

EntelliGuard* G Circuit Breakers



Installation, Operation,
and Maintenance Manual

Retain for Future Use.



Now with the following new features:

- New optimized dimension at 4000A
- Envelope 3, 200KAIC, @ 480V rating

HAZARD CATEGORIES

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

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



WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Failure to comply with these instructions may result in product damage.

NOTICE

Indicates important information that must be remembered and aids in job performance

TRADEMARKS

EntelliGuard™ G

EntelliGuard™ TU

WARRANTY

This document is based on information available at the time of its 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. ABB assumes no obligation of notice to holders of this document with respect to changes subsequently made. ABB makes no representation or warranty, expressed, implied, or statutory, with respect to, and assumes no responsibility for the accuracy, completeness, sufficiency, or usefulness of the information contained herein. No warranties of merchantability or fitness for purpose shall apply.

Contact your local sales office if further information is required concerning any aspect of EntelliGuard G circuit breaker operation or maintenance.

SECTION 1 – GENERAL INFORMATION

STORAGE	7
INTRODUCTION	7
Quality Assurance	7
Options Check Sheet	7
Product Serial Number	7
Measurement Units	7
PRODUCT DESCRIPTION	7
HAND TOOLS NEEDED FOR INSTALLATION	7
Table 1.1. Required Hand Tools	7
Figure 1.1. EntelliGuard G Power Circuit Breaker Features and Characteristics	8

SECTION 2 – PRODUCT SPECIFICATIONS

Table 2.1. Environmental Conditions	9
Table 2.2. EntelliGuard G Short Circuit and Interrupting Ratings: ANSI/UL1066	9
Table 2.3. EntelliGuard G Short Circuit and Interrupting Ratings: UL489	9
Table 2.4. EntelliGuard G Non-Automatic Circuit Breaker: ANSI Version	10
Table 2.5. EntelliGuard G Non-Automatic Circuit Breaker/Molded Case Switch: UL Version	10
Table 2.6. Key to Tables 2.2 Through 2.5	10
Table 2.7. Agency Certification	10
Table 2.8. Product Dimensions and Weights – ANSI/UL	11

SECTION 3 – LIFTING, MOUNTING AND INSTALLATION

CIRCUIT BREAKER UNPACKING	12
BASIC CIRCUIT BREAKER CONSTRUCTION	12
LIFTING AND MOUNTING	13
Using a Lifting Truck	13
Drawout Cassette Lifting, Mounting and Installation	13
Circuit Breaker Installation in to the Cassette	13
Drawout Circuit Breaker Installation into the Cassette	13
Circuit Breaker Removal from the Cassette	15
Fixed-Mounted Circuit Breaker Mounting	16
TRIP UNIT	16
General Information	16
Trip Unit Installation	16
WIRING	17
Table 3.1. Wiring Schematic for Block-A	17
Table 3.2. Wiring Schematic for Block-B	17
Table 3.3. Wiring Schematic for Block-C	17
Table 3.4. Electronic Interlock	18
Table 3.5. Wiring Schematic Nomenclature Definitions	18
SECONDARY DISCONNECT BLOCKS	19
Table 3.6. Terminal Wiring	19
SELECTIVITY/BACKUP PROTECTION	19

SECTION 4 – OPERATION

STORED ENERGY MECHANISM KEY FEATURES	20
Table 4.1. Stored Energy Mechanism Sequences of Operation	20
Circuit Breaker Charging	20
Two Step Mechanism Design	20
CLOSING SPRING DISCHARGE PROCEDURE	21
Table 4.2. Cassette Operating Positions	21

CLOSING PROCEDURE.....	21
CONDITIONS WHEN CLOSING CANNOT OCCUR.....	21
CIRCUIT BREAKER OPENING PROCEDURE	21

SECTION 5 – LOCKS AND INTERLOCKS

GENERAL INFORMATION.....	22
CIRCUIT BREAKER FRONT PANEL LOCKING	22
Pushbutton Locking	22
Key Lock for Breaker Trip Free Condition	23
DRAWOUT CASSETTE FRONT PANEL LOCKING	23
Security Locking	23
Isolation Shutters Locking (If Installed).....	23
Door Interlock Installation.....	24
KEY LOCKS AND INSTALLATION	25
TWO-BREAKER CABLE INTERLOCK INSTALLATION.....	25
Vertical Mounting	25
Horizontal Mounting	26
SAFETY SHUTTERS INSTALLATION	26
Table 5.1: Fixed-Mounted Circuit Breaker Locking	26
Table 5.2: Drawout Circuit Breaker Locking	26

SECTION 6 – ACCESSORIES DESCRIPTION

GENERAL INFORMATION.....	27
INDIVIDUAL ACCESSORIES	27
Motorized Spring Charging Unit	27
Table 6.1. Motor Operators.....	27
Circuit Breaker Closing Coils – Standard and Commanded	28
Table 6.2. Closing Coil Characteristics	28
Command Operation Module	28
Shunt Trip (ST).....	28
Table 6.3. Extended Range Shunt Trip for UL Ground Fault and ANSI DC Rating Applications	28
Status Indication Switch (Coil Signaling Contact).....	28
Table 6.4. Coil Signaling Contact Module.....	28
Under Voltage Release (UVR) with Fixed Time Delay	28
Table 6.5. UVR Operating Characteristics.....	29
Time Delay Module (TDM) for UVR (Externally Mounted).....	29
Table 6.6. TDM Characteristics	29
Remote Operation Coil Combination	29
Table 6.7. Remote Operation Coil Combination	29
Auxiliary Switches.....	29
Table 6.8. Auxiliary Switches.....	29
Table 6.9. Auxiliary Switch Ratings and Secondary Disconnect Points	29
Circuit Breaker – Key Interlock Facility	30
Table 6.10. Key Interlocks and Door Interlocks.....	30
Carriage Position Switch (TOC)	30
Table 6.11. Carriage Position Switches	30
Table 6.12. Carriage Position Switch Ratings (Common NO/NC Contact Configuration	30
Mechanical Interlocks (Cable/Rod).....	30
Table 6.13. Mechanical Interlocks (Cable/Rod)	30
Cables.....	30
Table 6.14. Cables for Mechanical Interlocks	30
Table 6.15. Interlock Configurations.....	31
Bell Alarm with Lockout.....	31
Bell Alarm Switches	31
Table 6.16. Bell Alarm Switches	31

Table 6.17. Bell Alarm Ratings (Common NO/NC Contact Configuration)	31
Charging Spring Status Indicator	32
Table 6.18. Spring Charged Contact (1 NO)	32
Secondary Disconnects (Factory-Installed/Field Installable)	32
Table 6.19. Block Location	32
Table 6.20. Secondary Disconnect Parts	32
Ground Fault	32
Table 6.21. Neutral Rogowski CTs	32-33
Ready to Close Contact	33
Table 6.22. Ready to Close Contacts (1NO)	33
Sealed Door Panel Escutcheon	33
Mechanical Operations Counter	33
Table 6.23. Miscellaneous Accessories	33
Cassette Substructure	33
Position Indicators	33
Rejection Device	33
Front Flat Terminations	33
Table 6.24. Optional Front Flat Terminations	33

SECTION 7 – ACCESSORIES INSTALLATION

CIRCUIT BREAKER FRONT COVER REMOVAL	34
MOTOR OPERATOR – SPRING CHARGING UNIT INSTALLATION	34
SHUNT TRIP, CLOSING COIL AND UNDER VOLTAGE RELEASE DEVICE INSTALLATION	35
Closing Coil Installation	35
Closing Coil Removal	35
NETWORK INTERLOCK INSTALLATION	35
Trip Alarm/Bell Alarm Switch Installation	35
Ready to Close Switch Installation	35
SHUTTER PROP OPEN FEATURE	35
CARRIAGE POSITION SWITCH INSTALLATION	36
BUSBAR/CABLE GROUNDING (OPTIONAL)	36
CLUSTERS	36
Upper Cluster Contact Set Grounding	37
Lower Cluster Contact Set Grounding	37
MECHANICAL TRIP ALARM INSTALLATION	37
MECHANICAL OPERATIONS COUNTER INSTALLATION (OPTIONAL)	38
REJECTION FEATURE	38

SECTION 8 – MAINTENANCE, TESTING AND TROUBLESHOOTING

MAINTENANCE	39
Inspection Schedule	39
Cleaning Procedure	39
Contact Wear Indicator Inspection (Optional)	39
Circuit Breaker Main Mechanism Inspection	40
Cassette Inspection	40
Isolating Contacts (Drawout Type) Inspection	40
Power Terminals and Busbar Inspection	40
Lubrication	40
TRIP UNIT TESTING	40
Trip Unit Testing	40
TROUBLESHOOTING	41
PUBLICATIONS	42

SECTION 1 – GENERAL INFORMATION

STORAGE

CAUTION

PRODUCT DAMAGE

- Do not store circuit breaker in corrosive environments above LC1 (sea salt mist) and G1 as per ANSI/ISA-S71.04-1985.
- Ensure circuit breakers and cassettes are stored in a clean, dry location in their original packaging.

Failure to comply with these instructions may result in product damage.

INTRODUCTION

Quality Assurance

All EntelliGuard G circuit breakers have been designed and manufactured to the highest technical standards. Strict procedures ensure first class product quality.

Options Check Sheet

Each circuit breaker comes with a detailed factory-assembled side label that lists all optional features included on both the circuit breaker and on the trip unit.

Product Serial Number

Please have the serial number available when communicating about the circuit breaker. Each circuit breaker has a unique serial number located on the left side (viewed from front) of the front fascia.

Measurement Units

- All data in this document is specified in conventional metric/SI units.
- All internal/external accessory and external cable/bus bar connections are metric for both IEC and UL/ANSI versions.

PRODUCT DESCRIPTION

The EntelliGuard G Circuit Breaker is suitable for application on power systems up to 1000 Vac 50/60 Hz systems and up to 750 Vdc as a main/source breaker, feeder breaker, bus coupler or tie breaker. See Section 2 for complete product specifications.

Figure 1.1 shows a front view of the EntelliGuard G. The indicated features are referenced in this document.

HAND TOOLS NEEDED FOR INSTALLATION

Table 1.1 provides a list of the hand tools required to install, operate and maintain the EntelliGuard G Circuit Breaker.

Table 1.1. Required Hand Tools

Tool Name	Function
Cluster pliers (two pairs, each with a different gap, are supplied under Cat. No. GUNI)	To remove primary contacts for inspection and maintenance.
Screwdriver (8 mm)	<ul style="list-style-type: none"> To operate racking shutter drive.
Allen wrench (5 mm)	<ul style="list-style-type: none"> To remove arc chutes for inspection and maintenance. To remove or adjust fixed and moving arcing contacts. To remove mechanism.
Allen wrench key (4 mm)	To remove motor and gearbox mounting screws.
Metric feeler gauges	To check and adjust arcing contact gaps.
Pozidrive terminal screwdriver	<ul style="list-style-type: none"> To remove mechanical and electronic component mounting screws. To connect wiring to secondary isolating contact terminals.
Pozidrive screwdriver (#1 and #3)	<ul style="list-style-type: none"> To remove front cover mounting screws. To remove Rogowski coil and Power current transformer cover plate at the rear of the circuit breaker moving portion.
Full Set of Metric Hex Allen Wrenches and Socket Set	<ul style="list-style-type: none"> To remove PMU base, auxiliary switch assembly, etc.

