase (or phases) on which to simulate the fault current (L1+L2+L3)
 10. Pres ENTER to activate fault simulation.

6. SACE PR212/P protection release

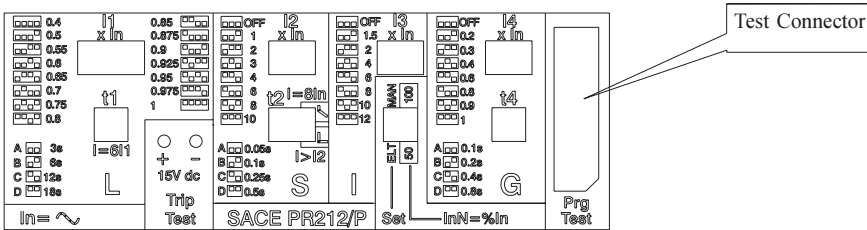


6.1. Operation mode menu tree

1°	2°	3°	4°	5°	6°	7°	8°	9°		
1. Operatin mode	7. DUT selection (PR212)	1. Test	1. Protections	1. Automatic	Start test (select SET ELT)			Create a report		
				2. Manual	1. Default setting	Start test				
			2. User setting	Set parameters	Start test					
			2. Reading	1. Ammeter	Read currents					
		2. Configuration parameters			1. DUT configuration /parameters	1. Manual	Display DUT configuration and parameters			
				2. Parameters default	1. Only for test	Display DUT default configuration and parameters				
				2. For operation	Display DUT default configuration and parameters					
			3. Information	Reading the relay name, SW release and Serial Number						
			4. Tripping parameters	Display tripping parameters						
			3. Programming	1. Configuration DUT parameters	1. DUT configuration	Define DUT configuration parameters				
		2. DUT (ELT) parameters			Define DUT protections parameters					
2. Parameters default	Program DUT with default parameters for normal operations									
	3. Define default	1. Only for test	Define DUT configuration parameters							
2. For operation		Define configuration parameters								

6.2 Specifications about functionality

- SACE PR010/T unit can be used only with SACE PR212/P-LSI and SACE PR212/P-LSIG protection releases with front test connector.



- Automatic and manual test with default setting parameters can be carried out only with DUT set to Electronic SET (set the dedicated dip-switch).
- Manual test can be carried out both with Electronic SET and Manual SET. In case of manual test and Manual SET, Thresholds and curves must be selected via dip-switches on the DUT; they are automatically updated on the display of PR010/T test unit (user must select test current value and phase).
- In case that during test, reading or programming operations, CB type and CT rating are not yet defined, the following message will be displayed:

WARNING
 Config. Not valid
 ESC to return
 ENTER to configure

In order to set the missing data, the procedure here below listed should be followed:

- Press ENTER
- Select CB type and CT rating
- Save setting by pressing ENTER



Connect the test wire provided (between the SACE PR010/T and the SACE PR212/P) the right way round (see drawing in par. 6).

Manual test example for unit PR212/P.

Note: the data indicating the type of CB and protection, the rated current of the CTs and the Neutral setting are automatically identified by the PR010/T test unit. In this example, protection function “S” is tested with curve $t=k$, setting $I_2=1.00 \cdot I_n$, curve $t_2=0.5s$ supplying a fault current equivalent to 2 times the rated current (I_n).

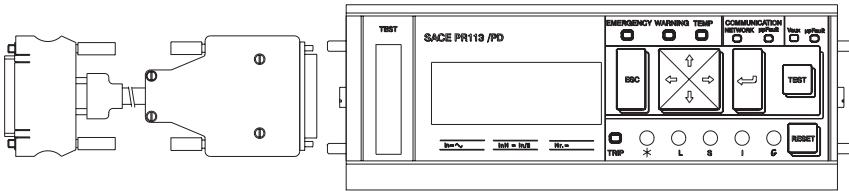
1. Set PR212/P in Manual SET, $I_1=1 \cdot I_n$ D curve , $I_2=1 \cdot I_n$ D curve, $T=K$, I_3 and I_4 in OFF position
2. Enter 1 in the main menu (Operation mode)
3. Enter 6 to select PR212 unit (PR212)
4. Enter 1 to select type if operation (Test)
5. Enter 1 to select type of test (Protection)
6. Enter 2 to select test mode (manual)
7. Enter 2 to select type of setting to be used in the test (User Setting)
8. “Manual test with MAN SET, ENTER to proceed”
9. “Enter 2 to select protection function to be tested (S protection)
10. Set $I-f=2.00$:

S-PROT: $t=k$, ON I_2 : 1,0 $I_n \Rightarrow$ 400 A T_2 : 0,5s $I-f$: 2,00 \Rightarrow 800 A(*)
--

(*) In the example it’s supposed the rated current of CTs was 400A, automatically identified.

