

INSTRUCTION BULLETIN

# SACE Emax 2 test cabinet

For testing accessories on manually and electrically operated LV circuit breakers



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 manually and electrically  
 operated LV circuit breakers



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# Warranty and general information

## Hazard classifications

The following important highlighted information appears throughout this document to warn of potential hazards or to call attention to information that clarifies a procedure.

Carefully read all instructions and become familiar with the devices before trying to install, operate, service or maintain this equipment.

**DANGER**

**Danger:** Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

**WARNING**

**Warning:** Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

**CAUTION**

**Caution:** Indicates that if the hazard is not avoided could result in minor or moderate injury.

**NOTICE**

**Notice:** Is used to notify of practices not related to personal injury.

## Trademarks

SACE Emax 2®  
SACE Emax 2 Ekip®  
ReliaGear® LV SG

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## Warranty

This document is based on information available at the time of publication. While efforts have been made to ensure accuracy, the information contained herein does not cover all details or variations in hardware and software, nor does it provide for every possible contingency in connection with installation, operation, and maintenance. Features may be described herein that are not present in all hardware and software systems.

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No warranties of merchantability or fitness for purpose shall apply. Contact your local sales office if further information is required concerning any aspect of ReliaGear LV SG switchgear and SACE Emax 2 breaker operation or maintenance.

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# Introduction

This manual provides the information needed by the user to properly install, operate and maintain the Test Cabinet.

## Safety

Each user must maintain a safety program for the protection of personnel, as well as other equipment, from the potential hazards associated with electrical equipment.

The following requirements are intended to augment the user's safety program, but NOT supplant the user's responsibility for devising a complete safety program.

The following basic industry practiced safety requirements are applicable to all major electrical equipment such as switchgear or switchboards.

ABB neither condones nor assumes any responsibility for practices which deviate from the following:

- ALL CONDUCTORS MUST BE ASSUMED TO BE ENERGIZED UNLESS THEIR POTENTIAL HAS BEEN MEASURED AS GROUND AND SUITABLE GROUNDING CONDUCTORS HAVE BEEN APPLIED TO PREVENT ENERGIZING. Many accidents have been caused by back feeds from a wide variety of sources.
- Although interlocks to reduce some of the risks are provided, the individual's actions while performing service or maintenance are essential to prevent accidents. Each person's knowledge; his mental awareness; and his planned and executed actions often determine if an accident will occur. The most important method of avoiding accidents, is for all associated personnel to carefully apply a thorough understanding of the specific equipment from the viewpoints of its purpose, its construction, its operation and the situations that could be hazardous.

All personnel associated with installation, operation and maintenance of electrical equipment, such as power circuit breakers and other power handling

## Introduction

equipment, must be thoroughly instructed, with periodic retraining, regarding power equipment in general, as well as the particular model of equipment with which they are working.

Instruction books, actual devices and appropriate safety and maintenance practices such as OSHA publications, National Electric Safety Code (ANSI C2), the National Electric Code, and National Fire Protection Association (NFPA) 70B Electrical Equipment. Maintenance must be closely studied and followed.

During actual work, supervision should audit practices to assure conformance.

## Maintenance

Excellent maintenance is essential for reliability and safety of any electrical equipment. Maintenance programs must be tuned to the specific application, well planned and carried out consistent with both industry experience and manufacturer's recommendations.

Local environment must always be considered in such programs, including such variables as ambient temperatures, extreme moisture, number of operations, corrosive atmosphere or major insect problems and any other unusual or abusive condition of the application.

One of the critical service activities, sometimes neglected, involves the calibration of various control devices. These monitor conditions in the primary and secondary circuits, sometimes initiating emergency corrective action such as opening or closing circuit breakers. In view of the vital role of these devices, it is important that a periodic test program be followed.

As was outlined above, it is recognized that the interval between periodic checks will vary depending upon environment, the type of device and the user's experience. It is the ABB recommendation that, until the user has accumulated enough experience to select a test interval better suited to his individual requirements, all significant calibrations be checked at an interval of one to two years. To accomplish this, some devices can be adequately tested using test sets. Specific calibration instructions on particular devices typically are provided by supplied instruction books.