Figure 1.1. EntelliGuard G Power Circuit Breaker Features and Characteristics

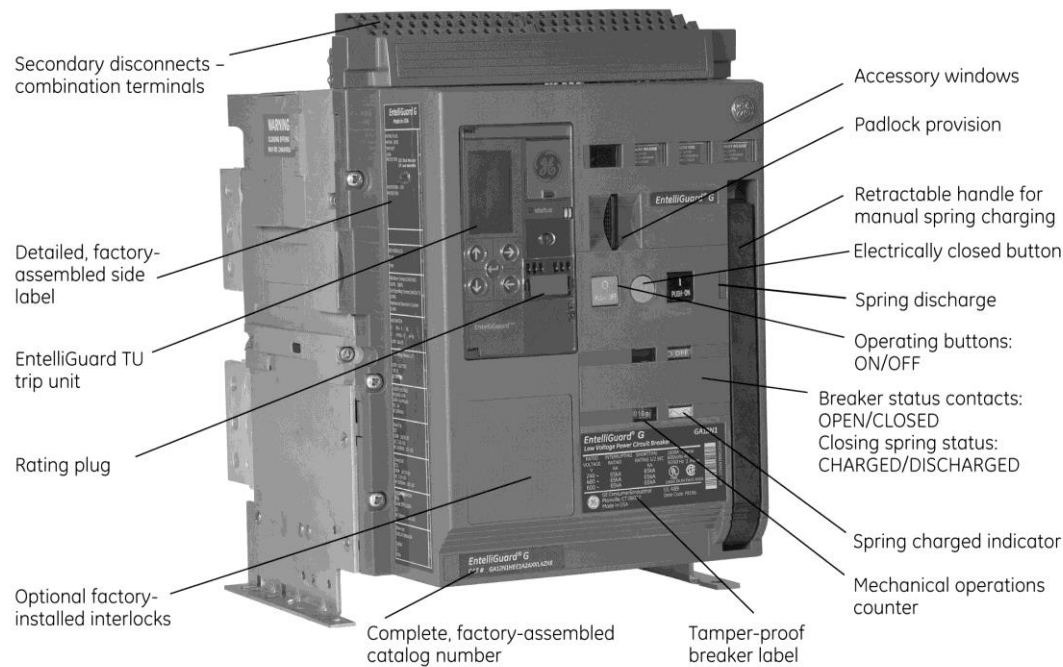


Figure 2.X. Label

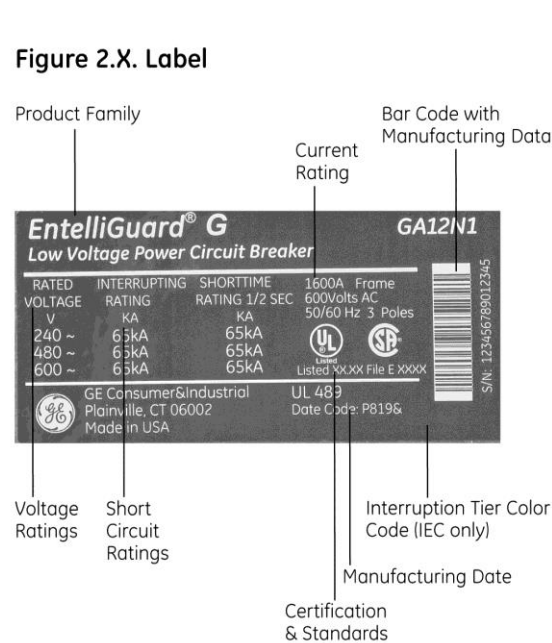
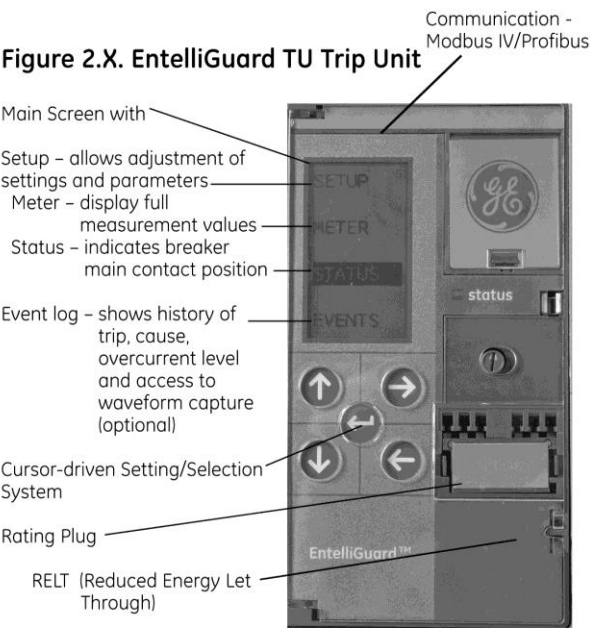


Figure 2.X. EntelliGuard TU Trip Unit



SECTION 2 – PRODUCT SPECIFICATIONS

⚠ WARNING
IMPROPER INSTALLATION, OPERATION AND MAINTENANCE
 Ensure only qualified personnel install, operate, service and maintain all electrical equipment.
Failure to comply with these instructions could result in death or serious injury.

Table 2.1. Environmental Conditions

Characteristic	Parameter
Temperature:	
Operating	-5 °C to 70 °C
Ambient (surrounding circuit breaker)	-20 °C to -5 °C
Storage	-40 °C to 70 °C
Humidity	20% RH to 95% RH
Salt fog	per ASTM-B117
Vibration (random and sinusoidal)	1 G max., 50 Hz to 500 Hz in X, Y, Z directions
Fungus resistance	per ASTM G21
Voltage and current de-rating at altitude above sea level	per ANSI C37.20.1, Tables 2 and 3
Noise level	<30 dB
Endurance:	
closing coil, Shunt trip	20,000 operations
motor operator, under voltage release, accessories	12,500 operations

Table 2.2. EntelliGuard G Short Circuit and Interrupting Ratings: ANSI/UL1066

Interrupting Rating Tier ANSI/UL1066 Devices, LVPCB					Envelope 1		Envelope 2		Envelop 2.5	Envelope 3	
Type	240 V	480 V	600 V	1/2S Withstand	400, 800, 1200	400, 800, 1600, 2000	3200	400-3200	800-4000	3200	4000-5000
S	65,000	65,000	50,000	50,000	X						
N	65,000	65,000	65,000	65,000		X	X				
H	85,000	85,000	65,000	85,000		X					
P	100,000	100,000	65,000	65,000		X					
E	85,000	85,000	85,000	85,000				X			
M	100,000	100,000	85,000	85,000				X			X
B	100,000	100,000	100,000	100,000						X	X
L	150,000	150,000	100,000	100,000						X	X
W	200,000	200,000	100,000	100,000						X	X
U	130,000	100,000	100,000	100,000					X		

Table 2.3. EntelliGuard G Short Circuit and Interrupting Ratings: UL489

Interrupting Rating Tier ANSI/UL1066 Devices, LVPCB					Envelope 1		Envelope 2		Envelop 2.5	Envelope 3		
Type	240 V	480 V	600 V	1/2S Withstand	400-1200	400-2000	2500-3000	400-3000	800-4000	3000	4000	5000-6000
S	65,000	65,000	50,000	42,000	X							
N	65,000	65,000	65,000	42,000		X	X					
H	85,000	85,000	65,000	50,000		X	X					
P	100,000	100,000	65,000	50,000		X						
M	100,000	100,000	85,000	65,000				X			X	X
L	150,000	150,000	100,000	85,000						X	X	X
W	200,000	200,000	100,000	85,000						X	X	X
U	130,000	100,000	100,000	85,000					X			

Table 2.4. EntelliGuard G Non-Automatic Circuit Breaker: ANSI Version*

Envelope	Type	Amps	Rated Interrupting Current	Rated Endurance		
				Minimum Mechanical Endurance	Minimum Electrical Endurance at 480 V	Minimum Electrical Endurance at 600 V
1	S	800	42	12,500	10,000	7,500
1	N	800	42	12,500	10,000	7,500
1	N	1600	42	12,500	10,000	7,500
1	N	2000	42	12,500	7,500	5,000
2	M	3200	65	5,000	5,000	5,000
2.5	U	4000	85	5,000	3,500	2,000
3	B	4000	100	5,000	3,000	2,000
3	B	5000	100	5,000	2,000	1,500

Table 2.5. EntelliGuard G Non-Automatic Circuit Breaker/Molded Case Switch: UL Version*

Envelope	Type	Amps	Short Interrupting Current (kA)	Rated Endurance		
				Minimum Mechanical Endurance	Minimum Electrical Endurance at 480 V	Minimum Electrical Endurance at 600 V
1	S	800	42	12,500	10,000	7,500
1	S	1200	42	12,500	10,000	7,500
1	N	800	42	12,500	10,000	7,500
1	N	1600	42	12,500	10,000	7,500
1	N	2000	42	12,500	7,500	5,000
2	M	3000	65	5,000	5,000	5,000
2.5	U	4000	85	5,000	3,500	2,000
3	B	4000	100	5,000	3,000	2,000
3	B	5000	100	5,000	3,000	1,500
3	B	6000	100	5,000	1,500	1,000

* Internal quality testing requirements exceeded 20,000 mechanical and electrical operations.

Table 2.6. Key to Tables 2.2 through 2.5

Type	Description	Type	Description
E	Sq. Rated (ICW = ICU) 400 A to 2000 A, 85 kAIC at 480/508 V	H	85 kAIC at 480/508 V; 65 kAIC at 600/635 V
B	Sq. Rated (ICW = ICU) 3200 A to 6000 A, 100 kAIC at 480/508 V	M	100 kAIC at 480/508 V; 85 kAIC at 600/635 V
N	65 kAIC at 480/508/600/635 V	L	150 kAIC at 480/508 V; 100 kAIC at 600/635 V
W	200 kAIC at 480/508 V; 100 kAIC at 600/635 V	U	100 kAIC at 480/508/600/635 V

Table 2.7. Agency Certification (All industry standards referenced in this table are the latest version at the time the product is sold.)

Standard Number	Title
ANSI C37.13,16,17, 20, 50	Low-voltage AC Power Circuit Breakers
NEMA SG 3, 5	Low-voltage Power Circuit Breakers
NEMA AB1	–
UL 1008*	Automatic Transfer Switches
UL 1066	Low voltage AC and DC Power Circuit Breakers Used in Enclosures
UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
CSA 22.2, No 5.1	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
IEC 60947 Part 1	Low Voltage Switchgear and Control Gear - General Rules
IEC 60947 Part 2	Low Voltage Switchgear and Control Gear - Circuit-Breakers
IEC 60947 Part 5	Low Voltage Switchgear and Control Gear - Accessories
IEC 60947 Part 3	Low Voltage Switchgear and Control Gear - Switches, Disconnects, Switch-Disconnects and Fuse-Combination Units
IEC Environmental: 68-2-1,-2,-3,-6,-11,-14,-14,-27,-29,-30,-31	–
IEC Environmental: 721	–
GB14048	China standards and CCC Mark
ABS (American Bureau of Shipping)	–
Germanischer Lloyds	–
CUL	Low-voltage AC Power Circuit Breakers

*Suitable for use in UL1008 applications.

Table 2.8. Product Dimensions and Weights – ANSI/UL

Type	Design	Width		Depth		Height		Weight	
		in.	mm	in.	mm	in.	mm	lbs.	kg
3-pole									
Envelope 1, Top Mounted, UL/ANSI	Fixed breaker - back connected	13.50	343	17.17	436	17.40	442	136.7	62
	Drawout breaker - Moving portion	13.07	332	16.34	415	17.24	438	149.9	68
	Cassette/substructure	13.50	343	20.83	529	17.44	443	110.2	50
Envelope 1, Side Mounted, UL/ANSI	Fixed breaker - back connected	16.14	410	17.17	436	15.98	406	136.7	62
	Drawout breaker - Moving portion	15.35	390	16.34	415	15.83	402	149.9	68
	Cassette/substructure	15.83	402	20.83	529	15.98	406	110.2	50
Envelope 2, Up to 2000A, UL/ANSI	Fixed breaker - back connected	17.17	436	17.17	436	17.40	442	165.3	75
	Drawout breaker - Moving portion	17.01	432	16.34	415	17.24	438	176.4	80
	Cassette/substructure	17.44	443	20.83	529	17.44	443	114.6	52
Envelope 2, Up to 3000A, UL	Fixed breaker - back connected	17.17	436	22.17	563	17.40	442	253.5	115
	Drawout breaker - Moving portion	17.01	432	16.34	415	17.24	438	209.4	95
	Cassette/substructure	17.44	443	26.14	664	17.44	443	231.5	105
Envelope 2, Up to 3200A, ANSI	Fixed breaker - back connected	17.17	436	22.17	563	17.40	442	275.6	125
	Drawout breaker - Moving portion	17.01	432	16.34	415	17.24	438	209.4	95
	Cassette/substructure	17.44	443	26.14	664	17.44	443	246.9	112
Envelop 2.5 Up tp 4000A UL/ANSI	Fixed breaker - back connected	24.86	631.5	22.16	562.8	17.38	442	372.5	169
	Drawout breaker - Moving portion	24.7	627.5	16.34	415	17.24	438	271.1	123
	Cassette/substructure	25.14	638.5	26.14	664	20.47	520	282.1	128
Envelope 3, Up to 4000A, ANSI/UL	Fixed breaker - back connected	28.98	736	17.17	436	17.40	442	286.6	130
Envelope 3, Up to 5000A ANSI / 6000A UL	Fixed breaker - back connected	28.98	736	22.17	563	17.40	442	463.0	210
Envelope 3, All Ratings	Drawout breaker - Moving portion	28.82	732	16.34	415	17.24	438	330.7	150
	Cassette/substructure	29.25	743	26.14	664	17.44	443	396.8	180
Envelope 3-200kA, All Ratings	Drawout breaker - Moving portion	28.82	732	16.34	415	17.24	438	339.5	154
	Cassette/substructure	29.25	743	26.14	664	20.47	520	407.8	185
4-pole									
Envelope 1, Top Mounted, UL/ANSI	Fixed breaker - back connected	17.44	443	17.17	436	17.40	442	180.8	82
	Drawout breaker - Moving portion	17.01	432	16.34	415	17.24	438	198.4	90
	Cassette/substructure	17.44	443	20.83	529	17.44	443	143.3	65
Envelope 1, Side Mounted, UL/ANSI	Fixed breaker - back connected	20.08	510	17.17	436	15.98	406	180.8	82
	Drawout breaker - Moving portion	19.29	490	16.34	415	15.83	402	198.4	90
	Cassette/substructure	19.76	502	20.83	529	15.98	406	143.3	65
Envelope 2, Up to 2000A, UL/ANSI	Fixed breaker - back connected	22.28	566	17.17	436	17.40	442	220.5	100
	Drawout breaker - Moving portion	22.13	562	16.34	415	17.24	438	242.5	110
	Cassette/substructure	22.56	573	20.83	529	17.44	443	154.3	70
Envelope 2, Up to 3000A, UL	Fixed breaker - back connected	22.28	566	22.17	563	17.40	442	330.7	150
	Drawout breaker - Moving portion	22.13	562	16.34	415	17.24	438	275.6	125
	Cassette/substructure	22.56	573	26.14	664	17.44	443	308.6	140
Envelope 2, Up to 3200A, ANSI	Fixed breaker - back connected	22.28	566	22.17	563	17.40	442	363.8	165
	Drawout breaker - Moving portion	22.13	562	16.34	415	17.24	438	275.6	125
	Cassette/substructure	22.56	573	26.14	664	17.44	443	330.7	150
Envelope 3, Up to 4000A, ANSI/UL	Fixed breaker - back connected	38.03	966	22.17	563	17.40	442	385.8	175
Envelope 3, Up to 5000A ANSI / 6000A UL	Fixed breaker - back connected	38.03	966	22.17	563	17.40	442	617.3	280
Envelope 3, All Ratings	Drawout breaker - Moving portion	37.87	962	16.34	415	17.24	438	440.9	200
	Cassette/substructure	38.31	973	26.14	664	17.44	443	529.1	240
Envelope 3-200kA, All Ratings	Drawout breaker - Moving portion	37.87	962	16.34	415	17.24	438	451.9	205
	Cassette/substructure	38.31	973	26.14	664	20.47	520	542.3	246

SECTION 3 – LIFTING, MOUNTING AND INSTALLATION**⚠ WARNING****IMPROPER INSTALLATION, OPERATION AND MAINTENANCE**

Ensure only qualified personnel install, operate, service and maintain all electrical equipment.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING**FALLING OBJECT**

- Ensure lifting equipment has capability for device being lifted.
- Wear hard hat, gloves and safety shoes.