11. Select the phase (or phase) on which to simulate the fault (L1+L2+L3)
12. Select ENTER to start the test

7. SACE PR113/P and PR113/PD protection release



7.1. Operation mode menu tree

1°	2°	3°	4°	5°	6°	7°	8°	9°
1. Operation mode	3. Select DUT (PR113)	1. Test	1. Protections	1. Automatic	Start test			Create a report
				2. Manual	1. Default setting	Start test		
			2. Electronic I inst	Start test				
		3. Trip	Start test					
		2. Reading	1. Currents	Read currents				
			2. Voltage	Read voltage				
			3. Power	1. Active power	Read active power			
				2. Reactive power	Read reactive power			
				3. Apparent power	Read apparent power			
			4. Energy counters	Read energy counters				
			5. Power factor	Read power factor				
			6. Freq./peak factor	Read Freq./peak factor				
			7. Last trip	Read last trip				
			8. Configuration/param.	1. DUT configur.	Read DUT configuration			
					2. DUT parameters	1. Protection parameters	Read protection parameters	
		2. Other param.		Read other parameters				
		3. Default parameters		1. For test	1. DUT config.	Read DUT config.		
					2. DUT paramet.	Read DUT param.		
				2. For operation	1. DUT config.	Read DUT config.		
			2. DUT paramet.		Read DUT param.			
		3. DUT other parameters	Read DUT other parameters					
		9. Informations	Read relay identification, SW version and Serial Number					
		3. Programming	1. Define conf/parameters DUT	1. DUT configuration	Define DUT configuration parameters			
				2. DUT parameters	1. Protection parameters	Define protection parameters		
2. Other param.	Define other parameters							
2. Download Def. Parameters	Download							
3. Definition parameters in PR010/T	1. For test		1. DUT config.	Define DUT configuration				
			2. DUT parameters	1. Protection parameters	Define protection parameters			
	1. For operation		1. DUT config.	Define DUT configuration				
		2. DUT parameters	1. Protection parameters	Define protection parameters				
2. Other param.	Define other par.							

7.2. Indications on operation

- The SACE PR010/T unit can be used with all SACE PR113/P and SACE PR113/PD releases.
- The SACE PR113/PD releases must be connected to the auxiliary power supply for use with the SACE PR010/T unit.
- The tests must be performed with the circuit-breaker open, no voltage to the busbar ($V=0$) (where the VTs are installed to measure the SACE PR113/P and SACE PR113/PD release voltage) and the auxiliary power supply enabled.



Connect the test wire provided (between the SACE PR010/T and the SACE PR113) the right way round (see the adhesive labels on the connectors).

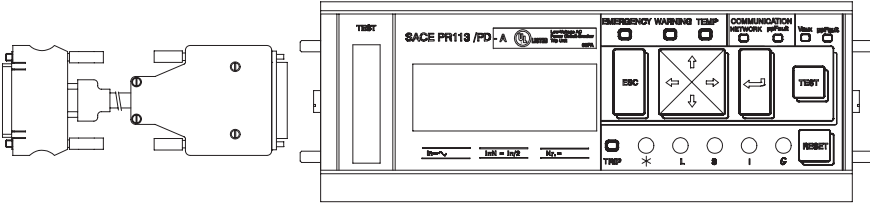
Example of an automatic test application on the PR113 release

Note: data on the CB and protections, on the current-carrying capacity of the CTs and on the neutral setting are automatically identified by the PR010/T.

Assuming you want to test all the protective functions implemented on the SACE PR113/P and SACE PR113/PD release automatically, proceed as follows:

1. From the main menu select 1 (Operation mode)
2. Select the PR113 unit with 3 (PR113)
3. Select the type of activity 1 (Test)
4. Select the type of test 1 (Protections)
5. Select the test mode 1 (Automatic)
6. Pressing ENTER enables a simulation of the failure for each protective function.

8. SACE PR113/P-A and PR113/PD-A protection release



8.1. Operation mode menu tree

1°	2°	3°	4°	5°	6°	7°	8°	9°		
1. Operation mode	6. Select DUT (PR113 A)	1. Test	1. Protections	1. Automatic	Start test			Create a report		
				2. Manual	1. Default setting	Start test	2. User setting		Set parameters	Start test
			2. Electronic I inst	Start test						
		2. Reading	3. Trip	Start test						
			1. Currents	Read currents						
				2. Voltage	Read voltage					
			3. Power	1. Active power	Read active power					
				2. Reactive power	Read reactive power					
				3. Apparent power	Read apparent power					
			4. Energy counters	Read energy counters						
			5. Power factor	Read power factor						
			6. Freq./peak factor	Read Freq./peak factor						
			7. Last trip	Read last trip						
			8. Configuration/param.	1. DUT configur.	Read DUT configuration					
					2. DUT parameters	1. Protection parameters	Read protection parameters			
				2. Other param.		Read other parameters				
				3. Default parameters	1. For test	1. DUT config.	Read DUT config.			
					2. For operation	2. DUT paramet.	Read DUT param.			
		3. DUT other parameters		Read DUT other parameters						
		9. Informations	Read relay identification, SW version and Serial Number							
		3. Programming	1. Define conf./parameters DUT	1. DUT configuration	Define DUT configuration parameters					
				2. DUT parameters	1. Protection parameters	Define protection parameters				
			2. Other param.		Define other parameters					
			2. Download Def. Parameters	Download						
3. Definition parameters in PR010/T	1. For test		1. DUT config.	Define DUT configuration						
			2. DUT parameters	1. Protection parameters	Define protection parameters					
	1. For operation	1. DUT config.	Define DUT configuration							
2. DUT parameters	1. Protection parameters	Define protection parameters			2. Other param.	Define other par.				