Instruction books supplied by manufacturers address components that would normally require service or maintenance during the useful life of the equipment. However, they can not include every possible part that could require attention, particularly over a very long service period or under adverse environments.

Maintenance personnel must be alert to deterioration of any part of the supplied switchgear, taking action, as necessary to restore it to serviceable status.

Industry publications of recommended maintenance practices such as ANSI/NFPA 70B. Electrical Equipment Maintenance, should be carefully studied and applied in each user's formation of planned maintenance.

Some users may require additional assistance from ABB in the planning and performance of maintenance. ABB can be contracted to either undertake maintenance or to provide technical assistance such as the latest publications.

The performance and safety of all equipment may be compromised by the modification of supplied parts or their replacement by non-identical substitutes. All such design changes must be qualified to ANSI/IEEE Standard C37.59.

The user should methodically keep written maintenance records as an aid in future service planning and equipment reliability improvement. Unusual experiences should be promptly communicated to ABB.

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# Receiving, handling and storage

## Receiving

Each test cabinet is carefully inspected before shipment. Immediately upon receipt of the test cabinet, an examination should be made for any damage sustained in transit. If damage or rough handling is evident, a damage claim should be filed immediately with the transportation company and the local ABB sales office should be notified.

It is expected that due care will be exercised during the unpacking and installation of the test cabinet so that no damage will occur from careless or rough handling, or from exposure to moisture or dirt.

## Handling

Normal care in handling the test cabinet will result in a trouble-free installation and long testing life.

## Storage

It is recommended that the test cabinet be put immediately in its permanent location. If this is not possible, the following precautions should be taken to assure proper storage of the test cabinet.

- The test cabinet should be stored in a clean location, free from corrosive gases or fumes; particular care, for example, should be taken to protect the equipment from moisture and dust, as this combination has a very corrosive effect on many parts
- If the test cabinet is stored for any length of time, it should be inspected periodically to see that rusting has not started and to insure good mechanical condition. Should the cabinet be stored under unfavorable atmospheric conditions, it should be cleaned and dried out before being placed in service

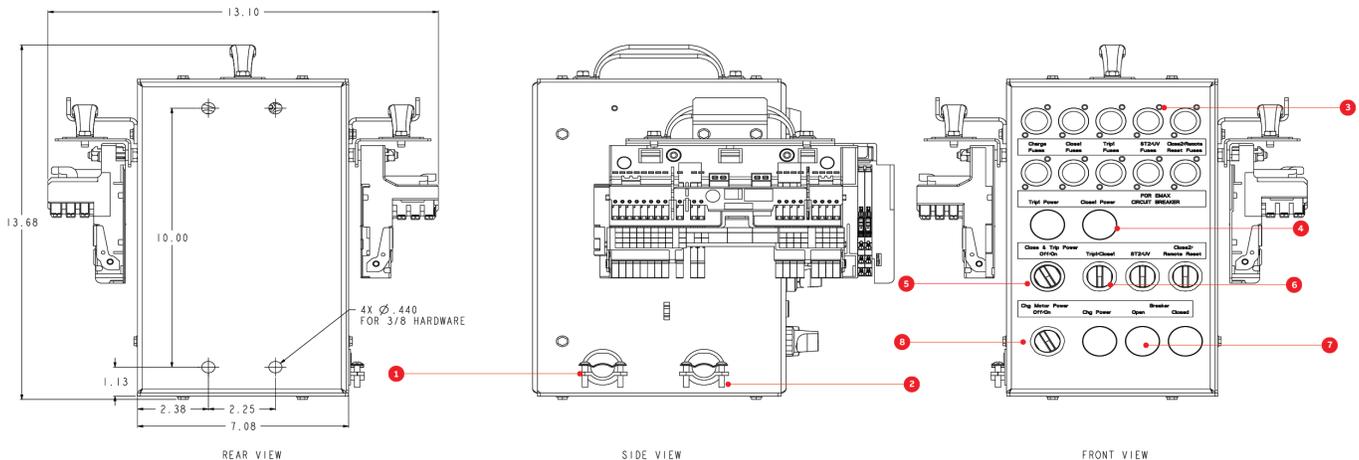
# Description and principles of operation