Failure to comply with these instructions could result in death or serious injury.

CAUTION**PRODUCT DAMAGE**

- Ensure circuit breaker and its accessories are always used within their designated ratings.
- Do not allow the circuit breaker to hit a hard surface while handling.
- Do not drag or slide the circuit breaker across a hard or rough surface.

Failure to comply with these instructions may result in product damage.

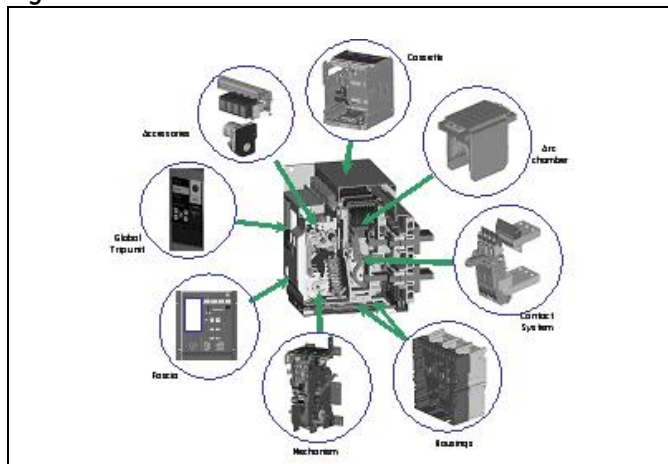
NOTICE

A factory-installed rejection feature prevents mismatching circuit breakers and cassettes/substructures, preventing the insertion of a circuit breaker with a lower rating into a higher rated cassette/substructure, or the insertion of a higher rated circuit breaker into a lower rated cassette/substructure.

CIRCUIT BREAKER UNPACKING (Fig. 3.1)

1. Inspect the shipping container for obvious signs of rough handling and/or external damage incurred during transportation.
2. Record any observed damage for reporting to the carrier. Ensure all recorded reports and claims include the order number and name plate information.
3. Remove the banding straps and lift off the top cover.
4. Remove all packaging material.
5. Remove all product documentation and store properly.

6. Unscrew the mounting screws that fasten the circuit breaker to the bottom of the shipping palette and remove the circuit breaker.

Figure 3.1. Unpacking the Circuit Breaker**BASIC CIRCUIT BREAKER CONSTRUCTION (Figs. 3.2 and 3.3)****Figure 3.2. Circuit Breaker Construction A****Figure 3.3. Circuit Breaker Construction B**

EntelliGuard G circuit breakers consist of rigid front and rear housings made of thermoset composite resins which provide high structural strength and excellent dielectric properties. These housings enclose a contact system consisting of a moving portion and a fixed portion:

- Moving portion: comprised of multiple finger assemblies connected to a conductor through flexible copper connections. The number of finger assemblies depends on the circuit breaker's continuous and short circuit ratings. Each finger assembly has an arcing contact and a main contact.

- Fixed portion: consists of a main fixed contact which is brazed to a conductive pad, and arc runner which is fastened to the conductive pad which guides the arc to the arc chamber.

Each pole has an arc chamber comprised of arc chamber molds which houses the de-ion plates and filtering system. The pole configuration depends upon the breaker frame size. For larger frames, the two pole units are connected mechanically in parallel to form one phase.

The operating mechanism is mounted on the front housing. The energy stored in the mechanism is used to close the contact system. The mechanism is coupled to each pole by a common layshaft/drive shaft.

The global trip unit measures CT current and compares the output with set parameters. It gives a trip command during overload and short circuit to trip the breaker within a specified time, circuit monitors the current passing through the circuit breaker and keeps a history of faults.

The fascia has interface buttons and features for safety locks.

The cassette, which is used for drawout breakers, consists of a mechanism which enables the circuit breaker to be racked in and out, and houses the interlocks.

The front panel on the cassette has three markings which indicate whether the breaker is in the CONNECTED, TEST or DISCONNECTED position.

LIFTING AND MOUNTING

Using a Lifting Truck

Circuit breaker removal can be made easier by using a specifically-designed lifting truck (Fig. 3.4). Contact the nearest sales office for availability.

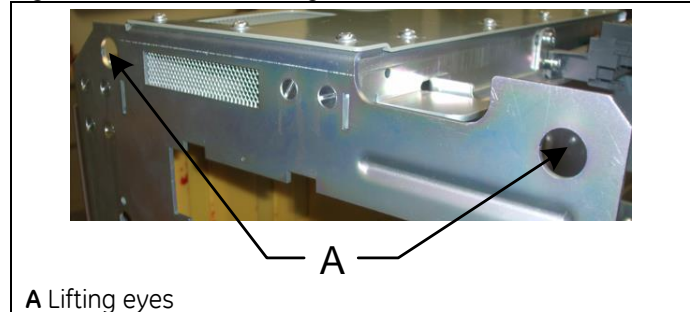
Figure 3.4. Lifting Truck



Drawout Cassette Lifting, Mounting and Installation

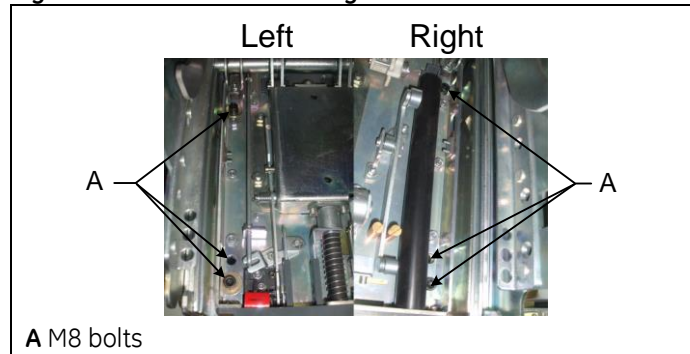
1. Place the cassette on a rigid, leveled appropriate support on the switchboard. If a handling truck or other lifting gear is used, install four M10 lifting bolts on to the M10 nuts available on the cassette channels as shown in Fig. 3.5. Use all four lifting bolts at front and rear of the cassette.

Figure 3.5. Cassette Lifting



2. Mount the cassette on to the switch board using six M8 bolts, nuts and lock washers through the mounting holes shown in Fig. 3.6. Do not tighten.
3. Ensure the cassette side walls are square to the switch board.
4. Tighten the mounting bolts to a torque of 25 N m at the front and rear mounting points (Fig. 3.6).

Figure 3.6. Cassette Mounting



5. Ensure there is minimal deflection/stress to the back of the cassette when connecting busbars.
6. Connect the incoming and outgoing cables/busbars.
7. Ensure any safety shutters move freely after the cassette is installed.

Drawout Circuit Breaker Installation into the Cassette

1. Pull the lifting handles on both side walls of the circuit breaker.
2. Attach the lifting bar between the two holes of the lifting eyes as shown in Fig. 3.7.

Figure 3.7. Circuit Breaker Lifting

3. Remove any padlocks and keep the key in place for key locks if applied from the racking panel of the cassette.
4. Ensure the cassette position indicator shows DISCONNECTED and the racking handle is disengaged.
5. Ensure the cassette racking cams on both side walls of the cassette are in the completely racked out position as shown in Fig. 3.8.

Figure 3.8. Racking Drive in the DISCONNECTED Position

6. Pull out the cassette rails until they drop into the horizontal locked position.
7. Lower the circuit breaker gradually so that the rollers drop over the rails. Ensure the grooves in all rollers straddle the rails as shown in Fig. 3.9.

Figure 3.9. Circuit Breaker Rollers Straddled on the Loading Rails

8. Using the hand grips on either side, remove the lifting bar and push the circuit breaker into the cassette until it reaches a positive stop (the rollers on circuit breaker are engaged with the racking cams of the cassette on both sides). The circuit breaker is now in the DISCONNECTED position (Fig. 3.10).

Figure 3.10. Circuit Breaker in Disconnected Position.

9. Push back both the extended rails of the cassette to the stowed position.
10. If the circuit breaker is ON and the springs are charged, press the OFF button on the circuit breaker fascia and ensure the circuit breaker contacts are open (Fig. 3.11).

Figure 3.11. Setting the Circuit Breaker to OFF

11. Remove the racking tool from the storage location on the cassette front panel by grabbing the handle (Fig. 3.12).

Figure 3.12. Racking Handle Storage Location

12. Pull out the torque bar from inside the handle and extend (Fig. 3.13).

Figure 3.13. Racking Handle Extended

13. With a screwdriver, turn the racking handle shutter drive A clockwise (Fig. 3.14).

Figure 3.14. Racking Handle Shutter Drive Location



14. Insert the racking handle in the handle insertion hole on the cassette front panel.
15. Rotate clockwise to rack the circuit breaker into the cassette. As the breaker approaches the TEST position check the alignment of the fixed and moving parts of the secondary circuit isolating contacts (Fig. 3.15).

Figure 3.15. Turning the Racking Handle



16. Continue rotating the racking handle clockwise until the position indicator first shows TEST, then CONNECTED. When approaching the CONNECTED position, effort to turn the racking handle will increase as the clusters engage with the cassette-mounted contacts. If a motor spring charge or under voltage to release is installed, these may operate when approaching the TEST position.
17. Remove and store the racking handle in its storage location.
18. The circuit breaker is now ready for normal operation.

Circuit Breaker Removal from the Cassette

⚠ DANGER

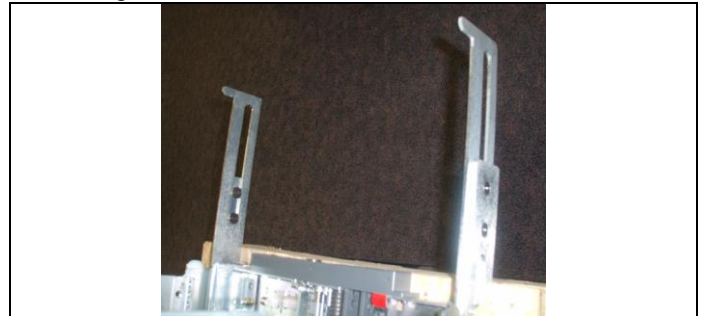
ELECTROCUTION

- Ensure the circuit breaker has been tripped, indicating OFF, and the main springs are fully discharged.
- Do not touch the circuit breaker's isolating contacts during lifting.

Failure to comply with these instructions will result in death or serious injury.

1. Repeat Steps 10 through 13 as explained in the previous section. Insert the racking handle in the handle insertion hole on the cassette front panel
2. Rotate counter clockwise to rack the circuit breaker out of the cassette. As the circuit breaker approaches the TEST position, check the alignment of the fixed and moving parts of the secondary circuit isolating contacts.
3. Continue rotating the racking handle counter clockwise until the position indicator first shows TEST, then DISCONNECTED.
4. Pull out the cassette rails until they drop into the horizontal locked position (Fig. 3.16).

Figure 3.16. Cassette Rails Pulled Out for Circuit Breaker Unloading



5. Using the hand grips on either side, pull the circuit breaker out of the cassette until it reaches a positive stop (rollers on the circuit breaker will stop against the extended rail projection as shown in Fig. 3.17).

