Record Plus™FG600

Current Limiting Molded-Case Circuit Breaker

Introduction

Congratulations and thank you for choosing the ***Record Plus™*** family of current-limiting circuit breakers.

Record Plus™ circuit breakers are designed to provide overload and short circuit protection to electrical distribution and utilization equipment. All units use integrated modular circuit breaker technology to allow flexibility in a broad range of applications.

Record Plus™ circuit breakers are listed by Underwriters Laboratories to the UL489 standard and the CSA Standard C22.2, No. 5. These circuit breakers are certified to EN 60947-2.

Record Plus™ circuit breakers and their accessories are designed and manufactured to exceed our global customers' high standards for reliability and quality.

Record Plus™ FG600A current-limiting two and three pole Mould case circuit breaker.

WARNING: DANGER of electrical shock or injury. Ensure ALL electrical power supplies are **OFF** before installing or removing any devices. Do not remove circuit protective devices until the power is turned **OFF**. The breaker, trip unit, or accessories MUST ONLY be installed and serviced by QUALIFIED personnel. See NEMA publication AB4.

CAUTION: This product is NOT suitable for use in equipment not specifically designed to accept it. Contact the equipment manufacturer for possible equipment modifications.

A – Unpack and Inspect

Unpack the breaker and inspect it for any shipping damage. Ensure that the breaker has the proper current, voltage, and interrupting ratings for the application. Also check breaker operation, as described in section D. Install any internal accessories, as described in section B, and terminal lugs, as described in section C, using the supplied installation instructions. Check all accessories for proper voltage ratings, installation, wiring routing, and operation. If internal accessories have been installed, attach the appropriate labels to the side of the breaker. An example of these labels is illustrated in Figure 1.B.

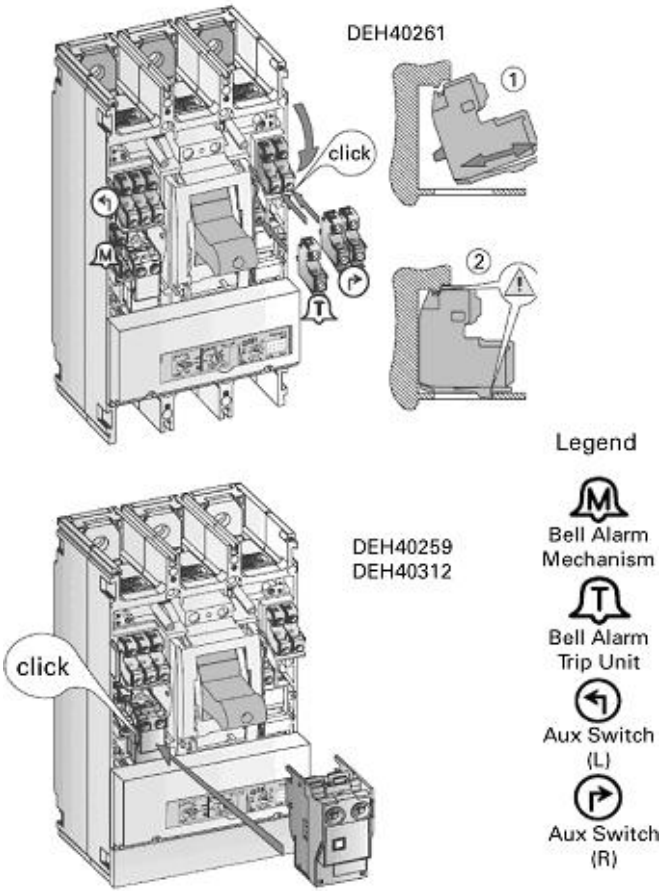


Figure 1.A. Installation of typical breaker accessories. See the Buylog® for details.

Figure 1.B. Accessory label.

