Littelfuse
Expertise Applied | Answers Delivered

Tel: +1-800-832-3873
E-mail: relays@littelfuse.com
www.littelfuse.com/SB5000

SB5000 SERIES MANUAL

INDUSTRIAL SHOCK BLOCK®

REVISION 1-D-043023

Copyright © 2023 by Littelfuse, Inc.

All rights reserved.

This page intentionally left blank.

TABLE OF CONTENTS

SECTION **PAGE**

1 Introduction 1
1.1 General 1
1.1.1 SB5000 GFCI 1
1.1.2 SB5000 SPGFCI 1
1.1.3 SB5000 EGFPD 2
1.2 Features 2
1.3 Operator Interface 2
2 Installation 2
2.1 Mounting 2
2.2 Supply Connections 2
2.3 Load Phase Connections 2
2.4 Ground Connections 2
2.5 Load-Ground-Connection Monitor 2
2.6 Trip Status Terminals 3
3 Operation and Setup 14
3.1 Operator Interface Buttons 14
3.1.1 Test 14
3.1.2 Reset 14
3.2 LED Indication 14
3.2.1 Power 14
3.2.2 Enabled 14
3.2.3 GF Trip 14
3.2.4 GC Status 14
3.3 Settings 15
3.3.1 Termination Device Type (Switch 1) 15
3.3.2 GC Reset Mode (Switch 2) 15
3.3.3 GF Reset Mode (Switch 3) 15
3.3.4 PWR Loss Mode (Switch 4) 15
3.4 Input Connection 15
3.5 Undervoltage, Overvoltage and Chatter Detection 15
3.6 Temperature Limit Trip 15
3.7 Contactor Monitoring 15
3.8 Ground-Fault Detection 15
3.9 Load-Ground-Connection Monitor 15
3.10 UL 943 Self-Test and UL 1998 Requirements 16
4 UL 943C Requirements 17
4.1 Trip Time 17
4.2 Grounding Circuit 17
4.3 Grounding Monitor/Interrupter 17
5 Troubleshooting 18
6 Technical Specifications 19
6.1 SB5032 Series 19
6.2 SB5060 Series 19
6.3 SB5080 Series 20
6.4 SB5100 Series 20
6.5 General Specifications 21
7 Ordering Information 22
Appendix A SB5000 Series Revision History 23

LIST OF FIGURES

FIGURE **PAGE**

1 UL GFCI Classes 1
2 Three-Phase Connection Diagram (GFCI Configuration Shown) 3
3 Single/Split-Phase Connection Diagram (EGPFD Configuration Shown) 4
4 SB5060-x11-0 Model (Lid not shown) 5
5 SB5060 (Lid closed) 6
6 SB5100-x11-0 and SB5100-021-0 Model (Lid not shown) 7
7 SB5100 (Lid closed) 8
8 SB5060 Outline and Mounting Details 9
9 SB5060 Conduit Cutout Locations 10
10 SB5100 Outline and Mounting Details 11
11 SB5100 Conduit Cutout Locations 12
12 1N5339B Zener-Diode and SE-TA6-SM Termination Devices 12
13 SE-TA6 Termination Assembly 13
14 SE-TA6ASF-WL Small-Format Termination Assembly with Wire Leads 13
15 Configuration Switches 15
16 SB5000 Series Temperature Derating Curves 16
17 Class-A GFCI Curve 17
18 Class-C and -D SPGFCI Curve 17

LIST OF TABLES

TABLE **PAGE**

1 Power and Trip Status LEDs 14
2 Status LED Troubleshooting 18

DISCLAIMER

Specifications are subject to change without notice. Littelfuse is not liable for contingent or consequential damages, or for expenses sustained as a result of incorrect application, incorrect adjustment, or a malfunction.

This page intentionally left blank.

1 INTRODUCTION

1.1 GENERAL

The SB5000 Industrial Shock Block™ is available as a ground-fault circuit interrupter (GFCI), special-purpose ground-fault circuit interrupter (SPGFCI), or as an equipment ground-fault protective device (EGFPD). All types operate within the time-current curve defined by UL 943 and CSA C22.1 for Class A GFCIs.

The SB5000 is available for voltages from 208 to 600 V and are continuously rated at 32, 60, 80, or 100 A. SB5000 models have NEMA-4X and IP69K ratings and are UL-listed.

The following model types are available:

- GFCI Class A with a 6 mA fixed trip level
- SPGFCI Class C with a 20 mA fixed trip level
- SPGFCI Class D with a 20 mA fixed trip level
- EGFPD with selectable trip-level settings from 6 to 100 mA

Class A GFCIs are UL 943 listed and CSA certified to C22.2 No. 144.1.

Class C and Class D SPGFCIs are UL 943C listed and CSA certified to C22.2 No. 144-M91.

EGFPD models have adjustable trip-level settings from 6 to 100 mA and are UL 943 and UL 1053 listed. EGFPD models are also CSA certified to C22.2 No. 144-M91.

1.1.1 SB5000 GFCI

GFCI models are permanently-connected GFCIs that meet the requirements of the UL 943 definition for Class A devices, with a fixed 6-mA trip level. It is available only for 208 Vac systems.

1.1.2 SB5000 SPGFCI

SPGFCI models are permanently-connected special-purpose GFCIs that meet the requirements of UL 943C definitions for Class C and Class D devices, with a fixed 20-mA trip level. These classes extend GFCI protection beyond the standard 6-mA Class-A GFCI and are appropriate for many industrial and commercial applications.

Special-purpose SB5000 GFCIs (Class C or Class D) can be used in the following applications:

- 3-Phase Grounded-neutral systems where voltage to ground is above 150 Vac and equipment grounding or double insulation is required by the National Electrical Code (NEC) and ANSI/NFPA 70.
- 3-Phase Grounded-neutral systems where voltage to ground is 150 Vac or less and equipment grounding or double insulation is provided, but the use of a Class A ground-fault circuit interrupter is not practical.
- Any 3-Phase CEC application in which a Class A GFCI is not required.

The UL GFCI classes and their intended applications are shown in Fig. 1.

The SB5000 also provides ground-connection monitoring as required by UL 943C. The ground-monitoring function automatically disconnects the supply if the load is not properly bonded to ground, and requires a cable pilot wire and a termination device installed at the load. The SB5000 will not allow its contactor to close on power-up and will open the contactor if the load ground is not connected. See Fig. 2.

If required by the application, a load-ground-connection monitor feature can be enabled for Class A GFCI models. See Section 2.5.

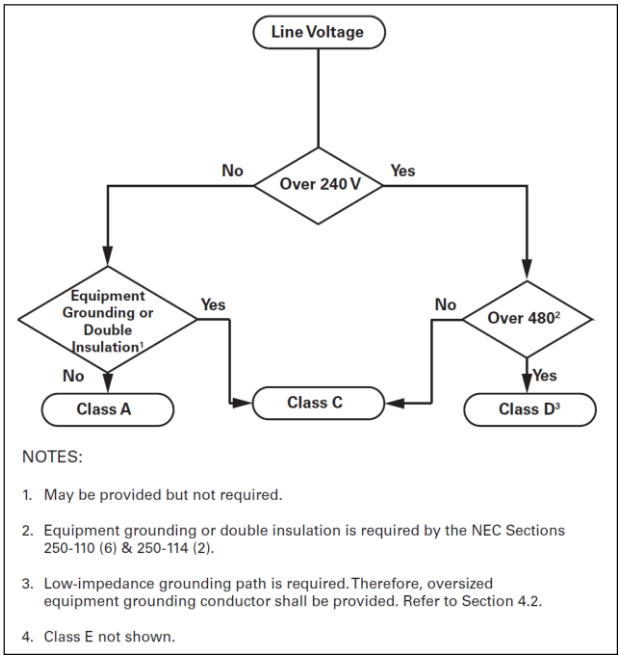


FIGURE 1. UL GFCI Classes.

1.1.3 SB5000 EGFPD

EGFPD models can be set to trip at 6 mA or from 10 to 100 mA in increments of 10 mA, and meet the requirements of UL 943 and UL 1053. The adjustable trip level can help prevent nuisance tripping in some applications.

If required by the application, a load-ground-connection monitor feature can be enabled for EGFPD models. See Section 2.5.

1.2 Features

- UL 943 inverse time curve reduces the probability of nuisance tripping.
- UL 943 fixed trip level (Class A GFCI models) provides protection meeting NEC 210.8 (B) for commercial kitchens, wet areas, and other applications.
- UL 943C fixed trip level (GFCI models) provides protection for systems with leakage current higher than the 6-mA trip level required by Class A GFCIs.
- Selectable trip levels (EGFPD models) help reduce nuisance tripping by allowing users to adjust the trip level in systems that have leakage current higher than UL 943 Class A 6-mA trip level, or UL 943C Class C or D 20-mA trip level.
- UL 943C ground-connection monitoring ensures continuity of the load ground.
- Undervoltage, brown-out and chatter detection prolong the internal contactor lifetime.
- Meets UL 1998 requirements.
- Self-test feature continuously monitors hardware to ensure safe operation.
- Conformally coated circuit boards.

1.3 Operator Interface

The operator interface includes LED status indication including the following:

- POWER
- ENABLE
- GF TRIP
- GC STATUS
- TEST and RESET buttons

2. Installation

The SB5000 is considered to be a permanently mounted GFCI/EGFPD and should be attached to a wall or other suitable mounting surface.

The connection diagram for three-phase systems is shown in Fig. 2. For two-phase or split-phase applications, refer to Fig. 3. This product is not intended to be used with a neutral connection – do not connect a neutral wire to any of the input terminals. Ensure that all conductors have the required voltage and current ratings necessary for the application. SB5000 installation should be performed by a qualified person. For further questions or clarifications, please contact relays@littelfuse.com.

2.1 Mounting

Install SB5000 models in the correct orientation as shown in Figs. 8 and 10, and refer to the 'This Side Up' label attached to the side of the enclosure.

All models ship with no cable entry points predrilled. Appropriate holes must be made in the enclosure and fitted with NEMA-4X-rated (and IP69K-rated when required) fittings for the installation of all conductors. Space is left near the bottom or lower sides of the enclosure to install the wiring. See Figs. 4 and 6.