Figure 3.17. Circuit breaker Pulled Out of the Cassette for Unloading

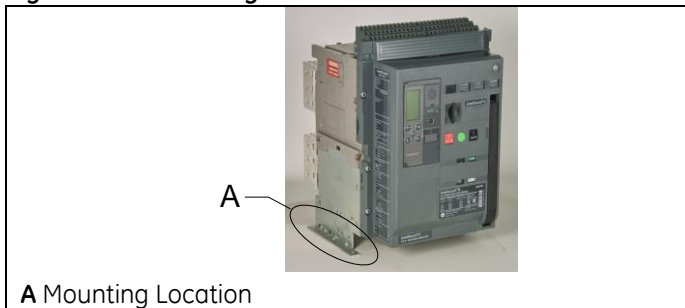


6. Attach the lifting bar to remove the circuit breaker.

Fixed-Mounted Circuit Breaker Mounting

1. Ensure adequate clearance above the circuit breaker to allow removal of the arc chutes and inspection of the arcing contacts.
2. Mount the circuit breaker into position, using the mounting location shown in Fig. 3.18 and four M8 bolts, on a suitable support structure using. Torque to 25 N m. A clearly-marked grounding point is provided on either side of the circuit breaker.

Figure 3.18. Mounting Location



TRIP UNIT

General Information

All EntelliGuard G power circuit breakers are equipped with a digital electronic trip unit available in four basic versions E, S, N, and H.

Each trip unit has a screen that provides an ammeter and a menu-driven adjustment of the breaker parameters across a broad current range. The menu has four settings and one enter key, allowing fast and accurate setting of the device (Fig. 3.19).

Figure 3.19. Trip Unit



Trip Unit Installation

1. The trip unit is mounted on the PMU base. Press the lever and align the trip unit as shown in Fig. 3.20.

Figure 3.20. Trip Unit Being Mounted on the PMU Base.



2. Insert the trip unit knob on the PMU base as shown in Fig. 3.21.

Fig 3.21. Trip Unit Knob



3. Release the lever once the trip unit is inserted. This action will lock the trip unit to the PMU base as shown in Fig. 3.22.

Figure 3.22. Trip Unit Alignment



4. Install the front cover as shown in Fig. 3.23.

Fig 3.23. Front Cover Installation



WIRING

Tables 3.1 through 3.3 show the wiring schematic for Blocks-A, -B and -C. Table 3.4 provides information on the factory-installed network interlock feature and is for use by maintenance organizations for optional network interlock connections. Table 3.5 provides nomenclature definitions for Tables 3.1 through 3.4.

Table 3.1. Wiring Schematic for Block-A (Three Layer Secondary Disconnect with Basic GTU and Basic Accessories)

	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13
	Motor	Motor	Spr NO/ RTC NO	Spr NO/ RTC NO	ST1	ST1	UV1	UV1	CC COM	CC IMM	CC CMD	ST2/ UV2	ST2/ UV2
Max. Current (I)	14.8 A	14.8 A	10 A	10 A	1.9 A	1.9 A	1.9 A	1.9 A	1.9 A	1.9 A	1.9 A	1.9 A	1.9 A
Max. Voltage (V)	440 V	440 V	240 V	240 V	440 V	440 V	440 V	440 V	440 V	440 V	440 V	440 V	440 V
	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26
	NC3	NC3	NC2	NC2	NC1	NC1	NO3	NO3	NO2	NO2	NO1	NO1	-
Max. Current (I)	15 A	15 A	15 A	15 A	15 A	15 A	15 A	15 A	15 A	15 A	1 A	15 A	-
Max. Voltage (V)	440 V	440 V	440 V	440 V	440 V	440 V	440 V	440 V	440 V	440 V	440 V	440 V	-
	A27	A28	A29	A30	A31	A32	A33	A34	A35	A36	A37	A38	A39
	O/P1a	O/P1b	O/P2a	O/P2b	24 V+	24 V-	BA NC	BA NO	BA COM	N-RC-	N-RC+	Eleg-CT	Eleg-CT
Max. Current (I)	1 A	1A	1 A	1 A	<500 mA	<500 mA	10 A	10 A	10 A	<50 mA	<50 mA	5 A	5 A
Max. Voltage (V)	30 Vdc/ 25 Vac	30 dc/ 25 Vac	30 Vdc/ 25 Vac	30 Vdc/ 25 Vac	30 V	30 V	240 V	240 V	240 V	480 mV	480 mV	2 V	2 V

Table 3.2. Wiring Schematic for Block-B (Three Layer Secondary Disconnect to be Added for GTU with Full I/O and Additional Accessory Signals)

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13
	INPUT1	INPUT2	I/P COM	ST1 NO/ NC8	ST1 COM/ NC8	UV1 NO/ NC7	UV1 COM/ NC7	NC6	NC6	NC5	NC5	NC4	NC4
Max. Current (I)	<50 mA	<50 mA	<50 mA	10 A/15 A	10 A/15 A	10 A/15 A	10 A/15 A	15 A	15 A	15 A	15 A	15 A	15 A
Max. Voltage (V)	30 Vdc/ 25 Vac	30 Vdc/ 25 Vac	30 Vdc/ 25 Vac	240 V/ 440 V	240 V/ 440 V	240 V/ 440 V	240 V/ 440 V	440 V	440 V	440 V	440 V	440 V	440 V
	B14	B15	B16	B17	B18	B19	B20	B21	B22	B23	B24	B25	B26
	RELT INPUT	COM	-	CC NO/ NO8	CC COM/ NO8	ST2 NO/ UV2 NO/ NO7	ST2 COM/ UV2 COM/ NO7	NO6	NO6	NO5	NO5	NO4	NO4
Max. Current (I)	<50 mA	<500 mA	-	10 A/ 15 A	10 A/ 15 A	10 A/ 15 A	10 A/ 15 A	15 A	15 A	15 A	15 A	15 A	15 A
Max. Voltage (V)	5 V	0.1V	-	240 V/ 440 V	240 V/ 440 V	240 V/ 440 V	240 V/ 440 V	440 V	440 V	440 V	440 V	440 V	440 V
	B27	B28	B29	B30	B31	B32	B33	B34	B35	B36	B37	B38	B39
	ZSI out+	ZSI out-	ZSI in+	ZSI in-	ISO GND	5V ISO	TX EN 1	RX	TX	GND Volt-IN	Volt-A	Volt-B	Volt-C
Max. Current (I)	<50 mA	<50 mA	<50 mA	<50 mA	<500 mA	<500 mA	<50 mA	<50 mA	<50 mA	<500 mA	<50 mA	<50 mA	<50 mA
Max. Voltage (V)	28 Vdc	28 Vdc	30 Vdc	30 Vdc	0.1 V	5 V	5 V	5 V	5 V	0.1 V	1.76 V	1.76 V	1.76 V

Table 3.3. Wiring Schematic for Block-C (Internal to the breaker, not used by customer.) (Two Layer Intermediate Secondary Disconnect at the Top for the Side Mounted Secondary Disconnect.)

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21
BA NC	BA NO	BA COM	ST1 NO	ST1 COM	UV1 NO	UV1 COM	CC NO	CC COM	ST2/ UV2 NO	ST2/ UV2 COM	NO5	NO5	NO4	NO4	NC3	NC3	NC2	NC2	NC1	NC1
C22	C23	C24	C25	C26	C27	C28	C29	C30	C31	C32	C33	C34	C35	C36	C37	C38	C39	C40	C41	C42
Spr NO/ RTC NO	Spr NO/ RTC NO	ST1	ST1	UV1	UV1	CC COM	CC IMM	CC CMD	ST2/ UV2	ST2/ UV2	NC5	NC5	NC4	NC4	NO3	NO3	NO2	NO2	NO1	NO1

Table 3.4. Electronic Interlock

Network Interlock Connections				Network Interlock Status Switch		
A5	A6	A7	A8	B4	B5	B6
NI TRIP	NI TRIP	NI RESET	NI RESET	NI NC	NI NO	NI COM
1.9 A	1.9 A	1.9 A	1.9 A	10 A	10 A	10 A
240 V	240 V	240 V	240 V	240 V	240 V	240 V

Table 3.5. Wiring Schematic Nomenclature Definitions

Pin	Nomenclature	Description	Pin	Nomenclature	Description
A1	Motor	power input to motor operator	B1	Input 1	relay input to trip unit
A2	Motor		B2	Input 2	relay input to trip unit
A3	SPR NO/RTC NO	spring charge status contact/ ready to close signaling contact	B3	I/P COM	relay input to trip unit
A4	SPR NO/RTC NO		B4	ST1 NO/NC8	shunt trip 1 signaling contact/normally open contact 8
A5	ST1	power input to shunt trip 1	B5	ST1 COM/NC8	
A6	ST1		B6	UV1 NO/NC7	under voltage release 1 signaling contact/normally closed contact 7
A7	UV1	under voltage release 1	B7	UV1 COM/NC7	
A8	UV1		B8	NC6	normally closed contact 6
A9	CC COM	closing coil neutral wire-common (CC or CCC)	B9	NC6	
A10	CC IMM	closing coil (CC), continuous control power (CCC)	B10	NC5	normally closed contact 5
A11	CC CMD	closing coil close signal (CCC)	B11	NC5	
A12	ST2/UV2	power input to shunt trip 2/under voltage release 2	B12	NC4	normally closed contact 4
A13	ST2/UV2		B13	NC4	
A14	NC3	normally closed contact 3	B14	RELT	RELT signal output
A15	NC3		B15	COM	trip unit communication
A16	NC2	normally closed contact 2	B16	-	-
A17	NC2		B17	CC NO/NO8	closing coil signaling contact/normally open contact 8
A18	NC1	normally closed contact 1	B18	CC COM/NO8	
A19	NC1		B19	ST2 NO/UV2	shunt trip 2 signaling contact/under voltage release 2 signaling contact/ normally open contact 7
A20	NO3	normally open contact 3	B20	ST2 COM/UV2	
A21	NO3		B21	NO6	normally open contact 6
A22	NO2	normally open contact 2	B22	NO6	
A23	NO2		B23	NO5	normally open contact 5
A24	NO1	normally open contact 1	B24	NO5	
A25	NO1		B25	NO4	normally open contact 4
A26	-	-	B26	NO4	
A27	O/P1a	relay output 1 from trip unit	B27	ZSI out+	GF zone selective interlock output
A28	O/P1b	relay output 1 from trip unit	B28	ZSI out-	
A29	O/P2a	relay output 2 from trip unit	B29	ZSI in+	GF zone selective interlock input
A30	O/P2b	relay output 2 from trip unit	B30	ZSI in-	
A31	24 V+	auxiliary power supply to trip unit	B31	ISO GND	trip unit communication
A32	24 V-		B32	5V Iso	
A33	BA NC	bell alarm switch	B33	TX EN 1	
A34	BA NO		B34	RX	
A35	BA COM		B35	TX	
A36	N-RC-	neutral Rogowski coil	B36	Voltage Input GND	ground point for voltage input to trip unit
A37	N-RC+		B37	Volt-A	system phase voltage signals
A38	Eleg-CT	earth leg CT (multi-source ground fault)	B38	Volt-B	
A39	Eleg-CT		B39	Volt-C	

SECONDARY DISCONNECT BLOCKS

- Located for easy customer wiring to the accessories and to the trip unit:
 - Top-mounted for all envelopes.
 - Optional side mounting is available for UL envelope 1.
- In case of drawout, by removing one screw, the cassette-mounted secondary disconnect block can be tilted in the mounted state and can be removed for easy control circuit wiring (Fig. 3.24).

Figure 3.24. Secondary Disconnect



- Block-A contains a set of 39 self-aligning secondary circuit isolating contacts. Each contact is clearly labeled with the connection point. For certain protection configurations and additional accessories, an additional block (Block-B) is installed.
- Current rating of each terminal is 10 A/240 Vac and 5 A/250 Vdc.
- Terminals are suitable for ring or spade terminals and bare conductors (Table 3.6). Recommended max. width or diameter of the connector is 7.4 mm.
- Connector examples:
 - Ring terminals: TYCO-35684 (wire gauge 14-12)
 - Spade terminals: TYCO-34384 (wire gauge 12-10)
 - Molex-0190690230 (wire gauge 10-12)

Table 3.6. Terminal Wiring

Number of Terminals	78	
Terminal capacity	1x	2x
Screw type (bare conductors)	12 AWG, solid or stranded	-
Screw type (bare conductors)	22 AWG to 14 AWG, 0.5 mm ² to 2.5 mm ²	
Ring/spade terminals	20 AWG to 12 AWG	-

SELECTIVITY/BACKUP PROTECTION

- The circuit breaker is time-selective with the downstream ACB and MCCBs up to the lowest of the breaking capacity of the combination.
- Selectivity levels are determined by the selection settings of short time and instantaneous pickup and time delay on the Trip Unit.
- No backup protection/cascading (series ratings) is available with this product.

SECTION 4 – OPERATION

⚠ WARNING

IMPROPER INSTALLATION, OPERATION AND MAINTENANCE

Ensure only qualified personnel install, operate, service and maintain all electrical equipment.
Failure to comply with these instructions will result in death or serious injury.

⚠ WARNING

PERSONAL INJURY

- Avoid risk of injury from moving parts while handling the breaker.
- If advisable, use a cable/busbar lockable grounding device (optional accessory) to provide additional safety during system maintenance.