B – Installation

Internal Accessories

Install any internal accessories, following the instructions supplied with each accessory. The available accessories and their mounting locations are listed in Table 1,Table 2,Table 3 and Table 4. Check all accessories for proper installation and wire routing. Verify breaker operation with the installed accessories.

Internal Accessory	Normally Open	Normally Closed	Max. No. Of Accessories
Auxiliary switch left mounted	FAS10LW	FAS01LW	3
Auxiliary switch right mounted	FAS10RW	FAS01RW	2
Bell alarm mechanism	FABAM10W	FABAM01W	1
Bell alarm trip unit	FABAT10W	FABAT01W	1

Table 1. Auxiliary switch and bell alarm accessories.

Trip Voltage	Shunt Trip	Under voltage	Max. No. Of Accessories
12 Vdc	FASHTBW	—	1 ST
24 Vac/Vdc	FASHTDW	FAURDW	1 ST or UV
48 Vac/Vdc	FASHTFW	FAUVRFW	1 ST or UV
110–130 Vac 110–125 Vdc	FASHTJW	FAUVRJW	1 ST or UV
120 Vac	FASHTKW	—	1 ST
220/240 Vac 250 Vdc	FASHTNW	FAUVRNW	1 ST or UV
277 Vac	FASHT7W	FAUVR7W	1 ST or UV
400/480 Vac	FASHTUW	FAUVRUW	1 ST or UV

Table 2. Shunt trip and under voltage accessories.

Accessory/Kit Catalog #	Rating (Voltage)	Description
FAMBAT	240 / 480 / 600	Spare Battery Module
FAMGFT2	240 / 480 / 600	Ground Fault Trip + Fault Type Indicators
FAMGFM2	240 / 480 / 600	Ground Fault Trip + Modbus Communications
FAMFGS2	240 / 480 / 600	Ground Fault Trip + 2-Channel Load Shedding
FAMAM2	240 / 480 / 600	Ammeter with 4-digit LCD Display
FAMB2	240 / 480 / 600	Spare Filler Module
FAMGAT2	240 / 480 / 600	Ground Fault Alarm + Fault Type Indicators
FAMGAM2	240 / 480 / 600	Ground Fault Alarm + Modbus Communications
FAMGAS2	240 / 480 / 600	Ground Fault Alarm + 2-Channel Load Shedding
FAMSM2	240 / 480 / 600	2-Channel Load Shedding + Modbus Communications
FAMST2	240 / 480 / 600	2-Channel Load Shedding + Fault Type Indicators
FAMMT2	240 / 480 / 600	Fault Type Indicators + Modbus Communications
FAMECM	240 / 480 / 600	External Communications and Contact Module

Table 3: Module Accessories/Kits for SMR2 (Internal Accessories).

Rating Plugs & Ground Fault Sensors

Following the instructions supplied with the rating plugs and Ground Fault sensors, illustrated in Figure 2.A & 2.B, install the plug into the breaker body. Available rating plugs, with their catalog numbers, are listed in Table 4.A ,4.B.,4.C & 5.

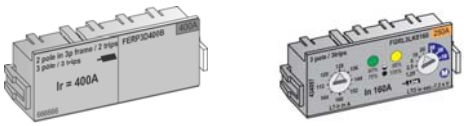


Figure 2.A. Record Plus Fixed & Adjustable rating plug.

Figure 2.B. Ground Fault sensor.

Catalog Number	Sensor Rating, A	Plug Rating, A
FGRP3K0125	250	125
FGRP3K0150		150
FGRP3K0175		175
FGRP3K0200		200
FGRP3K0225		225
FGRP3K0250		250
FGRP3L0175		175
FGRP3L0200	400	200
FGRP3L0225		225
FGRP3L0250		250
FGRP3L0300		300
FGRP3L0350		350
FGRP3L0400		400
FGRP3M0300		300
FGRP3M0350	600	350
FGRP3M0400		400
FGRP3M0450		450
FGRP3M0500		500
FGRP3M0600		600

Table 4.A. Rating plug catalog numbers and ratings for SMR1.