2.2 Supply Connections

The supply phases are marked Input A, B, and C on the base of the chassis as shown in Figs. 4 and 6. Use a hex driver (or flat-blade screwdriver for some models) to tighten the input connections. Torque the input terminals as described in Section 6. For SB5032 and SB5060, the input terminals will accept 4 to 18 AWG copper wire conductors. For SB5080 and SB5100, the input terminals will accept 2 to 14 AWG copper wire conductors.

2.3 Load Phase Connections

The load phases are marked Output A, B, and C on the base of the chassis as shown in Figs. 4 and 6. Use a hex driver (or flat-blade screwdriver for some models) to tighten the output connections. Torque the output terminals as described in Section 6. For SB5032 and SB5060, the output terminals will accept 4 to 18 AWG copper wire conductors. For SB5080 and SB5100, the output terminals will accept 2 to 14 AWG copper wire conductors.

2.4 Ground Connections

Connect the supply and load ground conductors to the chassis bonding point (⏚) as shown in Figs. 4 and 6. Use a flat-blade screwdriver to tighten the ground connections. Torque the ground terminals as described in Section 6. The ground terminals will accept 14 to 1/0 AWG (2.08 to 53.5 mm^2) conductors.

2.5 Load-Ground-Connection Monitor

An insulated pilot wire from the SB5000 to the load, and a termination device located at the load are required to monitor the load-ground connection. Total pilot wire and ground wire resistance must be less than 28 ohms (trip resistance is 38 ohms). Outline dimensions and mounting details for compatible termination devices are shown in Figs. 12, 13, and 14.

This monitoring function is required for Class C and Class D GFCI models installed in NEC applications, and can be implemented if desired for Class A GFCI or EGFPD models.

Use only a Littelfuse termination device as others may not meet performance requirements. Each SB5000 GFCI is supplied with a 1N5339B termination device. Install the termination device at the load to complete the ground-connection loop as shown in Fig. 2. Connect terminal G

of the termination device to the equipment frame so that the ground-conductor-to-equipment-frame connection will be included in the monitored loop. Connect terminal GC of the termination device to the end of the pilot wire located in the equipment (load), and connect the other end of the pilot wire to the SB5000 terminal GC. Leave terminal REF (in the SB5000) unconnected in this configuration.

Class A GFCI and EGFPD models include a 1N5339B termination device installed at the GC and REF terminals. The termination device should remain installed at the GC and REF terminals if the load-ground-connection monitoring feature is not required. See Fig. 3.

2.6 Trip Status Terminals

A normally-open contact (labeled TRIP STATUS) is provided on all models. This contact, rated at 1 A, 24 Vac/Vdc, follows the state of the internal contactor. See Figs. 2 and 3.

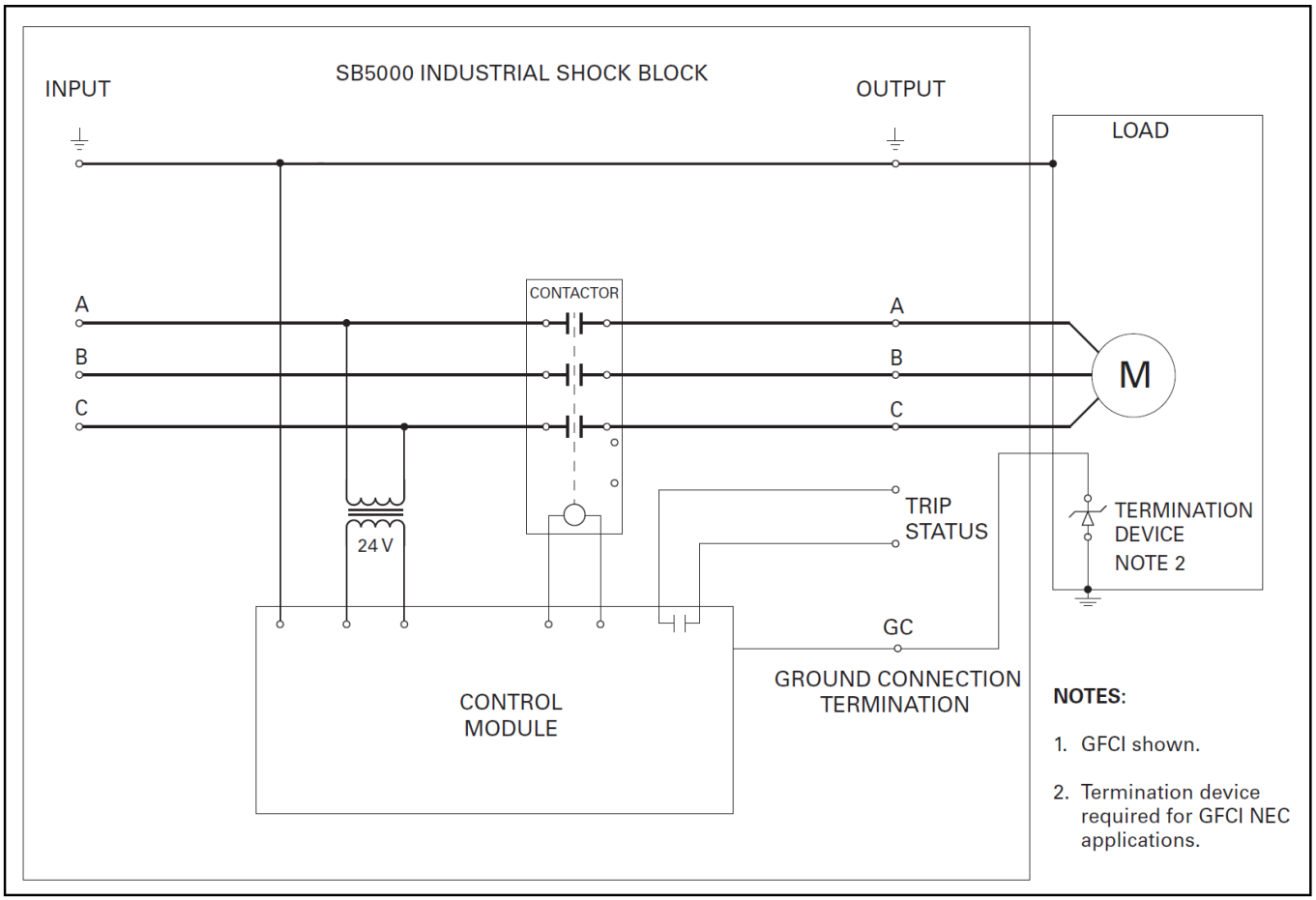
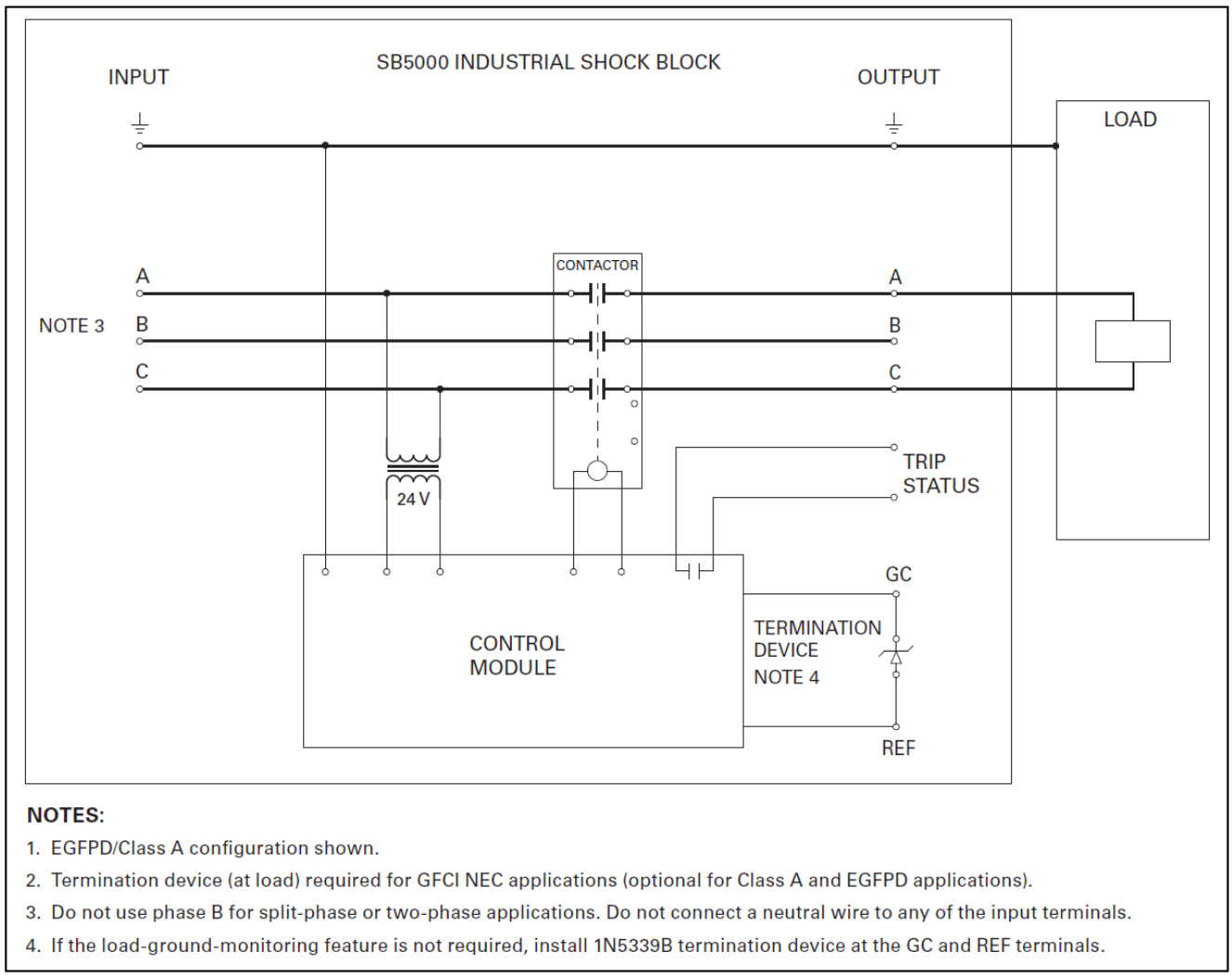


FIGURE 2. Three-Phase Connection Diagram (GFCI Configuration Shown).