8.2. Indications on operation

- The SACE PR010/T unit can be used with all SACE PR113/P-A and SACE PR113/PD-A releases.
- The SACE PR113/PD-A releases must be connected to the auxiliary power supply for use with the SACE PR010/T unit.
- The tests must be performed with the circuit-breaker open, no voltage to the busbar ($V=0$) (where the VTs are installed to measure the SACE PR113/P-A and SACE PR113/PD-A release voltage) and the auxiliary power supply enabled.



Connect the test wire provided (between the SACE PR010/T and the SACE PR113) the right way round (see the adhesive labels on the connectors).

Example of an automatic test application on the PR113 release

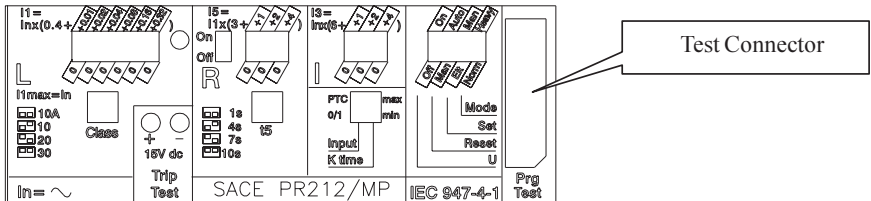
Note: data on the CB and protections, on the current-carrying capacity of the CTs and on the neutral setting are automatically identified by the PR010/T.

Assuming you want to test all the protective functions implemented on the SACE PR113/P-A and SACE PR113/PD-A release automatically, proceed as follows:

1. From the main menu select 1 (Operation mode)
2. Select the PR113 unit with 6 (PR113 A)
3. Select the type of activity 1 (Test)
4. Select the type of test 1 (Protections)
5. Select the test mode 1 (Automatic)
6. Pressing ENTER enables a simulation of the failure for each protective function.

9.2 Indications on operation

- The SACE PR10/T unit can only be used with the SACE PR212/MP protection releases with test connectors on the front.



- For the test with the SACE PR212/MP protection releases version 1 (with automatic data reading by the PR10/T unit), the maximum test current amounts to $7.3 \cdot I_n$; that is why the automatic test will test the protective functions in accordance with the above.
- The automatic test and the manual test with the default parameter set can only be performed if the protection release is configured in Electronic SET (ELT) mode using the dip switch provided.
- The manual test with the user's parameter set can be run both in Electronic SET (ELT) mode and in manual set (MAN) mode. In the case of manual testing with the manual SET mode, the thresholds and curves are selected by means of the dip switches on the protection device and are automatically updated on the PR10/T unit's display, where you only need to set the test current and the phase to apply it to.
- In the case of there being no PTC for protection against overtemperature, you need to set the "Input" dip switch as a generic input (Input = 0/1) during the tests.
- The "Welded contacts" (WC) input has to be at 0V (no alarm) during the tests.
- At the end of each test, the PR10/T unit waits until the thermal memory has returned to zero before proceeding with any subsequent tests in order to avoid any overlap in the measures between the function being tested and the overload function (L).
- For the test on the protection function against locked rotor (R), the PR10/T unit waits for an initial interval, which depends on the class specified for the L protection function (max duration 24s) before performing the test.
- If the data for the type of CB and the current-carrying capacity of the CTs have yet to be defined during the testing, reading or programming operations, the following message appears:

WARNING Config. Not valid ESC to return ENTER to configure

To input the missing data, proceed as follows:

1. Press ENTER
2. Select the type of CB and the current-carrying capacity of the CT
3. Store the settings by pressing ENTER



Connect the test wire (between the SACE PR010/T and the SACE PR212/MP) the right way round (see drawing in par. 9).

Example of an automatic test application on the PR212/MP release

Note: data on the CB and protection device, and on the current-carrying capacity of the CTs are automatically identified by the PR010/T.

Assuming you want to test all the protection functions implemented on the SACE PR212/MP release:

1. Set the PR212/MP in electronic set mode (ELT)
2. From the main menu select 1. (Operation mode)
3. Select the PR212MP unit with 8. (PR212/MP)
4. Select the type of activity with 1. (Test)
5. Select the type of test with 1. (Protections)
6. Select the test mode with 1. (Automatic)
7. Pressing ENTER enables a simulation of the failure for each protection function.