Catalog	Adjustable	Sensor Rating	Plug Rating
FGRN3K0160	Adjustable	250A	G400
FGRN3K0250	Adjustable		G400
FGRN3L0250	Adjustable	400A	G400
FGRN3L0400	Adjustable		G400
FGRN3M0600	Adjustable	600A	G600
FGRN2K0160	Adjustable	250A	G400
FGRN2K0250	Adjustable		G400
FGRN2L0250	Adjustable	400A	G400
FGRN2L0400	Adjustable		G400
FGRN2M0600	Adjustable	600A	G600

Table 4.B. Adjustable Rating plug catalog numbers and ratings for SMR2.

Catalog	Fixed	Sensor Rating	Plug Rating
FGRM3K0100	Fixed	250A	100
FGRM3K0110	Fixed		110
FGRM3K0125	Fixed		125
FGRM3K0150	Fixed		150
FGRM3K0160	Fixed		160
FGRM3K0175	Fixed		175
FGRM3K0200	Fixed		200
FGRM3K0225	Fixed		225
FGRM3K0250	Fixed		250
FGRM3L0175	Fixed	400A	175
FGRM3L0200	Fixed		200
FGRM3L0225	Fixed		225
FGRM3L0250	Fixed		250
FGRM3L0300	Fixed		300
FGRM3L0350	Fixed		350
FGRM3L0400	Fixed		400
FGRM3M0300	Fixed	600A	300
FGRM3M0350	Fixed		350
FGRM3M0400	Fixed		400
FGRM3M0450	Fixed		450
FGRM3M0500	Fixed		500
FGRM3M0600	Fixed		600
FGRM2K0100	Fixed	250A	100
FGRM2K0110	Fixed		110
FGRM2K0125	Fixed		125
FGRM2K0150	Fixed		150
FGRM2K0160	Fixed		160
FGRM2K0175	Fixed		175
FGRM2K0200	Fixed		200
FGRM2K0225	Fixed		225
FGRM2K0250	Fixed		250
FGRM2L0175	Fixed	400A	175
FGRM2L0200	Fixed		200
FGRM2L0225	Fixed		225
FGRM2L0250	Fixed		250
FGRM2L0300	Fixed		300
FGRM2L0350	Fixed		350
FGRM2L0400	Fixed		400
FGRM2M0300	Fixed	600A	300
FGRM2M0350	Fixed		350
FGRM2M0400	Fixed		400
FGRM2M0450	Fixed		450
FGRM2M0500	Fixed		500
FGRM2M0600	Fixed		600

Table 4.C. Fixed Rating plug catalog numbers and ratings for SMR2.

Catalog Number	Amps	Type
FGGS0250	250	Ground Fault SMR2 Sensor 250A
FGGS0400	400	Ground Fault SMR2 Sensor 400A
FGGS0600	600	Ground Fault SMR2 Sensor 600A

Table 5. Ground Fault sensors.

Applications Above 250 V

Because of safety considerations, a backplate must be attached to the back of an FG breaker used in applications greater than 250 V. The backplate catalog number is listed in Table 6.

Catalog Number	Application	Installation Instructions
FGJB	Backplate for use with applications above 250V	DEH40309

Table 6. Backplate used with applications above 250 V.

Mounting

Use Figure 4 as a reference to drill and tap all mounting holes and make any necessary front panel escutcheon cut outs. Mount the breaker using the appropriate breaker hardware kit, listed in Table 7. Which includes four screws and lock washers. Tighten the mounting screws to 20 lb-in.

Catalog Number	Application	Kit Description
FGMSK1	Mounting plate with tapped holes	Four #10-32 x 33/4 screws and lock washers
FGMSK2	Mounting plate with clearance holes	Four #10-32 x 41/4 screws, nuts, and lock washers

Table 7. Breaker mounting kits.