01 SACE Emax 2 test cabinet

The test cabinet is used to operate a SACE Emax 2 drawout, low voltage power circuit breaker that has been removed from the metal-enclosed equipment (Figure 01). It provides a convenient means of accessing the electrical close and trip circuits of the breaker during maintenance and inspection procedures. Control voltages must match the rating of charge, close, and trip circuits on the breaker.

This unit is designed to be wall or cabinet mounted. It has a test connector (with green ground wire), a 10-foot wire bundle, switches for opening and closing and charging the breaker, and control power switch, all located on the front of the cabinet.

Separate fuse holders and control power indicating lights are provided for the charge, close, and trip circuits. Lights are also provided for breaker open and close indication. Inside the unit is a terminal block for connecting the control power source(s) to the test cabinet. Four holes are provided on the back of the test cabinet for mounting using 3/8-inch hardware (mounting hardware is not included).



1. Control power input hole
2. Clamp for test connector cable
3. Fuse holders
4. Control power indicating lights

5. Close and Trip control power OFF / ON switch
6. Breaker operation switches
7. Green/Red indicating lights
8. Charging motor control power OFF / ON switch



**Caution:** The green ground wire and test connector must be connected to the breaker before the power is turned on.

OPERATION OF TEST CABINET: (circuit breaker must be out of its cubicle)

1. Make sure both CONTROL POWER switches are in the “OFF” position.
2. Connect the green ground wire to the breaker frame.
3. Plug the appropriate TEST CONNECTOR into the breaker secondary disconnect. Use the small TEST CONNECTOR for E1.2 breakers and the large TEST CONNECTOR for E2.2, E4.2 and E6.2 breakers. Make sure the TEST CONNECTOR is fully engaged into the breaker secondary disconnect.
4. Turn the CLOSE & TRIP power switch to the “ON” position. The trip power and close power indicating lights should be illuminated. If any of the indicating lights fail to illuminate, check the appropriate control power fuse(s) located at top. If the fuses are not blown, check the lamp in the indicating light assembly.
5. Move the CHARGE MOTOR CONTROL POWER switch to the “ON” position to charge the closing springs. The charge control power indicating light should be lit. The charge switch can remain in the “ON” position during testing.
6. The circuit breaker close and trip circuits can now be exercised by operating the CLOSE and OPEN switches on the test cabinet. Operation of the breaker auxiliary switch can be verified by observing the RED and GREEN indicating lights on the test cabinet.

7. Undervoltage coil operation (when equipped) can be verified by rotating SHUNT TRIP 2/UV switch to the right.



**Notice:** Do not leave the switch in the right position when equipped with SHUNT TRIP 2. If so, breaker will remain trip free.

8. Shunt trip coil 2 operation (when equipped) can be verified by rotating the SHUNT TRIP 2/UV switch to the left.



**Notice:** When the breaker is equipped with undervoltage the SHUNT TRIP2 / UV switch must be turned to right position before closing breaker or the breaker will go trip free.

9. Close coil 2 (When Equipped) can be verified by rotating CLOSE 2/REMOTE RESET switch to the left.

10. Remote reset (when equipped) can be verified by rotating CLOSE 2 / REMOTE RESET switch to the right.

11. When breaker testing is complete, turn the CONTROL POWER and CHARGE switches to the “OFF” position. Pull the TEST CONNECTOR out of the breaker secondary disconnect. Remove the green ground wire from the breaker frame.

12. Discharge the charging spring before attempting to install the breaker into its cubicle. This can be accomplished by manually pushing the close (GREEN) button and then manually pushing the open (RED) button on the breaker.