Failure to comply with these instructions could result in death or serious injury.

CAUTION

PRODUCT DAMAGE

- Ensure circuit breaker and its accessories are always used within their designated ratings.
- Use the specially designed circuit breaker handling truck (optional accessory) when removing the circuit breaker from its cassette.

Failure to comply with these instructions may result in product damage.

STORED ENERGY MECHANISM KEY FEATURES (Table 4.1)

NOTICE

- Each charging action provides sufficient charge for an O-C-O (Open-Close-Open) operation without requiring additional charging.
- The mechanism works properly only when the circuit breaker is mounted on a horizontal plane with bottom mounting or on vertical plane with front mounting.

Circuit Breaker Charging

The circuit breaker can be charged in one of two ways:

- Manually, using a charging handle.
 - The charging handle lies flush within the circuit breaker front cover. It is easily retracted without special tools.
 - Full spring charging is accomplished with 10 full pumps or less of the handle. Handle movement includes suitable stops so that it cannot be over extended and cause operator injury.
 - The handle engages the charging ratchet during motion away from the circuit breaker front cover and rotates freely on the return stroke.
- Electrically, via a motor operator that is automatically activated after the closing operation.

Two Step Mechanism Design

- The first step charges the closing spring through the manual charging handle or through the spring charging motor.
- The second step closes the circuit breaker via the PUSH ON (UL)/CLOSE (ANSI) pushbutton on the front cover or closes the breaker through energizing the closing coil.
- The mechanism is trip free and incorporates an anti-pumping system:
 - The circuit breaker may be closed only after the mechanism is fully charged and there is no active open command.
 - The closing coil has an electrical anti-pumping feature. The coil supply, if maintained continuously, will attempt to close the circuit breaker only one time. To achieve a second closing attempt, the closing coil must be de-energized and energized a second time.

Table 4.1. Stored Energy Mechanism Sequences of Operation

ON/OFF Indicator	Main Breaker Contacts	Charging Spring Indicator	Condition of Charging Springs	Next Permissible Operating Function
OFF	open	discharged	discharged	closing springs may be charged
OFF	open	charged	fully charged	contacts may be closed, then opened
ON	closed	discharged	discharged	contacts may be opened or closing springs may be charged
ON	closed	charged	fully charged	pen-closed-open sequence may be carried out and the closing springs can be charged after the close operation opened
OFF	open	charged	fully charged	closing spring may be discharged without closing contacts
ON	closed	charging	partially charged	complete charging
OFF	open	charging	partially charged	complete charging

CLOSING SPRING DISCHARGE PROCEDURE (Table 4.2)

The main spring may be discharged (also known as “crashing the mechanism”) without closing the breaker by using a special tool operated through a small window on the front cover.

One of the following safety-related capabilities should be provided per the applicable ANSI standard:

- Drawout version only:
 - ANSI versions: The mechanism closing springs are automatically discharged (crashed) when the circuit breaker is moved from the DISCONNECT position to the WITHDRAWN fully disconnected position and vice versa.
 - UL and IEC versions. The automatic spring discharge feature is optional.
- Fixed-mounting and drawout versions:
 - The front cover has a label indicating the position of the hidden spring charged indicator button and clearly indicates that the springs must be discharged prior to any maintenance activity or circuit breaker disassembly.

The closing springs must be discharged prior to removal of the arc-chute cover.

CLOSING PROCEDURE

- Pull the charging handle out and down to charge the closing springs (requires approximately 10 pumps of the handle to fully charge).
- If a motorized spring charging unit is installed, the springs will be automatically charged as soon as the motor is energized.
- Pressing the ON pushbutton or energizing the closing coil (if installed) will close the circuit breaker.

CONDITIONS WHEN CLOSING CANNOT OCCUR

- The OFF button is in a depressed position.
- The trip unit is not installed.
- If racking handle is inserted, remove it.
- The breaker is positioned anywhere between CONNECTED, TEST and DISCONNECTED positions.
- Trip unit reset button is protruding from the front cover. Press the reset button.
- An under voltage release is installed but not energized.
- A key interlock (Ronis, Profalux, Castell, etc.) or direct inter-breaker mechanical interlock is operating on the breaker.

CIRCUIT BREAKER OPENING PROCEDURE

- Press the OFF pushbutton or energize the shunt trip coil (if installed).
- Tripping under fault conditions will be automatic depending on the protective device installed and its settings.

Table 4.2. Cassette Operating Positions

Circuit Breaker Position in the Cassette	Primary Disconnects	Secondary Disconnects	Circuit Breaker Functionality	Circuit Breaker Door Position
CONNECTED	engaged	engaged	<ul style="list-style-type: none"> • circuit breaker may be operated both mechanically or electrically • ready for service 	closed
TEST	disengaged	engaged	<ul style="list-style-type: none"> • circuit breaker may be operated both mechanically or electrically • circuit breaker and control circuit operations may be tested and verified 	closed
DISCONNECTED	disengaged	disengaged	<ul style="list-style-type: none"> • circuit breaker may be operated only mechanically • circuit breaker may not be removed from the circuit breaker compartment 	closed
WITHDRAWN	disengaged	disengaged	<ul style="list-style-type: none"> • circuit breaker may be operated only mechanically • circuit breaker may be removed from the circuit breaker compartment 	open

SECTION 5 – LOCKS AND INTERLOCKS

⚠ DANGER**ELECTROCUTION**

Ensure the circuit breaker has been tripped, indicating OFF, and the main springs are fully discharged before installing locks and interlocks.

Failure to comply with these instructions will result in death or serious injury.

**WARNING****IMPROPER INSTALLATION, OPERATION AND MAINTENANCE**

Ensure only qualified personnel install, operate, service and maintain all electrical equipment.

Failure to comply with these instructions could result in death or serious injury.

**WARNING****PERSONAL INJURY**

- Avoid risk of injury from moving parts while handling the circuit breaker.

Failure to comply with these instructions could result in death or serious injury.

CAUTION**PRODUCT DAMAGE**

- Ensure the circuit breaker and its accessories are always used within their designated ratings.
- Use the specially-designed circuit breaker handling truck (optional accessory) when removing the circuit breaker from its cassette.

Failure to comply with these instructions may result in product damage.

GENERAL INFORMATION**NOTICE**

Ensure all padlocks are scissor compatible.

A variety of locks and interlock accessories are available. The operation of most of these accessories is described in this section.

CIRCUIT BREAKER FRONT PANEL LOCKING

Pushbutton Locking

This function denies unauthorized access to ON/OFF pushbuttons.

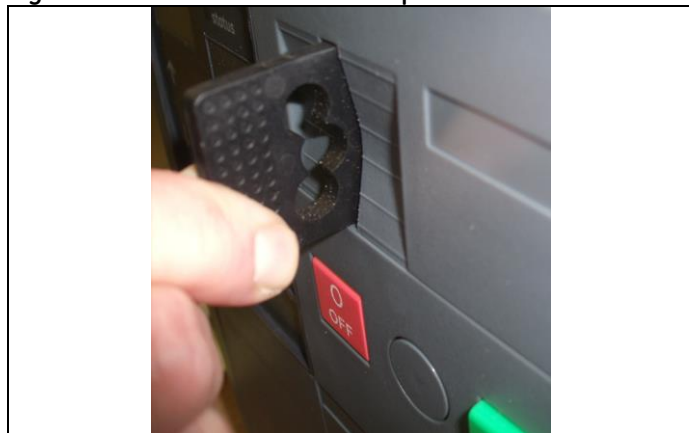
1. Ensure padlock shaft diameter is 3 mm to 9.5 mm.
2. Raise the appropriate window(s) and pass padlock hasp through the locking eye (Fig. 5.1).

Figure 5.1. Pushbutton Padlock Location

**Padlock or Scissor Lock for Breaker Trip Free Condition**

1. While pressing the OFF pushbutton, pull out the padlock lever.
2. Pull the padlock lever out.
3. Ensure padlock shaft diameter is 3 mm to 9.5 mm.
4. Insert padlock hasp (Fig. 5.2).

Figure 5.2. Padlock for Breaker Trip Free Condition



Key Lock for Breaker Trip Free Condition

A total of four key locks (Ronis/Profalux/Kirk and one Castel lock) can be installed.

1. Press the OFF pushbutton until the padlock lever is pulled out
2. Pull the padlock lever and remove the key from lock by rotating it in counterclockwise direction (Fig. 5.3).

Figure 5.3. Key Lock for Breaker Trip Free Condition



DRAWOUT CASSETTE FRONT PANEL LOCKING

Security Locking

This function locks the entry of the racking handle in the crank insertion hole of the cassette front panel when the padlock is installed when circuit breaker in the DISCONNECTED/ CONNECTED position. Up to three padlocks (shaft diameter of 3 mm to 9.5 mm) may be installed for additional security (Fig. 5.4).

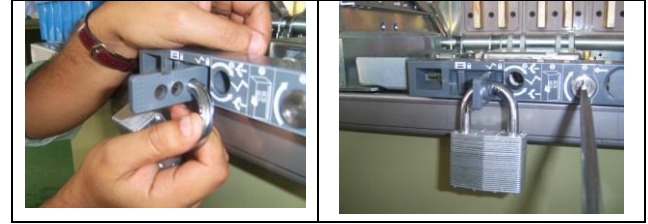
Figure 5.4. Circuit Breaker Security Padlocking Location



A Security Locking Bar

1. Ensure the position indicator shows the DISCONNECTED/CONNECTED position.
2. Remove the racking handle from the operating position.
3. Pull the locking bar until the locking eye is exposed and hold while inserting the padlock shaft (Fig. 5.5).

Figure 5.5. Padlock Insertion and Lock-Out on the Security Locking Bar



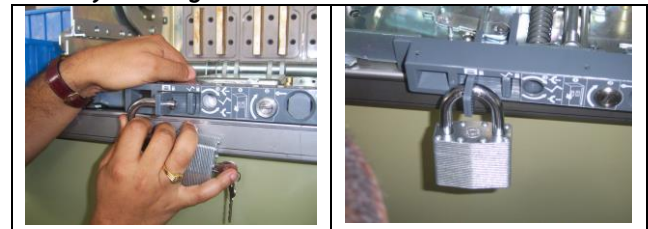
4. Using a screwdriver, turn the racking handle shutter drive A clockwise.

Isolation Shutters Locking (If Installed)

This function locks the operation of the safety shutters when the pad lock is installed on the security locking bar B only when the cassette is in the DISCONNECTED position. Only one padlock (shaft diameter of 3 mm to 9.5 mm) may be installed.

1. Ensure the position indicator shows the DISCONNECTED/CONNECTED position.
2. Remove the racking handle from the operating position.
3. Pull the locking bar until the locking eye is exposed and hold while inserting the padlock hasp (Fig. 5.6).

Figure 5.6. Padlock Insertion and Lock-Out on the Security Locking Bar

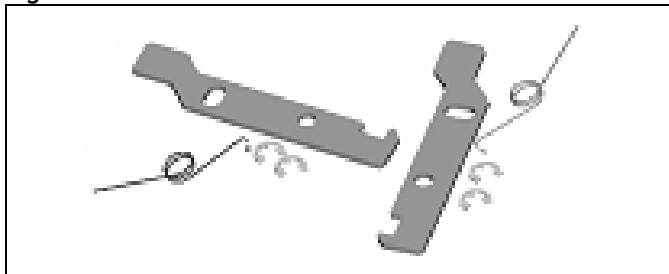
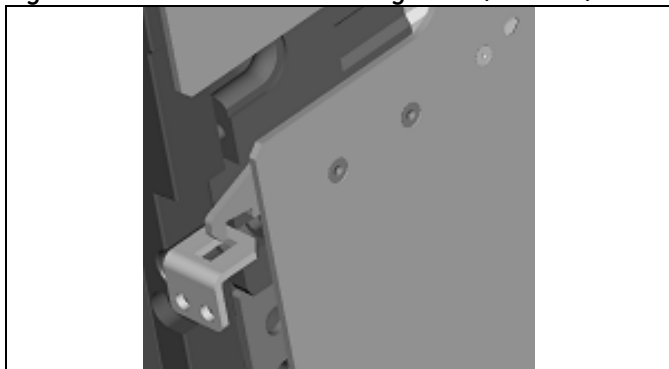


1. Using a screwdriver, turn the racking handle shutter drive clockwise.
2. Check installation by trying to lift the front shutter plate up and down (for horizontal terminations) or sliding it left to right (for vertical terminations) which are installed on the cassette in front of the terminals (Fig. 5.7).