C – Wire Terminal Connections

NOTE: When using aluminum wire, use a joint compound recommended by the wire manufacturer.

The lugs available for making wire connections to the breaker are illustrated in Figure 3 and listed in Table 8.

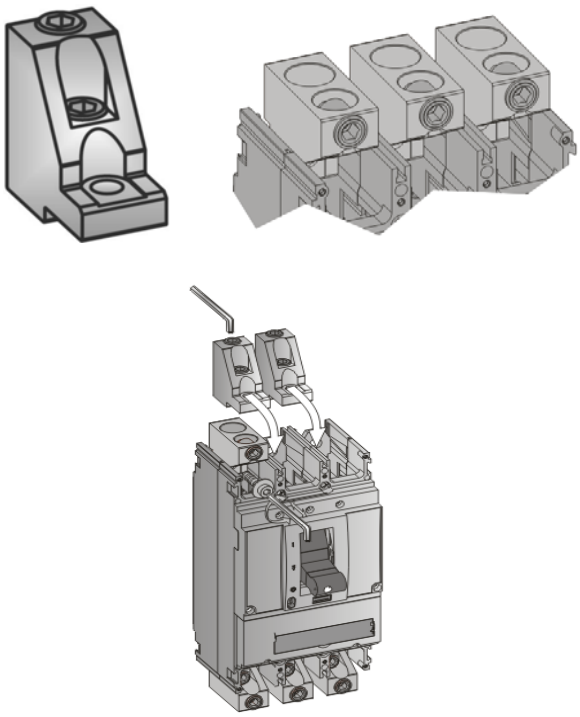


Figure 3. Record Plus lug.

Catalog Number	Wire Range Dimension des files	Wire Type	Location Emplacement	Torque/Couple		Strip Length	Lug Material
				Wire-Lug	Lug-Strap		
FCALK218H	Top Hole #8–400 kcmil #6–500 kcmil Bottom Hole #2/0–600 kcmil	Copper Aluminum Copper or Aluminum	2 Pole (2 lugs)	#8–#4 AWG AL/CU 275 in-lbs #3 AWG–600 kcmil AL/CU 375 in-lbs	200 in-lb 23 N-m	Top 7/8 in. Bottom 15/8 in.	Tin-plated aluminum
FCALK318H	Top Hole #8–400 kcmil #6–500 kcmil Bottom Hole #2/0–600 kcmil	Copper Aluminum Copper or Aluminum	3 Pole (3 lugs)	#8–#4 AWG AL/CU 275in-lbs #3 AWG–600 kcmil AL/CU 375 in-lbs	200 in-lb 23 N-m	Top 7/8 in. Bottom 15/8 in.	Tin-plated aluminum