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# Installation

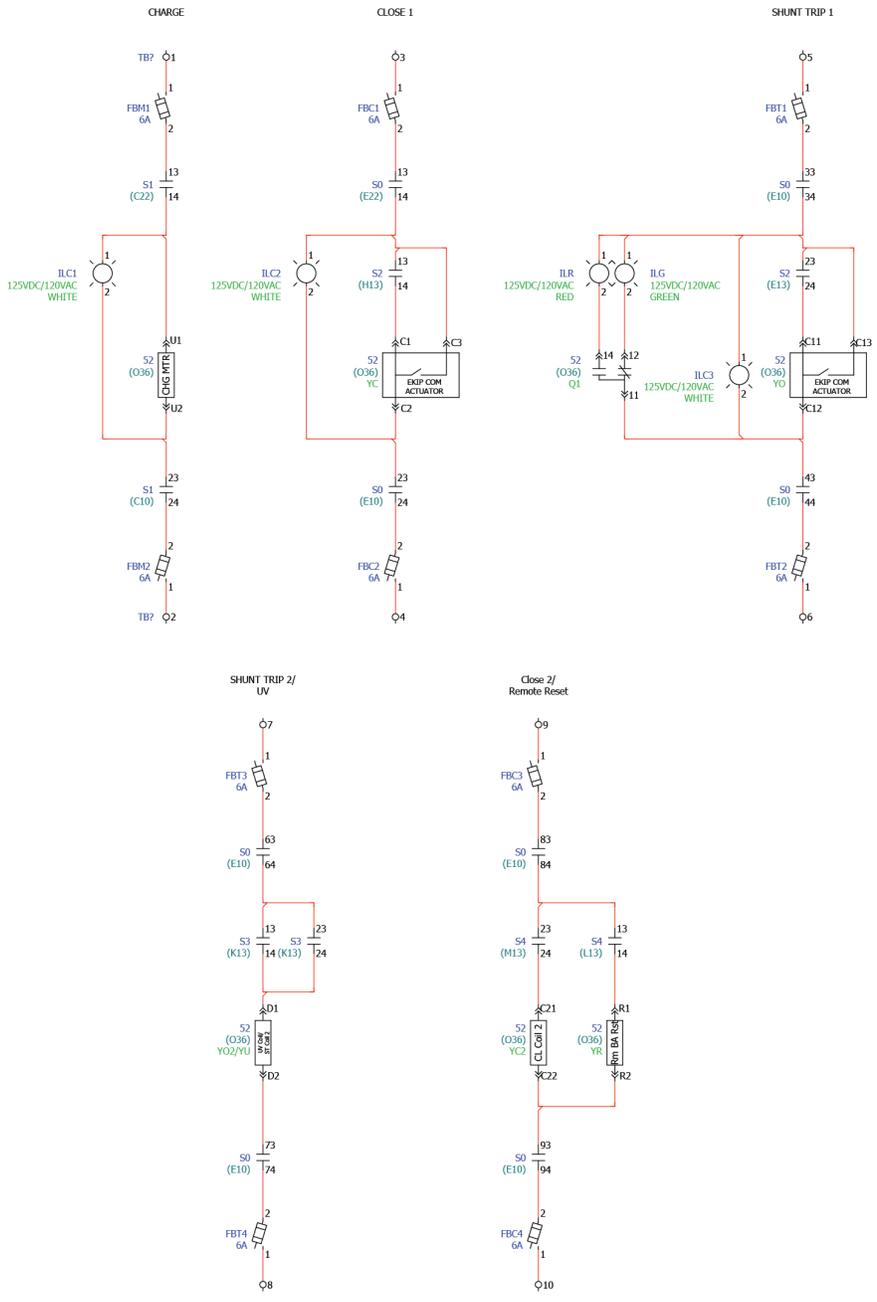
The test cabinet should be installed on the wall at a location where maintenance and testing of the breaker can be conveniently done.

Conduits may be installed for cables to supply control power for testing. A single 1-inch diameter hole is located on the left side to accommodate wiring. Refer to the wiring diagram in Figure 2 for control power connections and jumper positions.