Fig. 5.7. Safety Shutter in Closed Position**Door Interlock Installation**

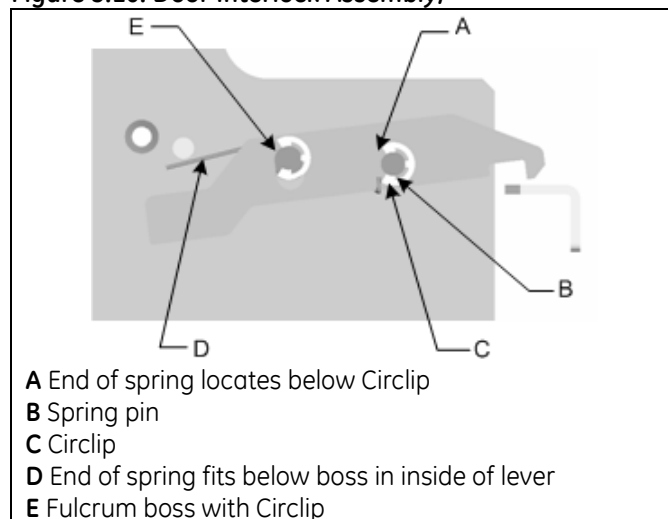
A door interlock mechanism may be installed inside the cassette on the right for L/H (left-hand) hinged door or left for R/H (right-hand) hinged door. Specify whether the door is L/H or R/H hinged when ordering interlock kits (Figs. 5.8 and 5.9). Each kit contains:

- One interlock lever
- One helical spring
- Door Catch Assembly
- Washers
- Circlips

Figure 5.8. Door Interlock Pack Contents**Figure 5.9. Door Interlock Showing both L/H and R/H Sets**

To assemble (Fig. 5.10):

1. Place the spring over the pivot pin protruding from cassette side plate.
2. Position interlock lever as shown. Ensure one end of spring is located below the nut and the other rests over the small boss on the lever.
3. While holding the interlock lever in position: Insert two Circlip into the groove in the pivot pins and secure.

Figure 5.10. Door Interlock Assembly)

4. Mount the door catch assembly to the panel door using 2 X M5 – 8 long socket head screws, lock washers through the mounting holes shown in Fig. 5.11 and Fig. 5.12. Tighten the bolts to a torque of 8 N m on the panel door.

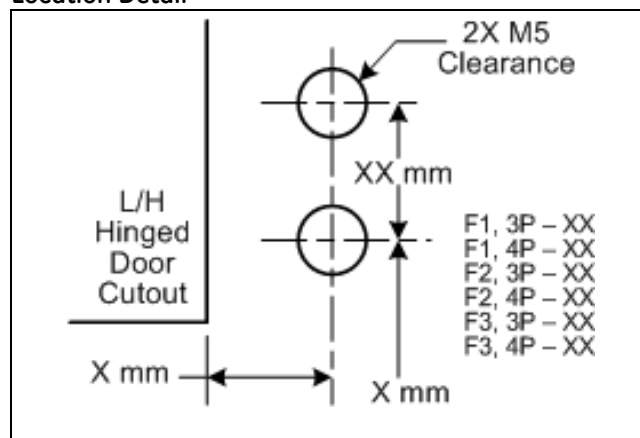
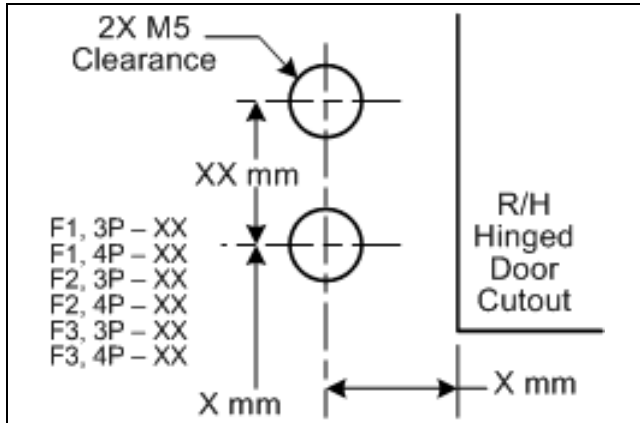
Figure 5.11. Left-Hand Hinged Board Door Bracket Location Detail

Figure 5.12. Right-Hand Hinged Board Door Bracket Location Detail



5. Ensure the circuit breaker is in the DISCONNECTED POSITION.
6. Close the panel door. Ensure the interlock lever is in the lifted position.
7. Close the door and rack-in the circuit breaker in the cassette. Follow steps 7 thru 12 in the section "Drawout Circuit Breaker Operation" already illustrated for racking the circuit breaker in the cassette.
8. After reaching CONNECTED position, test the now locked panel door to ensure it does not open.

KEY LOCKS AND INSTALLATION

Two types of key locks fit on the cassette (Figs. 5.13 and 5.14).

- Profalux
- Ronis

Figure 5.13. Profalux Key Interlock

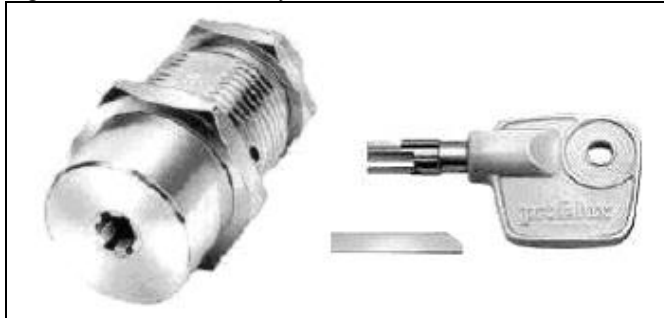


Figure 5.14. Ronis Key Interlock



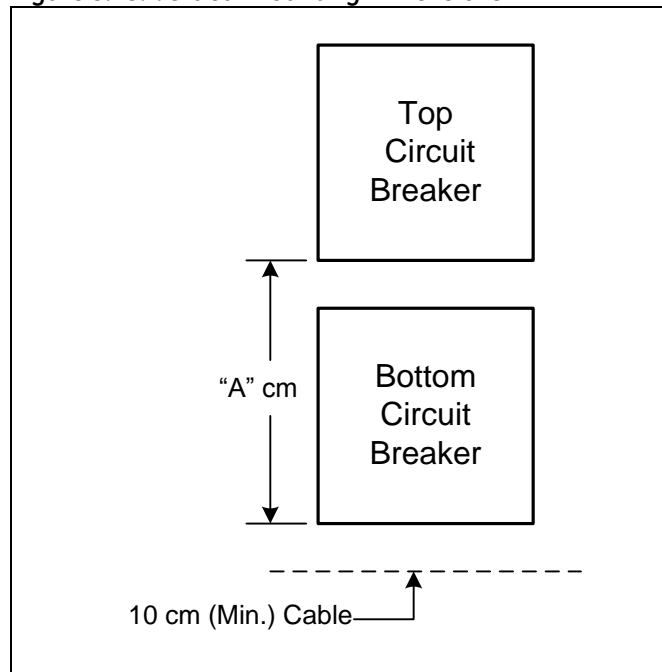
TWO-BREAKER CABLE INTERLOCK INSTALLATION

Figs. 5.15 and 5.16 provide information needed to calculate the correct cable length. More information on three-breaker and other combinations of cable interlocks is available on request.

Vertical Mounting (Fig. 5.15)

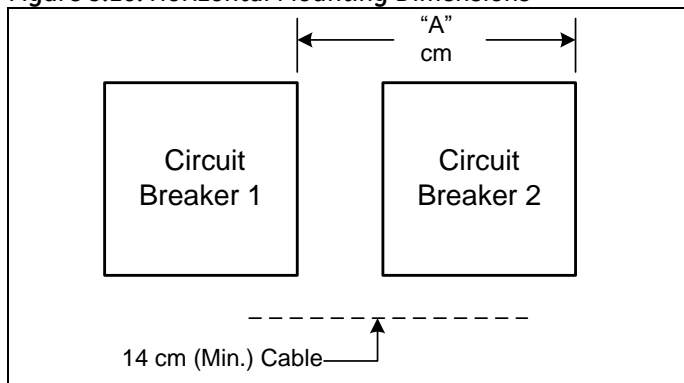
1. Cassette pitch "A" is from the bottom face of one cassette to the bottom face of the other. Dimension "A" must be no less than 60 cm.
2. Ensure that the minimum cable radius is not less than 125 mm. Minimum cable length is "A" + 100 cm. Longer cables may be used; however, they must be free from obstruction and no longer than 3 m.

Figure 5.15. Vertical Mounting Dimensions



Horizontal Mounting (Fig. 5.16)

1. Measure distance "A" from the right hand face of one cassette to the right hand face of the other.
2. Ensure the minimum cable radius is not less than 125 mm. Cable length is "A" + 67 cm. Longer cables may be used; however, they must be free from obstruction and no longer than 3 m.

Figure 5.16: Horizontal Mounting Dimensions**SAFETY SHUTTERS INSTALLATION (Fig. 5.17)**

1. Ensure circuit breaker is in the DISCONNECTED position and the racking handle is removed.
2. Pull out the top or bottom shutter locking bar, or both as required, to reveal the locking eye.
3. Hold while inserting padlock(s). (Shaft diameter is 6 mm min. to 8 mm max.).
4. Apply the provided "BUSBAR" and "CIRCUIT" designation labels.

Figure 5.17. Shutter Padlocking**Table 5.1. Fixed-Mounted Circuit Breaker Locking**

Function	Number and Type of Padlocks/Locking Devices	Padlock Shaft Diameter
Padlock for "ON" pushbutton restricting access to the button in raised position	maximum of one lock of may be mounted	3 mm to 9.5 mm
Padlock for "OFF" pushbutton restricting access to the button in depressed state to block ON operations	maximum of one lock of may be mounted	3 mm to 9.5 mm
Padlock for breaker trip free condition	maximum of three locks may be mounted	3 mm to 9.5 mm
Breaker Key Lock in OPEN position (Optional)	<ul style="list-style-type: none"> • maximum of four key locks of any one type (optional Kirk/Ronis/Profalux) may be used • maximum one of Castle lock may be installed 	N/A

Table 5.2. Drawout Circuit Breaker Locking

Function	Number and Type of Padlocks/Locking Devices	Padlock Shaft Diameter
Racking mechanism screw access blocking padlock in DISCONNECTED/TEST/CONNECTED positions	three locks may be mounted in one slot	3 mm to 9.5 mm
Racking mechanism screw access blocking and breaker trip free position key lock in DISCONNECTED/TEST/CONNECTED positions (Ronis/Profalux)	maximum of two locks	3 mm to 9.5 mm
Padlocking provisions on the drawout rails prevent unauthorized installation of a breaker that has been removed from the cassette for equipment or load maintenance.	maximum of three padlocks	3 mm to 9.5 mm

SECTION 6 – ACCESSORIES DESCRIPTION

⚠ WARNING

IMPROPER INSTALLATION, OPERATION AND MAINTENANCE

Ensure only qualified personnel install, operate, service and maintain all electrical equipment.

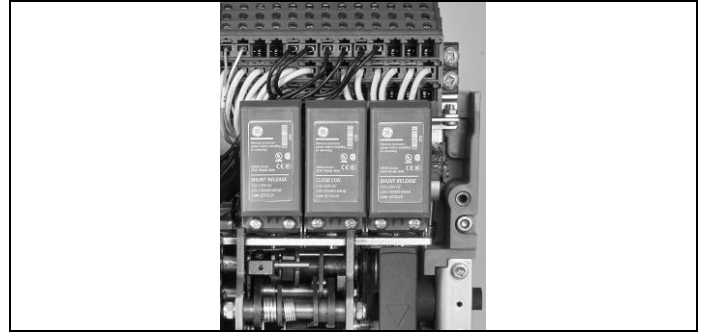
Failure to comply with these instructions could result in death or serious injury.

GENERAL INFORMATION

A wide range of optional accessories are interchangeable across all EntelliGuard G power circuit breakers, regardless of nominal rating or envelope/frame size. Each accessory incorporates easy-fit design features for quick installation, either at the factory or in the field (Fig. 6.1).

NOTE: Replacement accessories have an “R” at the end of the catalog number as shown.

Figure 6.1. Accessory Mounting



INDIVIDUAL ACCESSORIES

Motorized Spring Charging Unit

The unique motor/gearbox unit is specially designed to operate with the full range of EntelliGuard G. It is easily fitted with three heavy-duty bolts. After a breaker close operation, the unit automatically recharges the spring and makes it ready for immediate open and re-close should the need arise. High speed recharging ensures that the springs are fully charged within approximately three seconds following a release. All electrically operated (EO) ANSI/UL breakers are equipped with “Spring Charged” contacts (GSCC1R) for status indication (Table 6.1).