Table 8. Lug catalog numbers and specifications

Breaker Outline

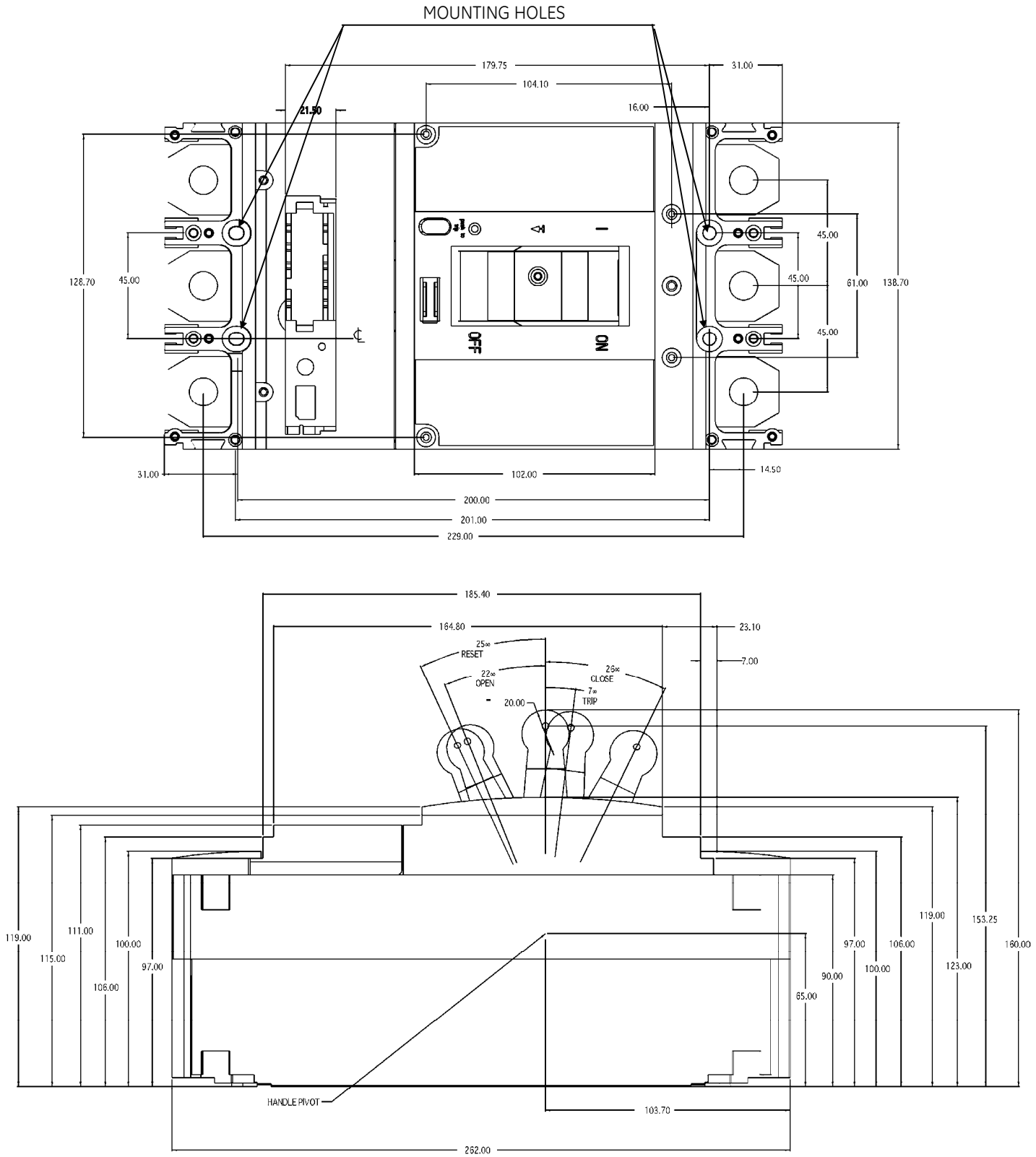
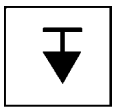


Figure 4. Outline of the Record Plus FG Breaker, two and three pole.

D – Circuit Breaker Operation

The breaker contact status is indicated by the handle position. The positions are marked on both sides of the handle escutcheon, clearly showing the status of the breaker contacts. ON and/or I indicate the breaker is ON and OFF and/or O indicate the breaker is OFF. The breaker tripped position is indicated by the following symbol:



To close the breaker from the OFF position, move the handle to the ON position. To close the breaker from the trip position, first move the handle fully to the OFF (reset) position and then to the ON position, as illustrated in Figure 5. A Push-To-Trip button is provided for convenience in testing the mechanical trip operation of the breaker, as shown in Figure 5. The Push-To-Trip operation should be tested annually.