NOTES:

1. EGFPD/Class A configuration shown.
2. Termination device (at load) required for GFCI NEC applications (optional for Class A and EGFPD applications).
3. Do not use phase B for split-phase or two-phase applications. Do not connect a neutral wire to any of the input terminals.
4. If the load-ground-monitoring feature is not required, install 1N5339B termination device at the GC and REF terminals.

FIGURE 3. Split-Phase/Two-Phase Connection Diagram (EGFPD Configuration Shown).

FIGURE 4. SB5060-x11-0 Model (Lid not shown).

FIGURE 5. SB5060 (Lid closed).

FIGURE 6. SB5100-x01-0 and SB5100-021-0 Model (Lid not shown)

FIGURE 7. SB5100 (Lid closed).

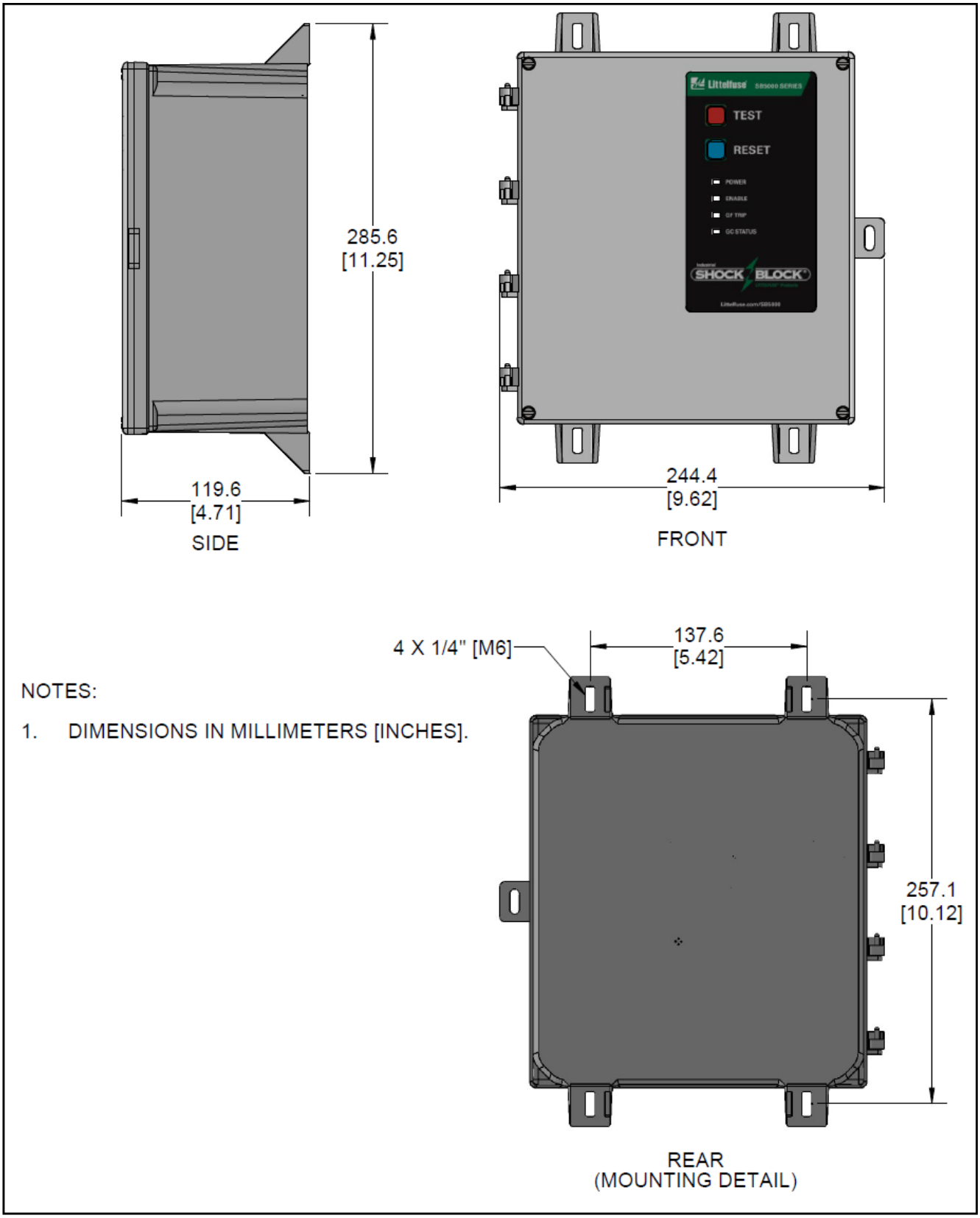


FIGURE 8. SB5060 Outline and Mounting Details.