Table 6.1 Motor Operators

Envelope	Power Consumption	Nominal Control Voltage	IEC Range (85% to 110%)	ANSI Range	UL Range (85% to 110%)	Cat No.
1	DC – 300 W	24 Vdc/30 Vdc	20.4 V to 26.4 V	-	20.4 V to 26.4 V	GM0124DR
		48 Vdc	40.8 V to 52.87 V	38 V to 56 V	40.8 V to 52.87 V	GM01048DR
		60 Vdc	51 V to 66 V	-	51 V to 66 V	GM01060DR
		72 Vdc	61.2 V to 79.2 V	-	61.2 V to 79.2 V	GM01072DR
		110 Vdc/130 Vdc	106.25 V to 137.5 V	100 V to 140 V	106.25 V to 137.5 V	GM01130DR
	AC – 350 VA	250 Vdc	212.5 V to 275 V	200 V to 280 V	212.5 V to 275 V	GM01250DR
		48 Vac	40.8 V to 52.87 V	-	40.8 V to 52.87 V	GM01048AR
		120 Vac	102 V to 132 V	104 V to 127 V	102 V to 132 V	GM01120AR
		240 Vac	204 V to 264 V	208 V to 254 V	204 V to 264 V	GM01240AR
		277 Vac	235.5 V to 304.7 V	-	235.5 V to 304.7 V	GM01277AR
2, 2.5 and 3	DC – 480 W	24 Vdc/30 Vdc	20.4 V to 26.4 V	-	20.4 V to 26.4 V	GM0224DR
		48 Vdc	40.8 V to 52.87 V	38 V to 56 V	40.8 V to 52.87 V	GM02048DR
		60 Vdc	51 V to 66 V	-	51 V to 66 V	GM02060DR
		72 Vdc	61.2 V to 79.2 V	-	61.2 V to 79.2 V	GM02072DR
		110 Vdc/130 Vdc	106.25 V to 137.5 V	100 V to 140 V	106.25 V to 137.5 V	GM02130DR
	AC – 560 VA	250 Vdc	212.5 V to 275 V	200 V to 280 V	212.5 V to 275 V	GM02250DR
		48 Vac	40.8 V to 52.87 V	-	40.8 V to 52.87 V	GM02048AR
		120 Vac	102 V to 132 V	104 V to 127 V	102 V to 132 V	GM02120AR
		240 Vac	204 V to 264 V	208 V to 254 V	204 V to 264 V	GM02240AR
		277 Vac	235.5 V to 304.7 V	-	235.5 V to 304.7 V	GM02277AR

- Spring charge contact is power rated only, as shown below.

AC Ratings		DC Ratings	
Voltage	Amps	Voltage	Amps
110 V-130 V	AC21-15 A	24 V	DC21-15 A
	AC23-10 A	110 V-130 V	DC21-10 A
220 V-240 V	AC21-10 A	250 V	DC21-5 A
	AC23-5 A	-	-

- Spring charge time = 3 sec max.
- Recommended fuse amps: contact factory.
- Duty cycle = 2/min.
- Envelope 1 motors: running VA ~ 300 VA; inrush = 2 to 3 times.
- Envelope 2 and 3 motors: running VA ~ 450 VA; inrush = 2 to 3 times.

Circuit Breaker Closing Coils – Standard and Commanded

Two, easy-to-fit, clip-on closing coil options with simple, plug-in connections are available. Both options offer electrical remote release of the spring charged closing mechanism. Both options include a standard anti-pump safety feature ensuring that the remote signal must be released before further close commands are allowed. The Command Close Coil additionally provides for local electrical command of the accessory and remote command over communications via the EntelliGuard trip unit (Table 6.2).

Table 6.2. Closing Coil Characteristics

Type	Power Consumption	Nominal Control Voltage	Catalog Number
Closing Coil	DC: 350 W, 20 W (sealed)	24/30 Vdc	GCCN24DR
		40 Vdc; 48 Vac/dc	GCCN048R
		60Vdc	GCCNM060DR
	AC: 350 W (inrush), 20 W (sealed)	70 to 72 Vac/Vdc	GCCN072R
		110/130/120 Vac	GCCN120R
		208 Vac	GCCN208AR
		220 Vdc/240 Vac	GCCN240R
Command Operated Closing Coil	DC: 350 W, 20 W (sealed)	24/30 Vdc	GCCC24DR
		40 Vdc; 48 Vac/dc	GCCC048R
		60 Vdc	GCCCM060DR
	AC: 350 W (inrush), 20 W (sealed)	70 to 72 Vac/Vdc	GCCC072R
		110/130/120 Vac	GCCC120R
		208 Vac	GCCC208AR
		220 to 250 Vac/Vdc/249 Vac	GCCC240R

- Duty cycle = 2/min.
- Closing coil inrush = 350 VA.

Command Operation Module

This module energizes the closing coil to cause the breaker to close whenever control power is applied to the accessory and when commanded from the breaker trip unit or breaker front panel push button (electrical closing).

Shunt Trip (ST)

Energizing the shunt trip, via local or remote input, will instantaneously activate the circuit breaker mechanism, ensuring a rapid open operation. The standard auxiliary switch ensures automatic isolation whenever the circuit breaker is open. The shunt trip release is a straightforward, field installable accessory available in wide range of voltages (Table 6.3).

Table 6.3. Extended Range Shunt Trip for UL Ground Fault and ANSI DC Rating Applications.

Nominal Control Voltage	Catalog Number
24 Vdc	GSTG024DR
48 Vac/dc	GSTG048R
70/72 Vdc	GSTG072DR
110 Vdc/120 Vac	GSTG120R
125 Vdc	GSTG125DR
208 Vac	GSTG208AR
240 Vac	GSTG240R
250 Vdc/277 Vac	GSTG277R

- Pickup range = 55%-110%.
- Duty cycle = 2/min.
- Inrush = 480 A (ac), 480 W (dc).
- Holding = 60 VA (ac), 50 W (dc).

Status Indication Switch (Coil Signaling Contact)

A plug-in module is available to provide status indication via the secondary disconnects and trip unit. Coil Signaling Contacts are available for closing coils, shunt trips and under voltage releases, see Table 6.4. Contact is mounted on top of the Accessory Device.

Table 6.4 Coil Signaling Contact Module

Type and Configuration	Rating			Cat. No.
1 Power rated + 1 Low signal (Hi-Fi) (1NO contact each)	AC	120 Vac	6 A	GCSP1R
		250 Vac	6 A	
	DC	125 Vac	0.5 A	
		250 Vdc	0.25 A	
	AC	125 Vac	0.1 A	
	DC	30 Vdc	0.1 A	
2 Low signal (Hi-Fi) (1NO contact each)	AC	125 Vac	0.1 A	GCSP2R

Under Voltage Release (UVR) With Fixed Time Delay

The UVR instantaneously activates the circuit breaker trip mechanism when the source voltage drops below the low voltage threshold. The UVR is also a simple, field installable device. NOTE: This accessory acts as a permissive; it is a no-voltage/no-close device. The circuit breaker cannot be closed (manually or electrically) unless the under voltage release coil is energized above the required threshold. The UVR shunt trip with fixed time delay is specifically intended for applications where a delay period (ride-through) is required due to potential voltage events. The delays are 50 ms when system voltage drops to 50% and 20 ms when system voltage drops below 50%. See Table 6.4. (A Time Delay Module is also available, see next page).

Table 6.5. UVR Operating Characteristics

Power Consumption	Nominal Control Voltage	Catalog Number
DC: 350 W, 20 W (sealed)	24/30 Vdc	GUVT030DR
	40 Vdc; 48 Vac/dc	GUVT048R
	60 Vdc	GUVT060DR
AC: 350 W (inrush), 20 W (sealed)	110/130/120 Vac	GUVT130R
	208 Vac	GUVT208AR
	220 Vdc/240 Vac	GUVT240R
	250 Vdc/277 Vac	GUVT277R

- Duty cycle = 2/min.
- Inrush = 350 VA (ac), 350 W (dc).
- Holding = 60 VA (ac), 50 W (dc).

Time Delay Module (TDM) for UVR (Externally Mounted)

The de-energized operation of the Under Voltage release can be delayed. This optional, externally mounted module has an adjustable time delay of 0 s to 3 s. The device can be implemented to prevent undesired breaker tripping due to momentary voltage interruptions and is connected in series with the Under Voltage release. The time delay is in addition to the time delay from the breaker mounted UVR accessory. The time delay module starts counting at 50% of rated voltage (Fig. 6.2 and Table 6.6).

Figure 6.2. Time Delay Module



Table 6.6 TDM Characteristics

Nominal Control Voltage	Catalog No.
48VDC	GTDM048D
48VAC	GTDM048A
60VDC	GTDM060D
120VDC	GTDM120D
120VAC	GTDM120A
208VAC	GTDM208A
240VDC	GTDM240D
240VAC	GTDM240A
250VDC	GTDM250D
277VAC	GTDM277A

Remote Operation Coil Combination

Each breaker accepts a maximum of four coils in the combinations shown in Table 6.7. All coils are mounted from the front and snap onto the mechanism after the fascia is removed.

Table 6.7. Remote Operation Coil Combination

Combination	Coil Position on Fascia (from left)			
	1	2	3	4
1	–	shunt	CC	UV
2	shunt	shunt	CC	UV
3	shunt	UV	CC	UV

Auxiliary Switches

Auxiliary switches indicate breaker main contact position. They change their state in the same time sequence as the breaker main contacts. See Tables 6.8 and 6.9 for available combinations and ratings.

Table 6.8. Auxiliary Switches

Contact Configuration	Cat. No.
Power rated (3NO+3NC)	GAUX3R
Power rated (3NO+3NC) + low signal (Hi-Fi) (2NO+2NC)	GAUX5R
Power rated (8NO+8NC)	GAUX6R
Power rated (4NO+4NC) + low signal (Hi-Fi) (4NO+4NC)	GAUX8R

Table 6.9. Auxiliary Switch Ratings and Secondary Disconnect Points

Contact Configuration	Power Rated	Hi-Fi	Cat. No.
Power rated (3NO+3NC)	A14 - A25	N/A	GAUX3R
Power rated (3NO+3NC) + low signal (Hi-Fi) (2NO+2NC)	A14 - A25	B10 - B13, B23 - B26	GAUX5R
Power rated (8NO+8NC)*	A14 - A25, B4 - B13, B17 - B26	N/A	GAUX6R
Power rated (4NO+4NC) + low signal (Hi-Fi) (4NO+4NC)*	A14 - A25, B12 - B13, B25 - B26	B4 - B11, B17 - B24	GAUX8R

*Options are not available for side mounted sec disc blocks.

- High Fidelity refers to gold-plated contacts. Use for signal level outputs (10 mA min to 100 mA max., 8 Vdc to 30 Vdc, 125 Vac).

Circuit Breaker - Key Interlock Facility

This option provides factory-installed interlocking devices for installation between separate circuit breakers (baseplates and mechanism). This safeguard ensures that a circuit breaker cannot be closed unless the dedicated key has been inserted and secured within the lock. Circuit breakers accept ready-to-fit interlocking device kits such as Castell, Ronis, Kirk and Profalux for installation between related, separate circuit breakers (Table 6.10).

NOTE: Locks and keys are not supplied by ABB. Please order separately from your local supplier.

Table 6.10. Key Interlocks and Door Interlocks

Description	Catalog Number
Baseplate and mechanism for Ronis locks (breaker mounted)	GBRONR
Baseplate and mechanism for Kirk Key locks (breaker mounted) (Question on markup.)	GBKRKR
Mechanism for Ronis key cassette interlock (cassette mounted)	GCRONR
Mechanism for Kirk key cassette interlock (cassette mounted)	GCKRKR
Door interlock (left side)	GLHD
Door interlock (right side)	GRHD

Carriage Position Switch (TOC)

Available as an option for mounting within the base of the cassette/substructure, the carriage position switch provides six single-pole changeover contacts for local or remote electrical indication of the circuit breaker status: CONNECTED, TEST and DISCONNECTED. The DISCONNECTED position is indicated only when minimum isolating distances between contacts on both the main and auxiliary circuits have been achieved. This option is in addition to the mechanical indicators, which are fitted as standard. When installed, the carriage switch is IP2X protected and includes wiring to a terminal block located on the left side of the cassette (Tables 6.11 and 6.12).

Table 6.11. Carriage Position Switches

Switch Configuration	Catalog Number
1 NO/NC switch per position	GCPS1R
Set of 2 No/NC switches per position	GCPS2R

Table 6.12. Carriage Position Switch Ratings (Common NO/NC Contact Configuration)

Ratings		
AC	120 Vac	6 A
	250 Vac	6 A
DC	125 Vac	0.5 A
	250 Vac	0.25 A

Mechanical Interlocks (Cable/Rod)

Available for fixed and drawout circuit breakers, these units enable the direct interlocking of EntelliGuard G circuit breakers, either mounted side-by-side or stacked. The interlocking mechanisms are connected by a specially designed cable or rod in a 1 from 2, 1 from 3, and 2 from 3 configuration, and any mix of current ratings/pole configurations can be accommodated. Standard cable lengths available: 1.0 m, 1.6 m, 2.0 m, 2.5 m, 3.0 m, 3.5 m and 4.0 m. (Please contact our technical customer service department if longer length is required.)

Mechanical interlocks can be fitted to electrical systems as shown in Table 6.13 and can link 2 and/or 3 circuit breakers. Any nominal rating, frame size, number of poles or type (fixed pattern or draw-out) can be interlocked (Tables 6.13 and 6.14).

Table 6.13. Mechanical Interlocks (Cable/Rod)

Interlock Type	Number of Cables Required	Breaker Type	Poles	Catalog Number
2 Way – Type A	2	withdrawable	3	GI2WADR
			4	GI3WADR
		fixed	3	GI2FADR
			4	GI3FADR
1 from 3 Type B	6	withdrawable	3	GI2WBR
			4	GI3WBR
		fixed	3	GI2FBR
			4	GI3FBR
2 from 3 Type C	6	withdrawable	3	GI2WCR
			4	GI3WCR
		fixed	3	GI2FCR
			4	GI3FCR
1 from 3 Way – Type D	4	withdrawable	3	GI2WDTR
			4	GI3WDTR
		fixed	3	GI2FDTR

- Contact factory for availability.