1. Trip Unit System Description

The SMR1 and SMR2 Electronic Trip Units (ETU) are designed for use in Record+ Molded Case Circuit Breakers (MCCB). The ETU is an electronic assembly, which interfaces with the circuit breaker. It monitors the breaker phase currents and trips the breaker in the event of an over current condition. ETU can be powered from 3 sources: Auxiliary Power; Self-Power (i.e., current flowing through the breaker) or battery power. The Trip Unit also connects with the circuit breaker flux shifter actuator to provide the electro mechanical tripping function. A user interface is provided on the front panel to allow adjustment of the Trip Unit's parameters.

The SMR1 is an electronic trip unit offering a set of sophisticated protective functions. Designed for use with the FG600 current limiting molded case circuit breakers, the device has a fixed set of 2 protective functions allowing a selective and fully adjustable protection against Overloads (Long Time) and short circuits (Instantaneous). The SMR1 uses rating plugs that gives the user the flexibility to make a last minute choice in the required current rating, protected poles or protection band.

The SMR2 is an electronic trip unit offering a set of sophisticated protective functions that can be extended at will by the addition of separately available modules. Designed for use with the FG600 current limiting molded case circuit breakers, the device has a fixed set of 3 protective functions allowing a selective and fully adjustable protection against Overloads (Long Time) and short circuits (Short Time and Instantaneous). Both the Long Time and Short Time protection can be set to different delay bands or bands (Long Time Delay and Short Time Delay) while the Short Time device can be switched on or off to energy protection mode (I2t). The SMR2 uses rating plugs that gives the user the flexibility to make a last minute choice in the required current rating, protected poles or protection band. The SMR2 ETU can communicate with any Modbus master (typically a PC) using Modbus protocol, if used with External contact (FAMECM) Module.

SMR1 & SMR2 trip units have a built-in temperature sensor that trips the breaker at temperatures above 85°C. It thus prevents the breaker and electrical components in its immediate vicinity from overheating.

SMR1 & SMR2 trip unit comes with a transparent, tamper-free (sealable) cover, this to prevent unauthorized manipulation of the breaker settings.

2. Overload protection LT (long time)

The Long Time or overload protection is adjustable from 0.4 to 1X the rating plug in 16 steps. The user can also define

one of the 8 time bands (LTD) each designed to match specific loads, motor or cable characteristics. Out of these 8 time band settings, 5 have time bands for line applications and 3 are dedicated to motor protection (for time band classes see EN 60947-4.1). When set to motor protection mode, a phase loss protection is initiated that will trip the breaker when the difference in current between one phase line and the average of all three phases drops below 20%. This easy-to-adjust trip unit is equipped with a LT load indicator device that operates by means of two LED indicators located on the trip unit front face. If the load reaches a 60% of the set Ir value, a green LED will start to blink (3 flashes a second). When the load reaches 75% of Ir it will stop blinking and remain on. The second orange LED will start to blink at 95% of the Ir value. It will remain on when the load reaches 105% of Ir and a trip is imminent.

The SMR2 is also equipped with a so called thermal memory device. This memory tracks overheating even after the device has tripped and prevents the breaker from being switched whilst its environment is still at a too high temperature.

3. Short-circuit Protection ST (short time, available only in SMR2)

Offering a selective protection against low value short-circuits the Short Time protection is settable from 2 to 10X the adjusted LT protection (Ir) depending on the sensor rating. The device can be set to five time setting bands (STD), this allowing selectivity between different breaker sizes. The STD device can be set to an 'energy curve mode'. This mode changes the fixed delay and reaction time value of the device, when the set current level is reached, into a reaction time that depends on the energy flowing in the circuit.

4. Short-circuit Protection I (instantaneous)

Offering a protection against short-circuits the Instantaneous protection is settable from 2 to 11X the chosen sensor rating. The device has no time delay band so that the breaker immediately trips when the set threshold is reached. Each

5. Ground Fault protection

The Ground Fault function computes the vector sum of the three phase currents. If the vector sum exceeds the user set threshold value for the set time delay, one of the following actions takes place:

1.) GF version: The ETU issues trip command
2.) GFA version: The ETU sets alarm signal. (Circuit breaker contact remains closed).