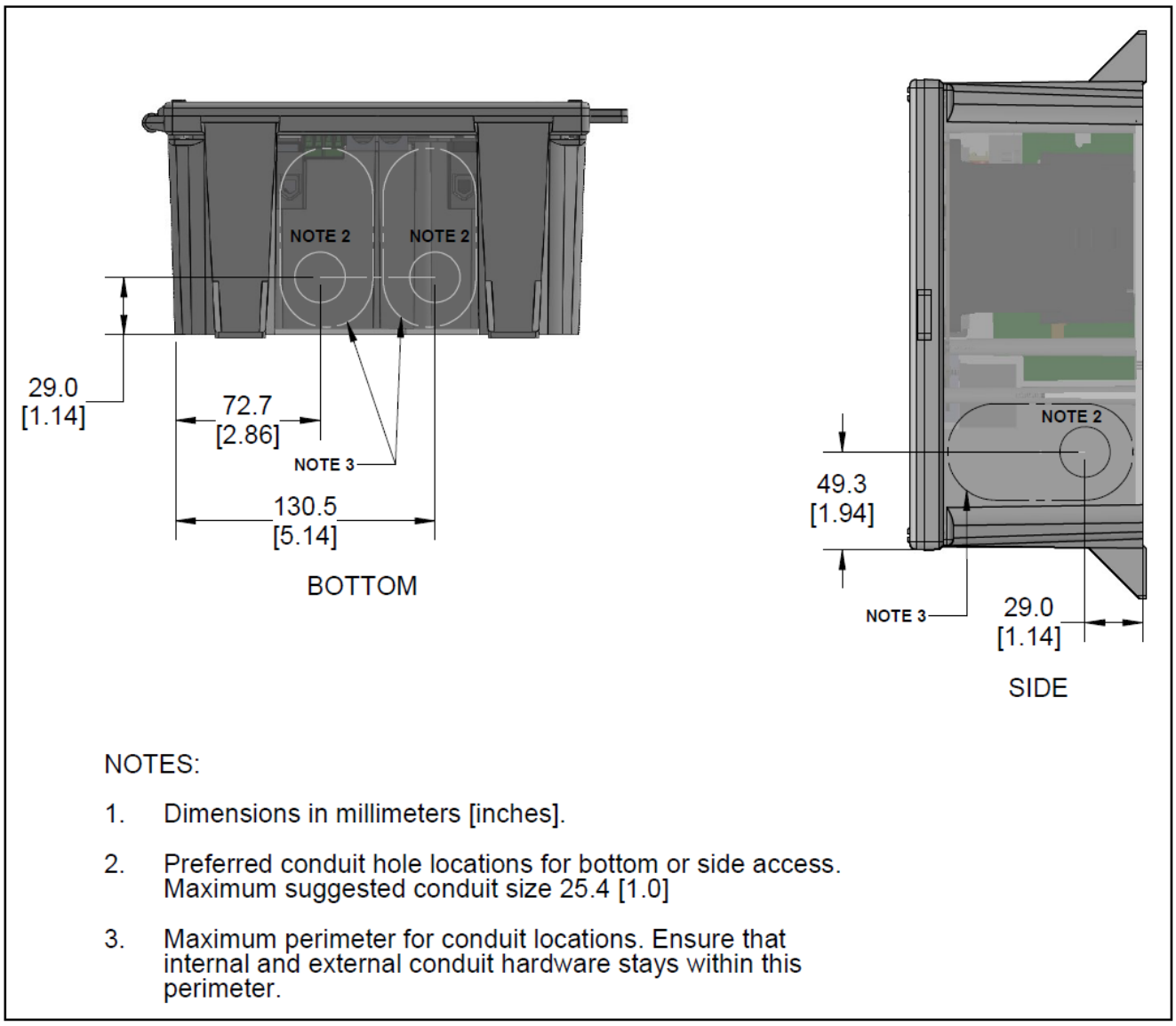


FIGURE 9. SB5060 Conduit Cutout Locations

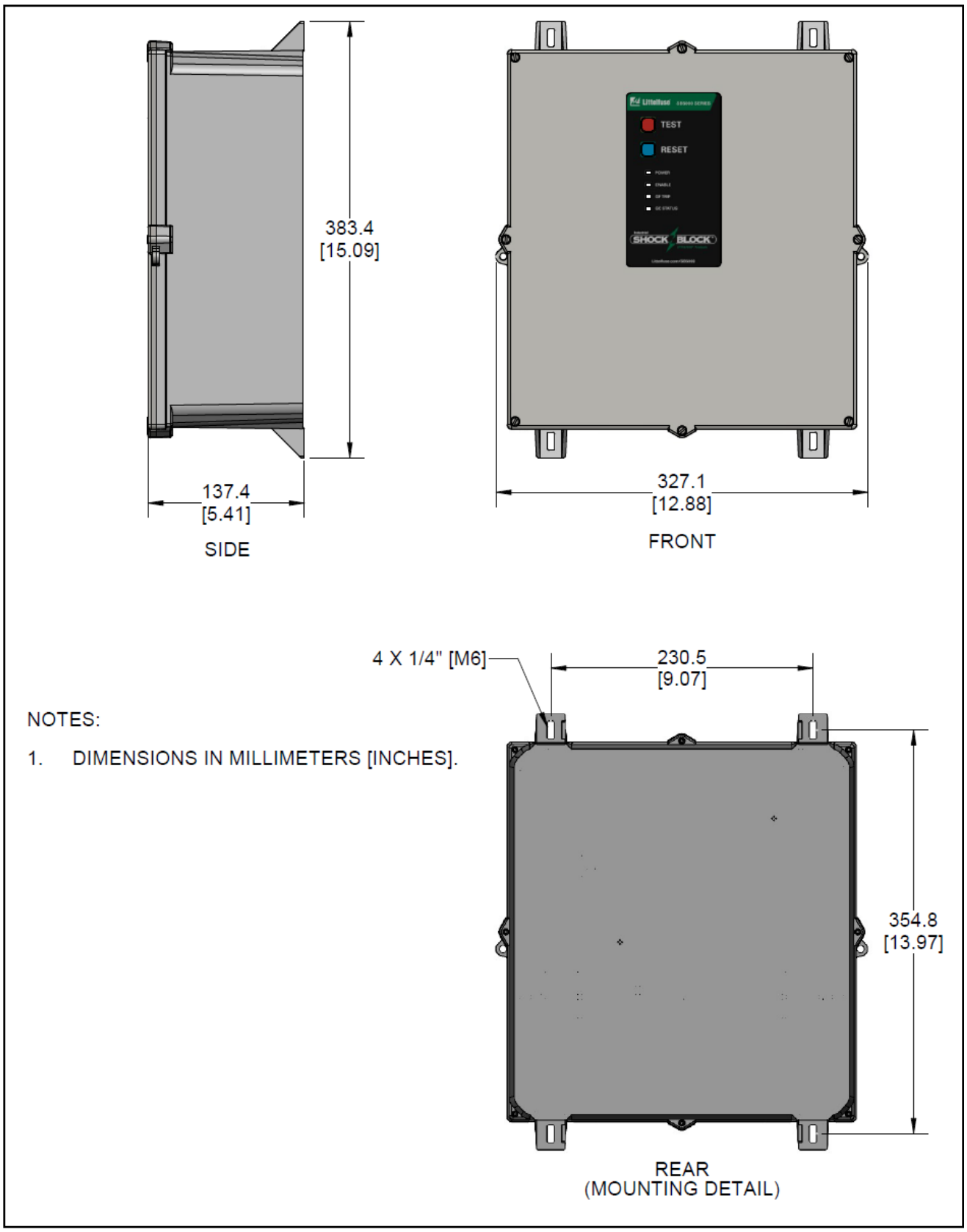


FIGURE 10. SB5100 Outline and Mounting Details.

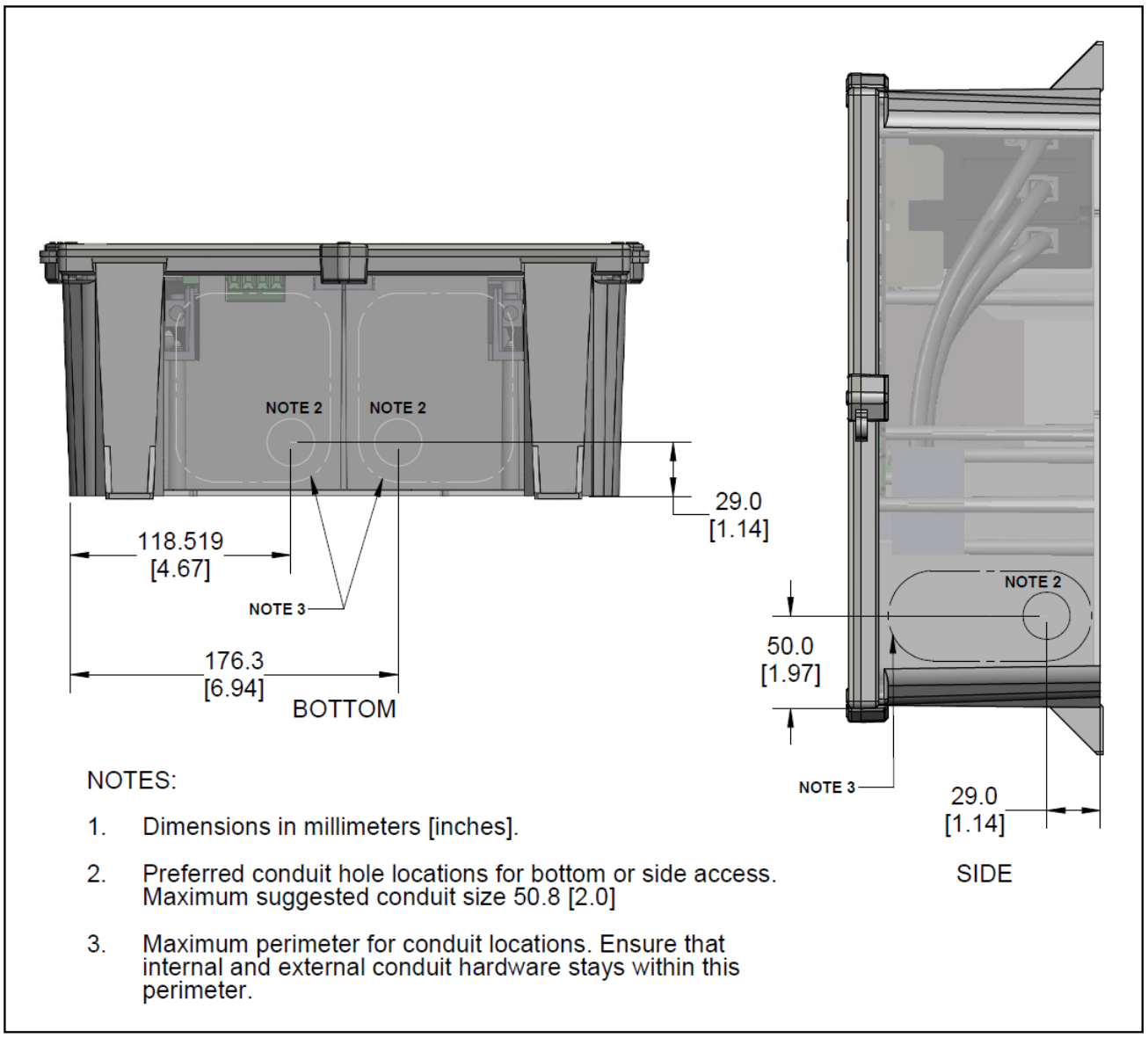


FIGURE 11. SB5100 Conduit Cutout Locations.

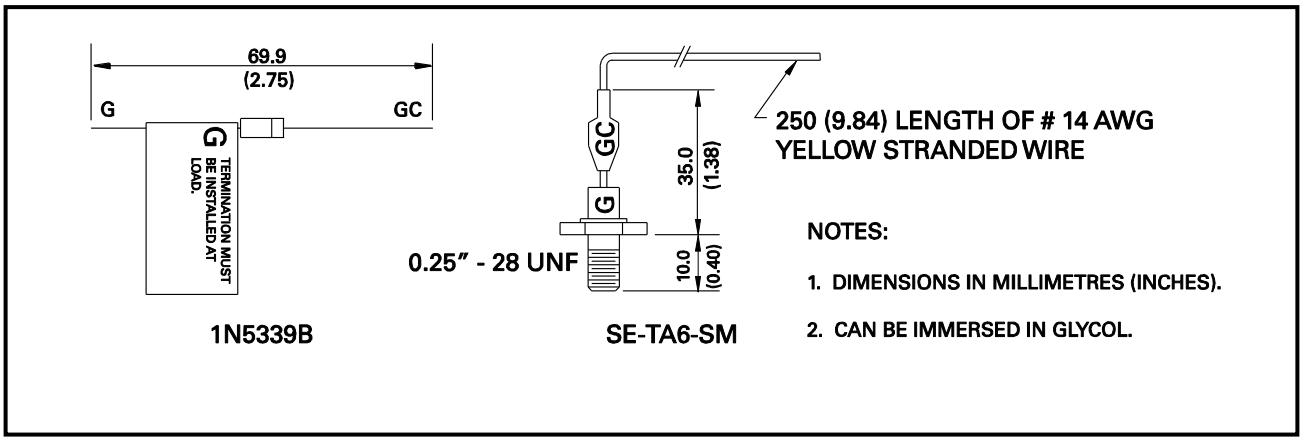


FIGURE 12. 1N5339B Zener-Diode and SE-TA6-SM Termination Devices.