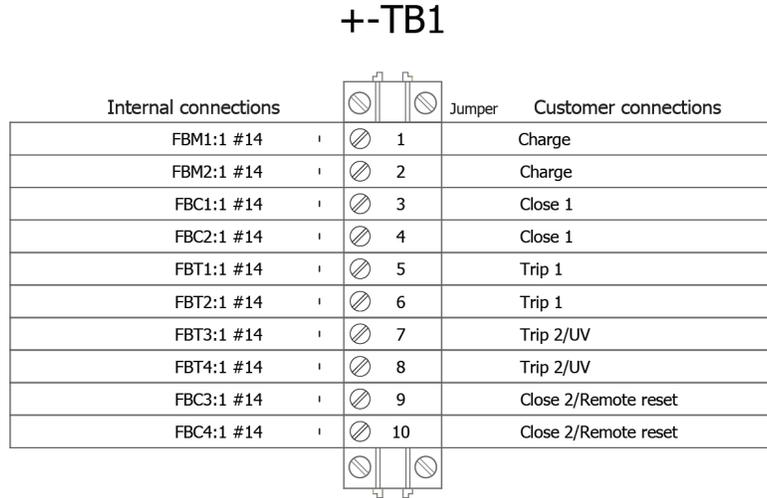
# Maintenance

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02 Test cabinet  
schematic diagrams

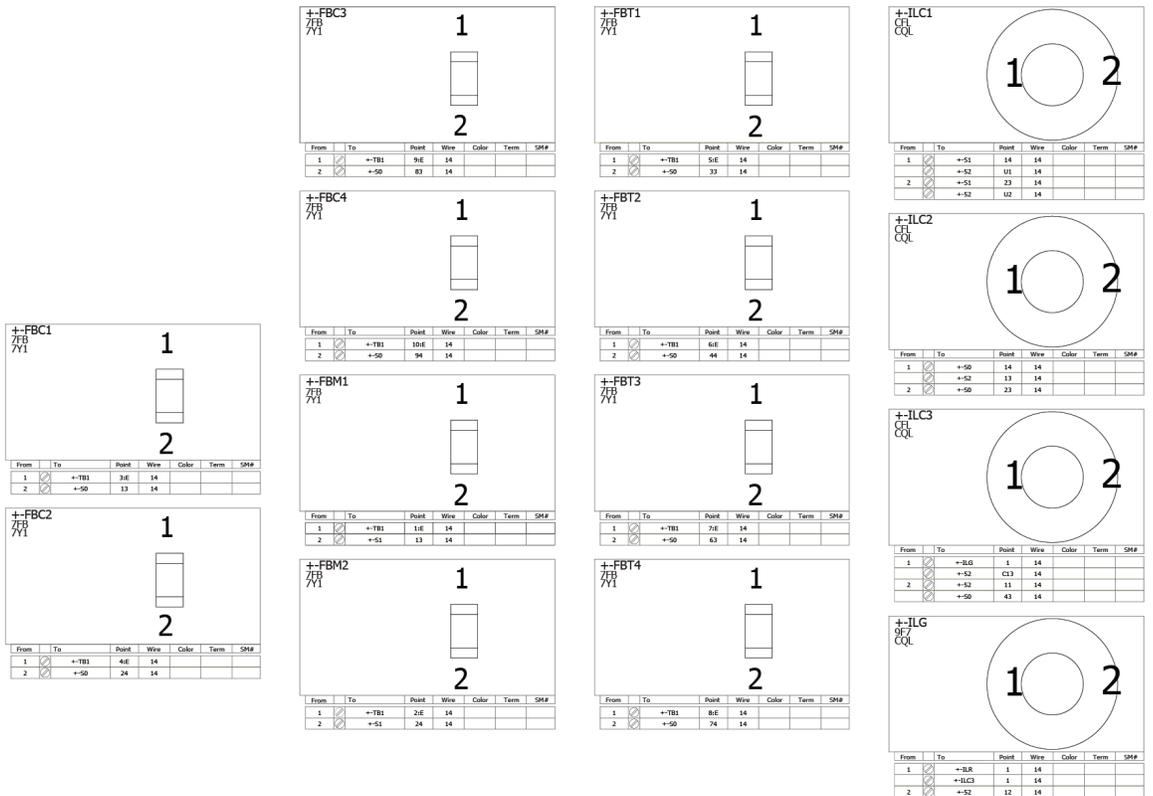
Aside from keeping the unit clean and dry, the most important requirement is to return the TEST CONNECTORS to the cabinet area when not connected to a breaker.