Ground Fault pickup settings range between 0.2 and 1X of sensor rating.

When the breaker is equipped with a Communication and Control Output Module option (with Target Communication Accessory) the trip indication is also passed on through the communication output as trip history.

6. Zone Selective Interlock (ZSI)

The Zone Selective Interlock (ZSI) feature is available with Short Time and GF (Ground Fault) protection functions. This feature helps in co-ordination of upstream and downstream circuit breakers during fault condition.

When a downstream breaker is in ST/GF Pickup, it shall have the capability of sending a signal to an upstream breaker indicating the normal behavior. Without this signal from a downstream breaker, the upstream breaker would assume that downstream breaker hasn't sensed the fault and will go for the fastest delay setting (STD1/GFD1) on sensing the fault.

E – Trouble-Shooting

Ensure the breaker is installed correctly and all terminal connections are tightened per instructions. If the breaker fails to close check the following items:

- Ground Fault, overload and short circuit on the system.
- If the handle is in the TRIPPED position, reset the breaker by moving the handle fully to the OFF position and then to the ON position, as shown in Figure 5.
- The under voltage trip is supplied with its rated voltage.
- The shunt trip is de-energized and there is no trip signal.
- The breaker trip unit settings are properly adjusted. If technical assistance is required contact your local GE Consumer & Industrial sales office. In the US call GE Post Sales Customer Service, 1-888-437-3765

F – Maintenance

Generally no maintenance is required but it is recommended that the breaker be cleaned and inspected annually.

Operate the breaker Push to Test button and toggle the handle several times, testing the mechanical operation of the device. If there are any signs of damage or if the mechanism is sluggish or sticky, replace the breaker. For abnormal or heavy-duty conditions, refer to NEMA publication AB4. For recommended maintenance practices, refer to publication NFPA70B.

WARNING: Danger of electrical shock or injury. Turn off power supplies ahead of equipment before attempting to service.

G – Storage

Store in a dry, dust-free, environment protected from corrosion. Long-term storage should be in the original shipping carton. The storage temperature range is –40°C to +80° C.

H – Accessories

For full details of accessories and their application, contact your local GE Consumer & Industrial representative. When installing accessories, read the accompanying accessory installation instruction and carefully follow all cautions and Warnings.

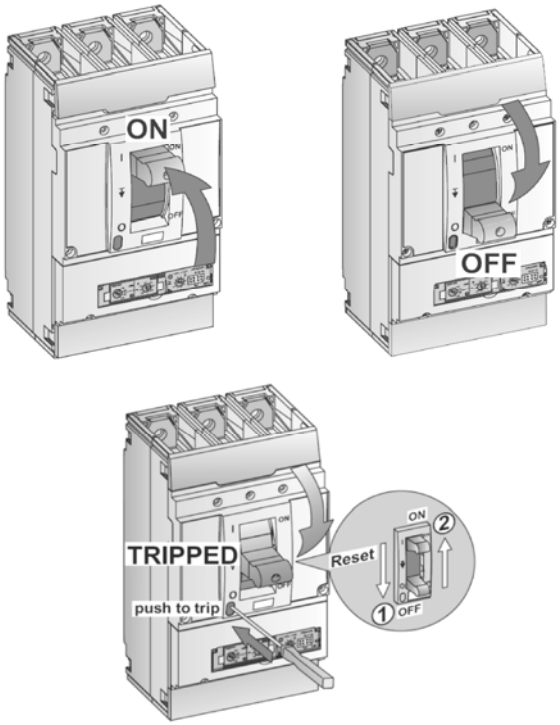


Figure 5. Mechanical operation of the circuit breaker.

These instructions do not cover all details or variations in equipment nor do they provide for every possible contingency that may be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise that are not covered sufficiently for the purchaser's purposes, the matter should be referred to the GE Company.

GE Consumer & Industrial

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