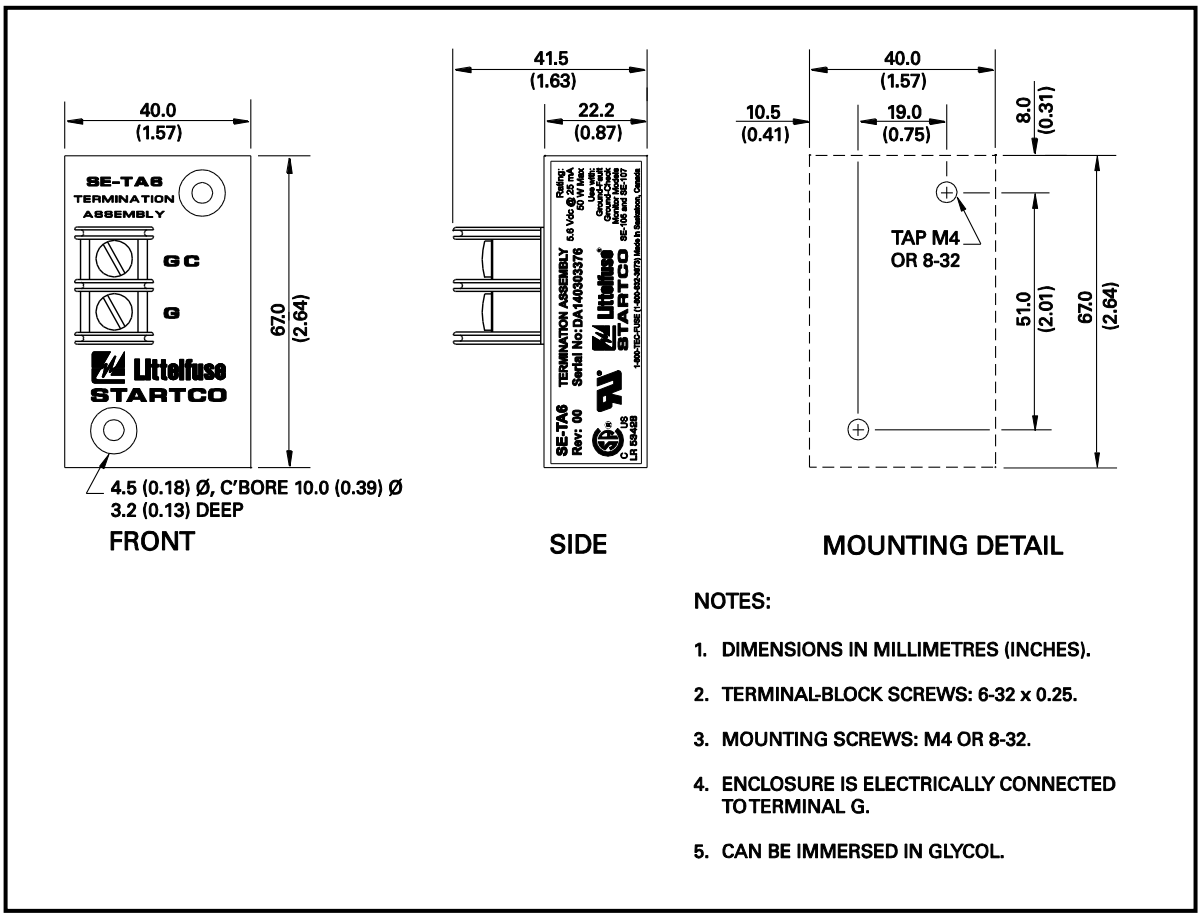


FIGURE 13. SE-TA6 Termination Assembly.

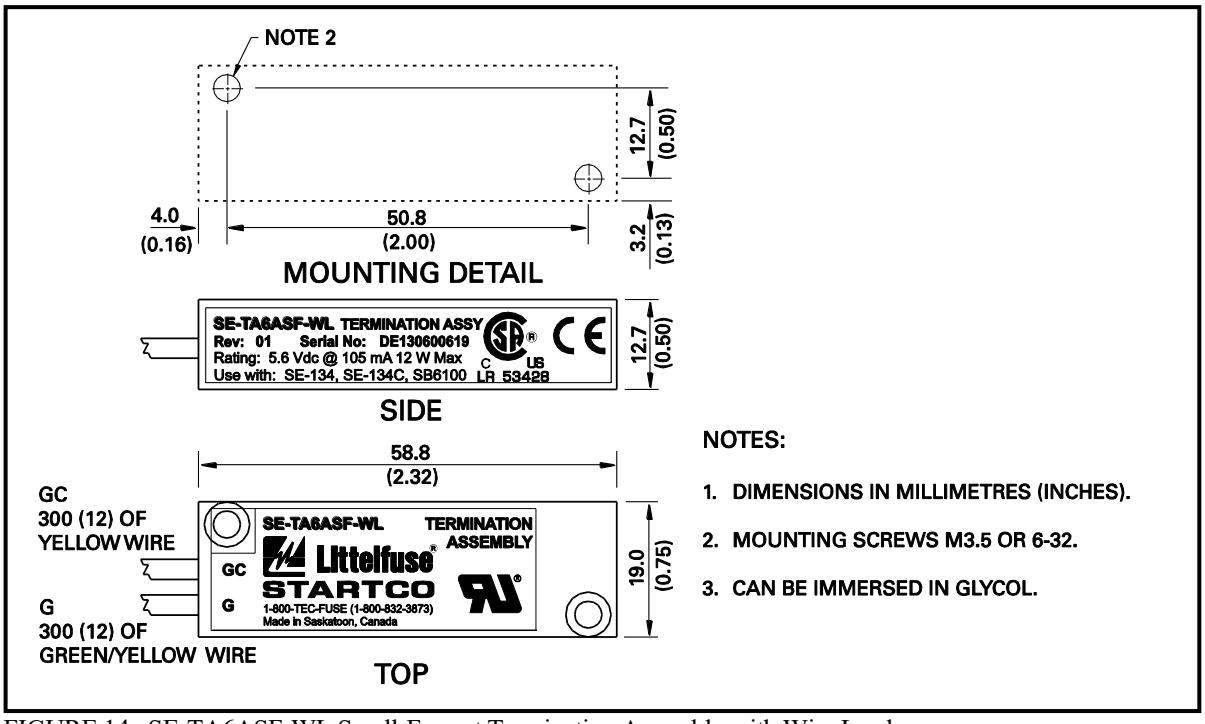


FIGURE 14. SE-TA6ASF-WL Small-Format Termination Assembly with Wire Leads.

3. OPERATION AND SETUP

NOTE: When its input terminals become energized, the SB5000 powers up in RESET mode (default setting) and the connected circuit will be energized after a brief system test. See Section 3.3. for additional configuration settings.

3.1 OPERATOR INTERFACE BUTTONS

3.1.1 TEST

The TEST button is used to de-energize the load and to test the SB5000 ground-fault detection circuit, indication, and contactor. When the TEST button is pressed for one second, the GF TRIP LED will turn ON, the ENABLE LED will turn OFF, and the SB5000 will trip.

3.1.2 RESET

The RESET button is used to reset the SB5000 after a ground fault has occurred and to energize the load. When the RESET button is momentarily pressed and there are no fault conditions present, the contactor will close and the ENABLE LED will be ON. If the SB5000 trips immediately after a reset, a ground fault is still present.

3.2 LED INDICATION

3.2.1 POWER

The green LED labeled POWER indicates the presence of supply voltage.

3.2.2 ENABLED

The green LED labeled ENABLE indicates that the contactor is closed. An audible sound from the internal contactor can be heard each time the contactor opens or closes.

When supply voltage is applied to the SB5000, the SB5000 closes the contactor after approximately 10 s if there are no fault conditions present.

3.2.3 GF TRIP

The red LED labeled GF TRIP provides ground-fault trip indication.

If the GF TRIP LED is on, the unit has tripped. One or more conditions may have caused a trip. If the GF TRIP LED is flashing, the SB5000 has detected an undervoltage, overvoltage, chatter, or temperature limit condition. See Table 1 and Sections 3.5 and 3.6.

3.2.4 GC STATUS

The dual-color red and green LED labeled GC STATUS provides ground-continuity indication.

If the GC STATUS LED is red, the unit has tripped. One or more conditions may have caused a trip. If the GC STATUS LED is flashing red, one of the following has occurred: GC Short, Incorrect Termination, Induced AC Voltage Trip, or a Termination Type change. See Table 1 and Sections 3.5 and 3.6.

If the GC STATUS LED is green, the load ground is connected. See Table 1 and Section 3.9.

TABLE 1. POWER AND TRIP STATUS LEDS.

LED	STATE	DESCRIPTION
POWER	ON	Unit Powered
	OFF	Unit Not Powered
ENABLE	ON	Load Connected
	OFF	Load Not Connected
GF TRIP	ON	Unit Tripped
	OFF	Unit Not Tripped
	Flash	Contactor drop-out due to an undervoltage condition, flash code 1 S – 1 L
	Flash	Contactor drop-out due to overvoltage condition, flash code 1 S – 1 L
	Flash	Contactor drop-out due to an over-temperature condition, flash code 2 S – 1 L
	Flash	Contactor drop-out due to chattering condition, flash code 3 S – 1 L
GC STATUS	ON (Green)	Load ground connected (when used)
	ON (Red)	Load ground not connected. Resistance is greater than 38 ohms. This LED will also be ON during the GC validation process.
	Flash (Red)	GC Short Detected 1 S – 1 L
	Flash (Red)	Incorrect Termination Detected 2 S – 1 L
	Flash (Red)	Induced AC Voltage Trip 3 S – 1 L
	Flash (Red)	Termination Type Change (Dip Switch 1) 4 S – 1 L
	OFF	Ground continuity verification in progress, or unit not powered
POWER, GF TRIP, GC STATUS	All three LEDs flashing	Internal diagnostic or Self-Test Fail has been detected

3.3 SETTINGS

The GFCI models have a fixed 6 mA (Class A) or 20 mA (Class C and D) trip-level value.

The EGFPD models can be set to trip at 6 mA, or from 10 to 100 mA in increments of 10 mA. The TRIP LEVEL (mA) rotary selection switch is located on the chassis front panel.

All models include four configuration switches that provide additional selections. Default settings are shown in Fig. 15.

FIGURE 15. Configuration Switches.

3.3.1 Termination Device Type (Switch 1)

The ZENER diode termination is recommended for all applications that require load-ground connection monitoring. The SB5000 senses this termination as a valid end-of-line device and will provide both open-circuit and short-circuit detection. The SB5000 is CSA M421 compliant when used with a zener diode termination.

If a simpler option is required when the zener diode cannot be used, the CONTINUITY ONLY mode can be selected. This mode detects continuity between the pilot wire and ground.

3.3.2 GC Reset Mode (Switch 2)

When set to AUTO, the SB5000 will automatically energize (close) when a valid termination is detected and there are no other trips present.

When set to LATCHING GC RESET, the SB5000 will remain de-energized when a GC Trip occurs. A GC Trip will also be retained when power is removed. Press RESET to clear the GC Trip.

3.3.3 GF Reset Mode (Switch 3)

Regardless of the GF Reset Mode, a GF Trip will always remain latched until it is manually reset.

When set to AUTO, a GF Trip will be cleared after cycling power.

When set to LATCHING GF RESET, a GF Trip will not be cleared after cycling power.

3.3.4 PWR Loss Mode (Switch 4)

When set to AUTO, a Temperature Limit trip will automatically reset when the internal temperature sensor returns to a normal temperature range.