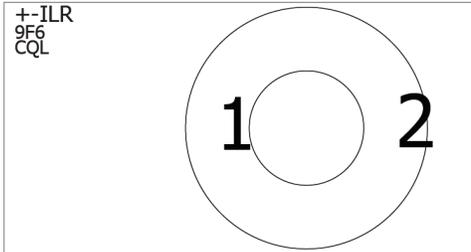
03 Terminal diagram



04 Device connection diagram



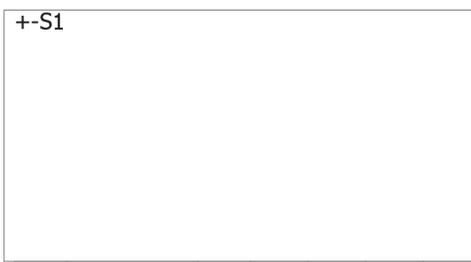
05 Device connection diagram



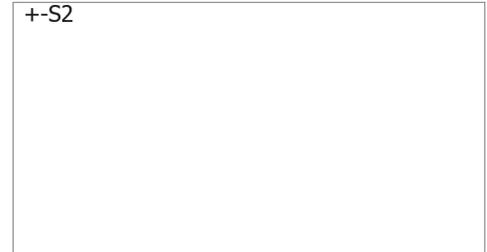
From	To	Point	Wire	Color	Term	SM#
1	+S0	34	14			
	+ILG	1	14			
2	+S2	14	14			



From	To	Point	Wire	Color	Term	SM#
13	+FBC1	2	14			
14	+ILC2	1	14			
23	+ILC2	2	14			
	+S2	C2	14			
24	+FBC2	2	14			
33	+FBT1	2	14			
34	+S2	23	14			
	+ILR	1	14			
43	+ILC3	2	14			
	+S2	C12	14			
44	+FBT2	2	14			
63	+FBT3	2	14			
64	+S3	13	14			
73	+S2	D2	14			
74	+FBT4	2	14			
83	+FBC3	2	14			
84	+S4	23	14			
93	+S2	C22	14			
	+S2	R2	14			
94	+FBC4	2	14			



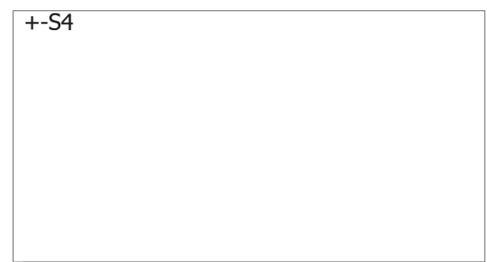
From	To	Point	Wire	Color	Term	SM#
13	+FBM1	2	14			
14	+ILC1	1	14			
23	+ILC1	2	14			
24	+FBM2	2	14			



From	To	Point	Wire	Color	Term	SM#
13	+ILC2	1	14			
	+S2	C3	14			
14	+S2	C1	14			
23	+S0	34	14			
24	+S2	C11	14			



From	To	Point	Wire	Color	Term	SM#
13	+S0	64	14			
	+S3	23	14			
14	+S3	24	14			
23	+S3	13	14			
24	+S3	14	14			
	+S2	D1	14			



From	To	Point	Wire	Color	Term	SM#
13	+S4	23	14			
14	+S2	R1	14			
23	+S0	84	14			
	+S4	13	14			
24	+S2	C21	14			

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