When set to AUTO, a Chatter Detection trip, Undervoltage trip, or Overvoltage trip will automatically reset when the supply voltage remains in a normal range for at least 10 s.

When set to LATCHING PWR LOSS, a Temperature Limit trip, Chatter Detection trip, Undervoltage trip, or Overvoltage trip will require a manual reset after returning to a normal state.

3.4 INPUT CONNECTION

The SB5000 electronics are supplied from input phases A and C. If either phase is not connected, the unit will remain off with the contactor open.

3.5 UNDERVOLTAGE, OVERVOLTAGE, AND CHATTER DETECTION

The input voltage (phases A and C only) is always checked before the contactor is closed. If an input undervoltage condition is detected, the contactor will remain open and the red GF TRIP LED will flash. The control circuit will continuously check the input voltage and will close the contactor when the input voltage is within acceptable limits (if PWR Loss Mode set to AUTO).

Undervoltage detection is provided to prolong the lifetime of the contactor by preventing contactor chatter. Contactor chatter occurs when the voltage applied to the control coil is marginally lower than the minimum pull-in voltage.

3.6 Temperature Limit Trip

The SB5000 includes an internal temperature sensor. A Temperature Limit trip will occur if the temperature is beyond the minimum or maximum temperature limits. The SB5000 can be reset when the temperature returns to a normal temperature range. See Section 6 for details.

3.7 CONTACTOR MONITORING

The SB5000 continuously monitors the state of the contactor. If an incorrect state is detected, a Diagnostic Trip will occur, the contactor will open and will remain open until supply voltage to the unit is cycled. This condition should never be encountered during normal operation.

The SB5000 should be used within the specifications listed in Section 6 to ensure correct operation.

NOTE: At room temperature, the minimum contactor pull-in voltage is approximately 80% of the nominal voltage. At higher temperatures, the minimum pull-in voltage is higher than 80% of the nominal voltage.

3.8 GROUND-FAULT DETECTION

The red GF TRIP LED indicates a ground-fault trip. The SB5000 will remain tripped until the RESET button is pressed or supply voltage is cycled (if GF Reset Mode is set to AUTO). See Section 3.1.2.

3.9 LOAD-GROUND-CONNECTION MONITOR

The Load-Ground-Connection Monitor (GC STATUS) LED indicates that the load ground is open when the LED is red.

If the load ground connect is connected, the GC STATUS LED will turn on (GREEN).

If the load ground connection is not connected during power-up or becomes disconnected during normal operation, the GC STATUS LED will turn ON (RED) and the contactor will open.

The SB5000 continuously monitors the load ground and will automatically close the contactor if the load-ground connection is restored (if GC Reset Mode is set to AUTO).

NOTE: Load-ground-connection monitoring is only required for GFCI Class C and Class D models as per UL 943C. Refer to Section 4.3 for a description of the UL 943C load-ground monitor requirements. For EGFPD and GFCI Class A models, load-ground-connection monitoring is optional.

3.10 UL 943 SELF-TEST AND UL 1998 REQUIREMENTS

The 2015 revision to the UL 943 standard includes a self-test requirement to verify a GFCIs ability to respond to a ground fault. All SB5000 options include an automatic self-test feature. If a problem is detected, the SB5000 will trip. A Self-Test Failure will be indicated by a unique LED pattern as described in Table 1.

A self-test is initiated a few seconds after power-up, a few seconds after the contactor is closed, and during normal operation.

In addition to the automatic self-test, a monthly manual test is also recommended.

Compliance to the UL 1998 Software in Programmable Components standard is also included.

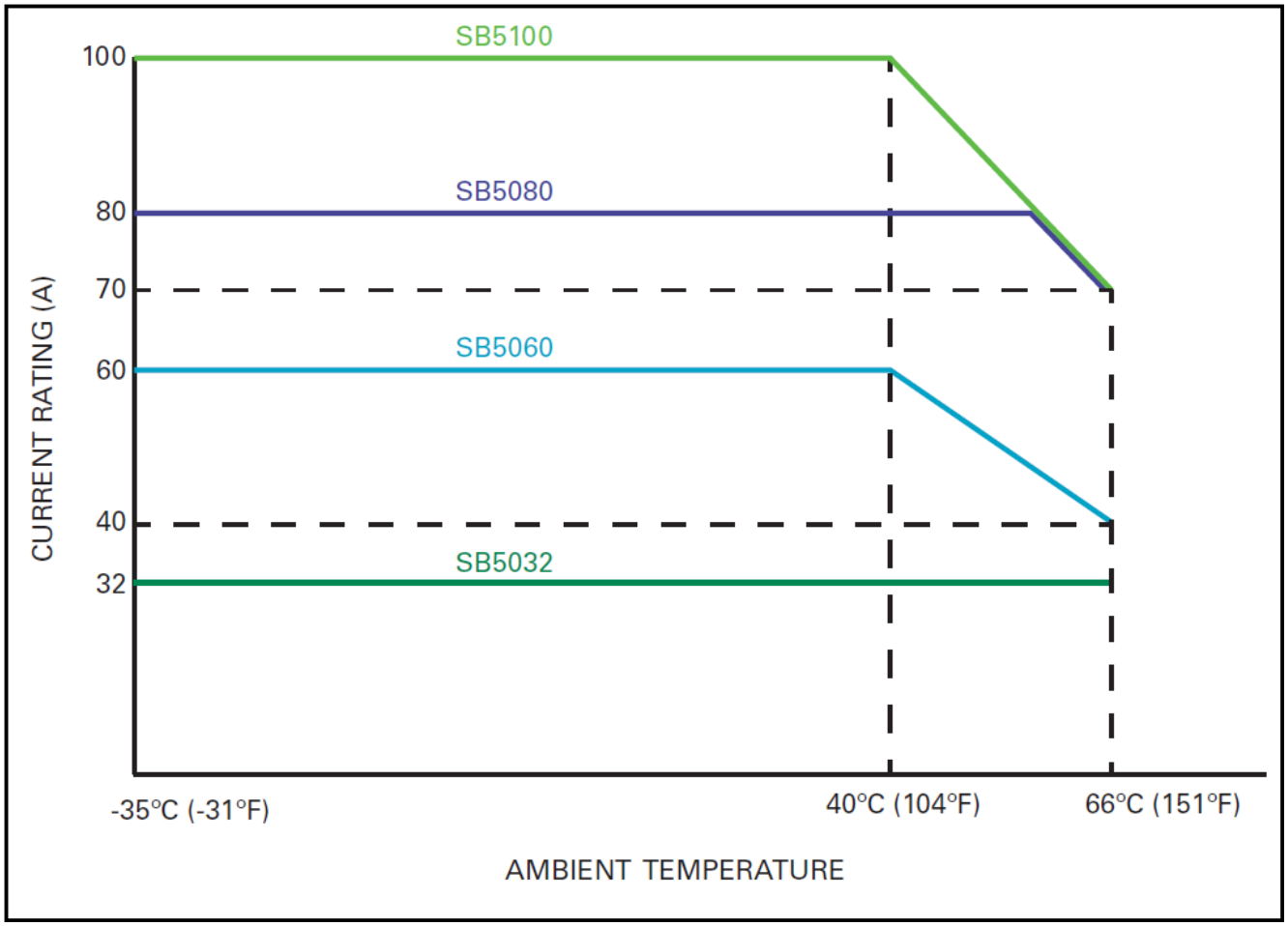


FIGURE 16. SB5000 Series Temperature Derating Curves.

4. UL 943C REQUIREMENTS

The following sections contain excerpts from the UL 943C[1] Standard for Class C and D applications. For EGFPD models, only Section 4.1 applies where selectable trip levels from 6 to 100 mA are permitted (20 mA is the only allowed trip level for SPGFCI devices in NEC applications).

4.1 TRIP TIME

Class C and Class D GFCIs shall be capable of interrupting the electric circuit to the load when the fault current to ground (*I*) is within the range of a minimum of 20 mA through a maximum of (110% of the rated voltage/500 Ω) *A* within the time interval (*T*) in accordance with the relationship:

$$T = \left(\frac{20}{I}\right)^{1.43}$$

Where:

T is expressed in seconds, and
I is expressed in mA
Except that *T* is not required to be less than 20 ms.

The tripping threshold of these GFCIs shall be in the range of 15 to 20 mA.

Fig. 17 shows the Class-A GFCI maximum-trip-time-versus-current curve defined by UL 943 (with the above formula); UL 943 also defines a limit to the formula, with a minimum required trip time (or fastest trip speed) of 20 ms, which occurs at about 300 mA of ground-fault current (*I*) per the formula. Class C and D SPGFCIs must operate within this same curve, except that their operating threshold is 15 to 20 mA (non-adjustable). See Fig. 18. The SB5000 EGFPDs described in this manual also operate within the Class-A formula, but have a 6- to 100-mA threshold setting range.

4.2 GROUNDING CIRCUIT

The equipment grounding circuit of the circuit shall be sufficiently low impedance that, should a fault to ground occur, the voltage resulting across the grounding circuit shall not exceed 150 V. The size of the grounding conductor required for a circuit shall be determined by calculating the resistance using the following formula and converting that value to a wire gauge based on the length of the equipment grounding conductor:

$$R_G = \frac{150\,R_U}{V_{LG} - 150}$$

Where:

R_G is the resistance of the equipment grounding conductor
R_U is the resistance of the ungrounded conductor, and
V_{LG} is the RMS value of the supply line to ground voltage

Refer to UL 943C Appendix A for a sample calculation of grounding conductor size.

4.3 GROUNDING MONITOR/INTERRUPTER

A GFCI shall be capable of detecting and causing interruption of the circuit under both of the following conditions:

a) An open grounding circuit, and
b) Impedance in the grounding circuit that would allow more than a 150 volt drop in the grounding circuit.

[1] Excerpts from UL 943C are the property of Underwriters Laboratories Inc.

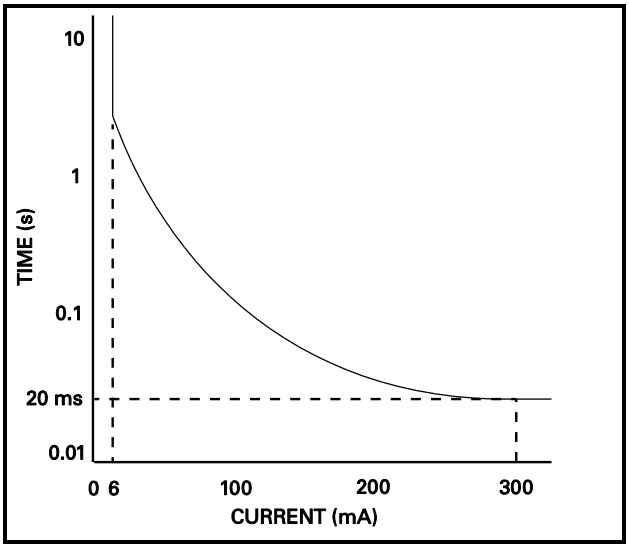


FIGURE 17. Class-A GFCI Curve.

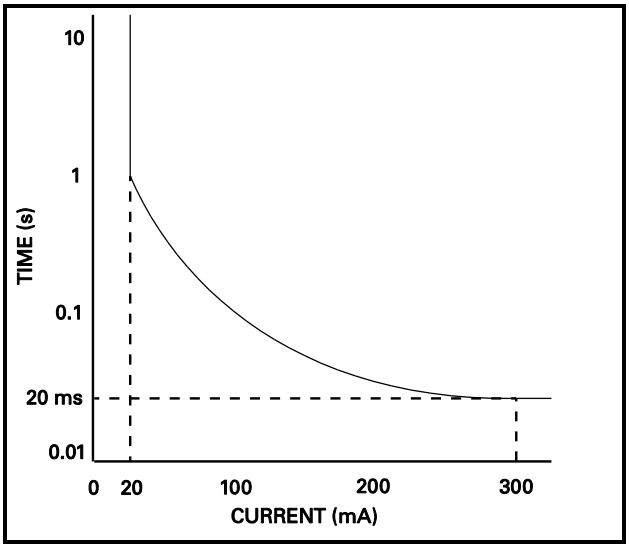


FIGURE 18. Class-C and -D SPGFCI Curve.

5. TROUBLESHOOTING

TABLE 2. STATUS LED TROUBLESHOOTING.

STATUS LEDS					DESCRIPTION	TROUBLESHOOTING
POWER	ENABLE	GF TRIP	GC STATUS			
ON	ON	OFF	ON (GREEN)		Normal Operation	----------
OFF	OFF	OFF	OFF		No Power to the SB5000	Check supply connection to, and external power fuses of, inputs A and C.
ON	OFF	ON	ON (GREEN)		Ground Fault Occurred	Clear ground fault on the system and press RESET.
ON	OFF	FLASH 1 S – 1 L	ON (GREEN)		Contactor Drop-Out Due to an Undervoltage, Overvoltage, or Chattering Condition	Verify the input voltage is within acceptable limits and press RESET.
ON	OFF	FLASH 2 S – 1 L	ON (GREEN)		Contactor Drop-Out Due to a Temperature-Limit Exceeded Condition	Allow the temperature to fall back to a normal range.
ON	OFF	FLASH 3 S – 1 L	ON (GREEN)		Temperature limit exceeded Contactor Drop-Out Due to a Chattering Condition	Verify the input voltage is within acceptable limits and press RESET.
ON	OFF	OFF	ON (RED)		Load-Ground Connection Open	Check load ground, pilot wire, and termination device(1).
ON	OFF	OFF	FLASH (RED) 1 S – 1 L		GC Short detected	Check resistance between GC wire and ground. Ensure that the resistance is greater than 500 ohms.
ON	OFF	OFF	FLASH (RED) 2 S – 1 L		Incorrect termination type detected	Confirm that the intended termination type is selected (see Section 3.3). If the Zener termination type is selected, ensure that the termination is installed correctly (if used).
ON	OFF	OFF	FLASH (RED) 3 S – 1 L		Induced AC limit detected	Induced AC has exceeded 10 Vrms for greater than 500ms.
ON	OFF	OFF	FLASH (RED) 4 S – 1 L		Termination type has been changed.	Confirm that the selected termination type (Dip Switch 1) matches the installed termination type and press RESET.
FLASH	OFF	FLASH	FLASH RED		Diagnostic error or Self-Test failure	Cycle power. If error repeats, consult factory.

NOTES:

(1) If ZENER mode is selected, a zener termination device is required. If CONTINUITY ONLY mode is selected, a termination device is not required.

6. TECHNICAL SPECIFICATIONS

6.1 SB5032 Series

Voltage, Current, and Power Ratings[1]:

208 Vac Option:

- Voltage: 3 PH, 3 wire (no neutral), 60 Hz[2], 208 Vac (+10, -15%)
- Current:
  - AC-1: 32 A
  - AC-3: 32 A
    - Breaking Capacity: 6 x 32 A
    - Making Capacity: 6 x 32 A
- Power (AC-3): 10 hp

480 Vac Option:

- Voltage: 3 PH, 3 wire (no neutral), 60 Hz[2], 480 Vac (+10, -15%)
- Current:
  - AC-1: 32 A
  - AC-3: 32 A
    - Breaking Capacity: 5 x 32 A
    - Making Capacity: 5 x 32 A
- Power (AC-3): 20 hp

600 Vac Option:

- Voltage: 3 PH, 3 wire (no neutral), 60 Hz[2], 600 Vac (+10, -15%)
- Current:
  - AC-1: 32 A
  - AC-3: 32 A
    - Breaking Capacity: 4 x 32 A
    - Making Capacity: 4 x 32 A
- Power (AC-3): 15 hp

Wiring and Torque Requirements:

- Input and Output Terminals:
  - Conductor Size: 18 to 4 AWG (0.82 to 21.2 mm^2)
  - Terminal Type: Hex (0.125 in.)
  - Torque: 16 lbf·in (1.8 N·m)
- Ground-Check and Trip Status Terminals:
  - Conductor Size: 26 to 12 AWG (0.13 to 3.3 mm^2)
  - Torque: 5 lbf·in (0.56 N·m)

Short-Circuit Current Rating: 10 kA,

Test Information: Tested with Littelfuse K5 input fuses installed. K5 fuses have a short-circuit current rating of 50 kA

Fuse Requirements:

- Input Fuses (not included):
  - Fuse Rating: 35 A, 600 Vac, Class K5 or RK5
  - Fuse Part Number: Littelfuse 0NLS035.T or FLSR035.T

Dimensions:

- Height: 285.6 mm (11.25 in.)
- Width: 244.4 mm (9.62 in.)
- Depth: 119.6 mm (4.71 in.)

Shipping Weight: 4.5 kg (10 lb)

6.2 SB5060 Series

Voltage, Current, and Power Ratings[1]:

208 Vac Option:

- Voltage: 3 PH, 3 wire (no neutral), 60 Hz[2], 208 Vac (+10, -15%)
- Current:
  - AC-1: 60 A
  - AC-3: 60 A
    - Breaking Capacity: 6 x 60 A
    - Making Capacity: 6 x 60 A
- Power (AC-3): 20 hp

480 Vac Option:

- Voltage: 3 PH, 3 wire (no neutral), 60 Hz[2], 480 Vac (+10, -15%)
- Current:
  - AC-1: 60 A
  - AC-3: 60 A
    - Breaking Capacity: 5 x 60 A
    - Making Capacity: 5 x 60 A
- Power (AC-3): 40 hp

600 Vac Option:

- Voltage: 3 PH, 3 wire (no neutral), 60 Hz[2], 600 Vac (+10, -15%)
- Current:
  - AC-1: 60 A
  - AC-3: 60 A
    - Breaking Capacity: 4 x 60 A
    - Making Capacity: 4 x 60 A
- Power (AC-3): 25 hp

Wiring and Torque Requirements:

- Input and Output Terminals:
  - Conductor Size: 18 to 4 AWG (0.82 to 21.2 mm^2)
  - Terminal Type: Hex (0.125 in.)
  - Torque: 16 lbf·in (1.8 N·m)
- Ground-Check and Trip Status Terminals:
  - Conductor Size: 26 to 12 AWG (0.13 to 3.3 mm^2)
  - Torque: 5 lbf·in (0.56 N·m)

Short-Circuit Current
Rating ..... 10 kA,
Test Information ..... Tested with Littelfuse K5 input fuses installed. K5 fuses have a short-circuit current rating of 50 kA

Fuse Requirements:
Input Fuses (not included):
Fuse Rating ..... 60 A, 600 Vac, Class K5 or RK5
Fuse Part Number ..... Littelfuse 0NLS060.T or FLSR060.T

Dimensions:
Height ..... 285.6 mm (11.25 in.)
Width ..... 244.4 mm (9.62 in.)
Depth ..... 119.6 mm (4.71 in.)

Shipping Weight ..... 4.5 kg (10 lb)

6.3 SB5080 Series

Voltage, Current, and Power Ratings[1]:
208 Vac Option:
Voltage ..... 3 PH, 3 wire (no neutral), 60 Hz[2], 208 Vac (+10, -15%)
Current:
AC-1 ..... 80 A
AC-3 ..... 80 A
Breaking Capacity ..... 6 x 80 A
Making Capacity ..... 6 x 80 A
Power (AC-3) ..... 25 hp

480 Vac Option:
Voltage ..... 3 PH, 3 wire (no neutral), 60 Hz[2], 480 Vac (+10, -15%)
Current:
AC-1 ..... 80 A
AC-3 ..... 80 A
Breaking Capacity ..... 5 x 80 A
Making Capacity ..... 5 x 80 A
Power (AC-3) ..... 40 hp

600 Vac Option:
Voltage ..... 3 PH, 3 wire (no neutral), 60 Hz[2], 600 Vac (+10, -15%)
Current:
AC-1 ..... 80 A
AC-3 ..... 80 A
Breaking Capacity ..... 4 x 80 A
Making Capacity ..... 4 x 80 A
Power (AC-3) 40 hp

Wiring and Torque Requirements:
Input and Output Terminals:
Conductor Size ..... 14 to 2 AWG (2.08 to 33.6 mm^2)
Terminal Type ..... Hex 5/32 in.
Torque (2 to 6 AWG) ..... 50 lbf·in (5.6 N·m)
Torque (8 to 14 AWG) ..... 40 lbf·in (4.5 N·m)

Ground-Check and Trip Status Terminals:
Conductor Size ..... 24 to 10 AWG (0.2 to 4.0 mm^2)
Torque ..... 5.31 lbf·in (0.6 N·m)

Short-Circuit Current
Rating ..... 50 kA,
Test Information ..... Tested with Littelfuse K5 input fuses installed. K5 fuses have a short-circuit current rating of 50 kA

Fuse Requirements:
Input Fuses (not included):
Fuse Rating ..... 80 A, 600 Vac, Class K5 or RK5
Fuse Part Number ..... Littelfuse 0NLS080.T or FLSR080.T

Dimensions:
Height ..... 383.4 mm (15.09 in.)
Width ..... 327.1 mm (12.88 in.)
Depth ..... 137.4 mm (5.41 in.)

Shipping Weight ..... 9.07 kg (20.0 lb)

6.4 SB5100 Series

Voltage, Current, and Power Ratings[1]:
208 Vac Option:
Voltage ..... 3 PH, 3 wire (no neutral), 60 Hz[2], 208 Vac (+10, -15%)
Current:
AC-1 ..... 100 A
AC-3 ..... 100 A
Breaking Capacity ..... 6 x 100 A
Making Capacity ..... 6 x 100 A
Power (AC-3) ..... 30 hp

480 Vac Option:
Voltage ..... 3 PH, 3 wire (no neutral), 60 Hz[2], 480 Vac (+10, -15%)
Current:
AC-1 ..... 100 A
AC-3 ..... 100 A
Breaking Capacity ..... 5 x 100 A
Making Capacity ..... 5 x 100 A
Power (AC-3) ..... 50 hp

600 Vac Option:
- Voltage: 3 PH, 3 wire (no neutral), 60 Hz[2], 600 Vac (+10, -15%)
- Current:
  - AC-1: 100 A
  - AC-3: 100 A
    - Breaking Capacity: 4 x 100 A
    - Making Capacity: 4 x 100 A
- Power (AC-3): 60 hp

Wiring and Torque Requirements:
- Input and Output Terminals:
  - Conductor Size: 14 to 2 AWG (2.08 to 33.6 mm^2)
  - Terminal Type: Hex 5/32 in.
  - Torque (2 to 6 AWG): 50 lbf·in (5.6 N·m)
  - Torque (8 to 14 AWG): 40 lbf·in (4.5 N·m)
- Ground-Check and Trip Status Terminals:
  - Conductor Size: 24 to 10 AWG (0.2 to 4.0 mm^2)
  - Torque: 5.31 lbf·in (0.6 N·m)

Short-Circuit Current Rating: 50 kA,
Test Information: Tested with Littelfuse K5 input fuses installed. K5 fuses have a short-circuit current rating of 50 kA

Fuse Requirements:
- Input Fuses (not included):
  - Fuse Rating: 100 A, 600 Vac, Class K5 or RK5
  - Fuse Part Number: Littelfuse 0NLS100.T or FLSR100.T

Dimensions:
- Height: 383.4 mm (15.09 in.)
- Width: 327.1 mm (12.88 in.)
- Depth: 137.4 mm (5.41 in.)

Shipping Weight: 9.07 kg (20.0 lb)

6.5 General Specifications

Trip Level Settings:
- GFCI Class A: Fixed 6 mA
- GFCI Class C and Class D: Fixed 20 mA
- EGFPD: 6, 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100 mA

Trip Time: Defined by:

$$T = \left(\frac{20}{I}\right)^{1.43}$$

or minimum 20 ms. See Section 4.1.

Operating Frequency: 60 Hz ± 3 Hz

Wiring and Torque Requirements:
- Ground Terminals:
  - Conductor Size: 14 to 1/0 AWG (2.08 to 53.5 mm^2)
  - Torque:
    - 14 to 10 AWG (2.08 to 5.26 mm^2): 35 lbf·in (4.0 N·m)
    - 8 AWG (8.36 mm^2): 40 lbf·in (4.5 N·m)
    - 6 to 4 AWG (13.3 to 21.1 mm^2): 45 lbf·in (5.1 N·m)
    - 3 to 1/0 AWG (26.7 to 53.5 mm^2): 50 lbf·in (5.6 N·m)
- Enclosure Cover Fasteners:
  - Torque: 20 lbf·in (2.26 N·m)

PWB Conformal Coating: MIL-1-46058 qualified UL QMJU2 recognized

Ground-Check Circuit:
- Open-Circuit Voltage: 21 Vdc
- Nominal Loop Current (Zener termination): 30 mA
- Maximum Loop Current: 40 mA
- Induced-ac Withstand: 10 Vac
- GC-Loop Trip Resistance: 38 ± 5 Ω
- GC-Loop Reset Resistance: 28 Ω

Trip Status Contact:
- Contact Configuration: Normally Open (N.O.)
- UL Rating: 1 A Resistive, 24 Vac; 1 A Resistive, 24 Vdc

Security:
- Enclosure: Lockable latch

Enclosure: NEMA 4X, IP69K Polycarbonate, Lockable

Environment:
- Temperature:
  - UL Rating: -35 to 66°C (-31 to 151°F)
  - Maximum Operating Range:
    - SB5032 and SB5060: -35 to 75°C (-31 to 167°F)
    - SB5080 and SB5100: -40 to 75°C (-40 to 167°F)
  - Maximum Internal Temp Limit: 90°C (194°F)

Minimum Internal Temp Limit:
SB5032 and SB5060 ..... -40°C (-40°F)
SB5080 and SB5100 ..... -45°C (-49°F)
Temperature derating ..... See Fig. 16
Storage Temperature ..... -55 to 80°C (-67 to 176°F)
Humidity ..... 93% Non-Condensing
Altitude ..... 2,000 m (6,562 ft) maximum

Certification:
All Models UL1998
SB5032, SB5060 models ... . CSA

LR 53428

GFCI:
Enclosed:
Class A ..... UL 943 listed

c UL US LISTED Ground-Fault Circuit Interrupter Class A E330856

Class C ..... UL 943C listed

UL LISTED Ground-Fault Circuit Interrupter, Special Purpose Class C E352763

Class D ..... UL 943C listed

UL LISTED Ground-Fault Circuit Interrupter, Special Purpose Class D E352763

EGFPD:
Enclosed ..... UL 943/UL 1053 listed

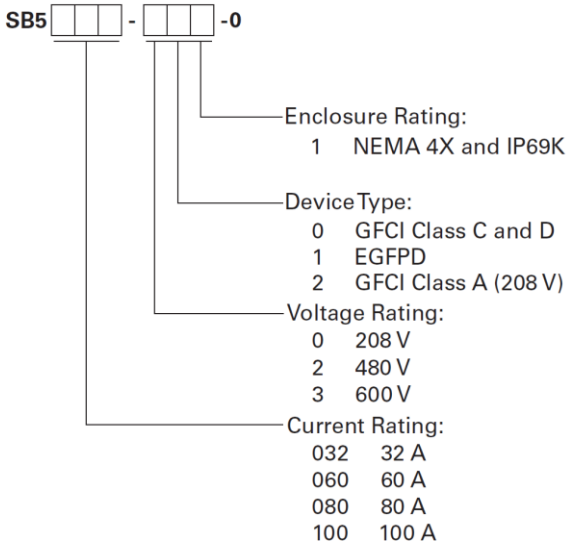
c UL US LISTED Equipment Ground-Fault Protective Device E359574

To: UL 943 Ground-Fault Circuit-Interrupters
UL 943C Special Purpose Ground-Fault Circuit-Interrupters
UL 1053 Ground Fault Sensing and Relaying Equipment
UL 1998 Software in Programmable Components

CSA C22.2 No.144.1 Ground-Fault Circuit Interrupters
CSA C22.2 No.144.M91 Ground-Fault Circuit Interrupters

NOTES:
(1) IEC 60947-1 Annex A defines several utilization categories. AC-1 refers to non-inductive or slightly inductive loads. AC-3 refers to squirrel-cage motors.
(2) UL 943 and UL 943C does not apply to 50-Hz installations.

7. ORDERING INFORMATION



Termination Assemblies(1):
1N5339B ..... 5-W Axial Lead Termination Device
SE-TA6 ..... 50-W Termination Assembly
SE-TA6-SM ..... 50-W Stud-Mount Termination Assembly
SE-TA6ASF-WL ..... 12-W Small Format Termination Assembly with Wire Leads

NOTES:
(1) All SB5000 models include a 1N5339B Termination Device.

APPENDIX A
SB5000 SERIES REVISION HISTORY

MANUAL RELEASE DATE	MANUAL REVISION	PRODUCT REVISION (REVISION NUMBER ON PRODUCT LABEL)	FIRMWARE REVISION
April 30, 2023	1-D-043023	SB5032, SB5060: 02 SB5080, SB5100: 00	SB5032, SB5060: 1.23 SB5080, SB5100: 1.05
January 15, 2023	1-C-011523	02	
October 18, 2021	1-B-101821	02 01	
May 28, 2021	1-A-052821	00	

MANUAL REVISION HISTORY

REVISION 1-D-043023
Added SB5080 and SB5100 models.

REVISION 1-C-011523
Added Figure 3.
Added CSA Certification for SB5032 and SB5060 models.

REVISION 1-B-101821
UL approval for Class A and EGFPD models.

REVISION 1-A-052821
Initial release.

PRODUCT REVISION HISTORY

SB5032, SB5060

PRODUCT REVISION 02
IP69K enclosure rating added.

PRODUCT REVISION 01
No functional changes.

PRODUCT REVISION 00
Initial release.

SB5080, SB5100

PRODUCT REVISION 00
Initial release.

FIRMWARE REVISION HISTORY

SB5032, SB5060

FIRMWARE REVISION 1.23
Initial release.

SB5080, SB5100

FIRMWARE REVISION 1.05
Initial release.