Cables

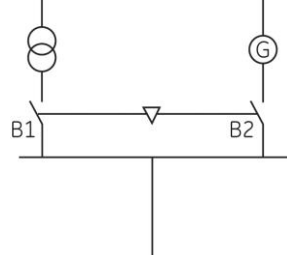
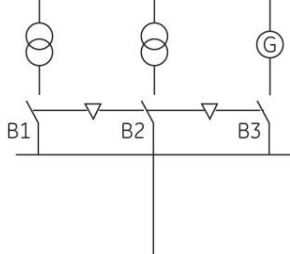
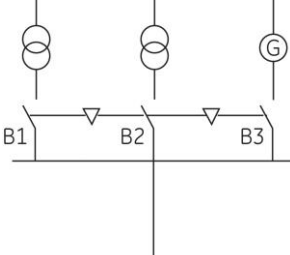
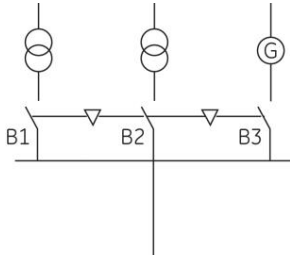
Standard cable lengths are shown in Table 6.14. (Cables ordered separately. Please contact our technical customer service department if longer length is required.)

Table 6.14. Cables for Mechanical Interlocks

Length		Catalog Number
Meters	Inches	
1	39.4	GCB1
1.6	63	GCB2
2	78.7	GCB3
2.5	98.4	GCB4
3	118.1	GCB5
3.5	137.8	GCB6
4	157.5	GCB7

- Contact factory for availability.

Table 6.15. Interlock Configurations

Typical Circuit	Interlock Configuration	Possible Combinations																								
	Type A 1 from 2 way interlock 2 cable configuration Interlocking between two circuit breakers One normal power supply One generator (emergency) supply	<table><tr><th>B1</th><th>B2</th></tr><tr><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td></tr></table> B1 can close only if B2 is open. B2 can close only if B1 is open.	B1	B2	0	0	1	0	0	1																
B1	B2																									
0	0																									
1	0																									
0	1																									
	Type B 1 from 3 way interlock 6 cable configuration Interlocking among three circuit breakers Three power supplies (generator or transformers) feeding the same busbar but parallel operation is prevented. Available on request.	<table><tr><th>B1</th><th>B2</th><th>B3</th></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td></tr></table> Only 1 of 3 breakers can be closed.	B1	B2	B3	0	0	0	1	0	0	0	1	0	0	0	1									
B1	B2	B3																								
0	0	0																								
1	0	0																								
0	1	0																								
0	0	1																								
	Type C 1 from 3 way interlock 6 cable configuration Interlocking among three circuit breakers Two bus sections can be powered by single transformer (bus coupler closed) or both transformers (bus coupler open). Available on request.	<table><tr><th>B1</th><th>B2</th><th>B3</th></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td></tr><tr><td>v</td><td>0</td><td>1</td></tr></table> <ul style="list-style-type: none">Any two from three breakers can be closed.Any one from three breakers can be closed.Two breakers must be closed to prevent the third breaker from closing.	B1	B2	B3	0	0	0	1	0	0	0	0	1	0	1	0	1	1	0	0	1	1	v	0	1
B1	B2	B3																								
0	0	0																								
1	0	0																								
0	0	1																								
0	1	0																								
1	1	0																								
0	1	1																								
v	0	1																								
	Type D 1 from 3 way interlock 6 cable configuration Interlocking between three circuit breakers Two normal power supplies not set in parallel. One power supply may assist the priority circuit. Available on request.	<table><tr><th>B1</th><th>B2</th><th>B3</th></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td></tr></table> <ul style="list-style-type: none">B1 and/or B3 can be closed only if B2 is open.B2 can only be closed if B1 and B2 are both open.	B1	B2	B3	0	0	0	1	0	0	0	0	1	1	0	1	0	1	0						
B1	B2	B3																								
0	0	0																								
1	0	0																								
0	0	1																								
1	0	1																								
0	1	0																								

- Contact factory for availability

Bell Alarm with Lockout

The bell alarm provides remote indication that the circuit breaker has opened because of an electrical fault. The Lockout feature is integral to the trip unit. When a Bell Alarm is supplied with the breaker, the trip unit dial is set and locked to the manual position. In order to re-close the breaker, the Lockout button must be pushed in/reset on the trip unit 1-Form C contact (Tables 6.16 and 6.17).

Table 6.16. Bell Alarm Switches

Switch Configuration	Cat. No.
One single pole, double throw switch (1-Form C contact)	GBAT1R

Table 6.17. Bell Alarm Ratings (Common NO/NC Contact Configuration)

Ratings		
AC	120 Vac	6 A
	250 Vac	6 A
DC	125 Vac	0.5 A
	250 Vac	0.25 A

Charging Spring Status Indicator

Factory-installed on the motor, this auxiliary switch indicates that the circuit breaker is charged and is standard with the spring-charging motor (Table 6.18).

Table 6.18. Spring Charged Contact (1 NO)

Ratings			Cat. No.
AC	120 Vac	6 A	
	250 Vac	6 A	GSCC1R
DC	125 Vac	0.5 A	
	250 Vac	0.25 A	

Secondary Disconnects (Factory-installed/Field Installable)

Inputs and outputs to the circuit breaker are wired through secondary disconnects located on either the top or the side (Envelope 1 only) of the breaker. The plug-style secondary disconnects engage mating disconnects in the breaker cubicle when the breaker is in the TEST or CONNECT position. Up to 78 points are available so that all breaker accessories can be wired to dedicated disconnect points. See Table 6.19 for block location and Table 6.20 for secondary disconnect parts.

Table 6.19. Block Location

		Top Disconnect	
		Block B	Block A
Side Disconnect	Block A	circuit breaker/cradle viewed from the front	

Table 6.20. Secondary Disconnect Parts

Breaker Type	Mounting	Number of Poles	Cat. No.
Fixed	top	39 pole set	GSDFTR1
	side	78 pole set	GSDFTR2
	top	78 pole set	GSDFSR
Drawout	side	78 pole set	GSDWTR
		39 pole set	GSDWSR

- Set contains both the male and female sides of the secondary disconnect.
- Drawout kits include the metal bracket for connections to the cassette.
- Breakers ordered with side mounted disconnects come standard with 78 pole secondary disconnect.

Ground Fault

The EntelliGuard TU Trip Unit provides a non-core CT input for zero sequence or residual summation current. The expected ratio is 1A = 100%.

Neutral Rogowski CT's

The Neutral Rogowski CT's are used to measure the Neutral Current and is required when Internal Ground Fault is selected on the trip unit. There are two types available:

1. Encased with Terminal Screws: The Rogowski coil is encased in a plastic mold with two terminal screws. No additional mounting hardware is required as the encasing is molded to the mounting dimensions. Table 6.21
2. Loose Rogowski Coil with separate mounting hardware: The coil and mounting hardware are separate. The coil comes with the two wire leads for connection to a terminal block. Table 6.21a

Table 6.21. Neutral Rogowski CTs (Encased with Terminal Screws)

Envelope	Current Rating	Cat. No.
1	400 A	G04HNRCE
	600/630 A	G07HNRCE
	800 A	G08HNRCE
	1000 A	G10HNRCE
	1200/1250 A	G13HNRCE
	1600 A	G16HNRCE
	2000 A	G20HNRCE
2	400 A	G04MNRCE
	600/630 A	G07MNRCE
	800 A	G08MNRCE
	1000 A	G10MNRCE
	1200/1250 A	G13MNRCE
	1600 A	G16MNRCE
	2000 A	G20MNRCE
	2500 A	G25MNRCE
	3000/3200 A	G32HNRCE
	4000 A	G40HNRCE
3	3000/3200 A (1600 A x 2)	G32GNRCE
	4000 A (2000 A x 2)	G40MNRCE
	5000 A (2000 A x 2)	G50MNRCE
	6000/6400 A (3200 A x 2)	G04MNRCE

**Table 6.21a. Neutral Rogowski CTs
(Loose Rogowski Coil and mounting hardware)**

Envelope	Current Rating	Cat. No.
1	400 A	G04HNRC
	600/630 A	G07HNRC
	800 A	G08HNRC
	1000 A	G10HNRC
	1200/1250 A	G13HNRC
	1600 A	G16HNRC
	2000 A	G20HNRC
2	400 A	G04MNRC
	600/630 A	G07MNRC
	800 A	G08MNRC
	1000	G10MNRC
	1200/1250 A	G13MNRC
	1600 A	G16MNRC
	2000 A	G20MNRC
	2500 A	G25MNRC
	3000/3200 A	G32HNRC
	4000 A	G40HNRC
3	3000/3200 A (1600 A x 2)	G32GNRC
	4000 A (2000 A x 2)	G40MNRC
	5000 A (2000 A x 2)	G50MNRC
	6000/6400 A (3200 A x 2)	G04MNRC

Ready to Close Contact (Table 6.22)

This contact indicates that the following conditions are met and the circuit breaker can be closed:

- The circuit breaker is open.
- The closing springs are charged.
- The circuit breaker is not locked/interlocked in open position.
- There is no standing closing order.
- There is no standing opening order.

Table 6.22. Ready to Close Contacts (1 NO)

Ratings			Cat. No.
AC	120 Vac	6 A	GRTC2R
	250 Vac	6 A	GRTC2R
DC	125 Vac	0.5 A	GRTC1R
	250 Vac	0.25 A	GRTC3R

Sealed Door Panel Escutcheon

An optional complete IP54 front door pane is available when a higher degree of protection is needed.

Mechanical Operations Counter

Used with either manual or motor charged circuit breakers, the counter provides an accurate record of the cumulative number of complete breaker closing operations (Table 6.23).

Table 6.23. Miscellaneous Accessories

Description	Cat. No.
IP54 Door Panel - Withdrawable Type	GF54D
IP54 Door Panel - Fixed Pattern	GW54D
Mechanical Operations Counter	GMCNR
ACB Lifting Truck	ACBLIFT

- Contact factory for availability.

Cassette/Substructure

The drawout mechanism allows the breaker to be racked in four distinct positions:

- CONNECTED
- TEST
- DISCONNECTED
- WITHDRAWN

Position Indicators

Position indicators provide a positive mechanical indication of CONNECTED, TEST and DISCONNECTED positions of the breaker.

Rejection Device

A factory-installed rejection feature prevents mismatching breakers and cassettes/substructures. This prevents:

- Inserting a breaker with a lower rating into a higher rated cassette/substructure.
- Inserting a higher rated breaker into a lower rated cassette/substructure.

Front Flat Terminations

The EntelliGuard G Fixed mounted breaker comes standard with Back Connected Terminations. Optional Front Flat terminations are available for front access mounting (Table 6.24).

Table 6.24. Optional Front Flat Terminations

Description	Catalog Number
Env1 800 - 2000A, Type N&H, Flat Front UL489 Fixed 3 Pole Breaker Bus Bar Terminations (Top/Bottom)	GBB1TBF3
Env1 800 - 2000A, Type N&H, Flat Front UL489 Fixed 4 Pole Breaker Bus Bar Terminations (Top/Bottom)	GBB1TBF4
Env2 800A - 3000A Flat Front UL489 Fixed 3 Pole Breaker Bus Bar Terminations (Top/Bottom)	GBB2TBF3
Env2 800A - 3000A Flat Front UL489 Fixed 4 Pole Breaker Bus Bar Terminations (Top/Bottom)	GBB2TBF4
Env2.5 800-4000A Flat Front UL Fixed 3 Pole Breaker Bus Bar Terminations (Top/Bottom)	GBBNTBF3
Env3 4000-6000A Flat Front UL Fixed 3 Pole Breaker Bus Bar Terminations (Top/Bottom)	GBB3TBF3
Env3 4000-6000A Flat Front UL Fixed 4 Pole Breaker Bus Bar Terminations (Top/Bottom)	GBB3TBF4

SECTION 7 – ACCESSORIES INSTALLATION

⚠ DANGER**ELECTROCUTION**

Ensure the circuit breaker has been tripped, indicating OFF, and the main springs are fully discharged before installing accessories.

Failure to comply with these instructions will result in death or serious injury.

⚠ WARNING**IMPROPER INSTALLATION, OPERATION AND MAINTENANCE**

Ensure only qualified personnel install, operate, service and maintain all electrical equipment.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING**PERSONAL INJURY**

- Avoid risk of injury from moving parts while handling the breaker.
- If advisable, use a cable/busbar lockable grounding device (optional accessory) to provide additional safety during system maintenance.

Failure to comply with these instructions could result in death or serious injury.

CAUTION**PRODUCT DAMAGE**

- Ensure circuit breaker and its accessories are always used within their designated ratings.
- Use the specially designed circuit breaker handling truck (optional accessory) when removing the circuit breaker from its cassette.

Failure to comply with these instructions may result in product damage.

CIRCUIT BREAKER FRONT COVER REMOVAL

Required for most accessory installation.

1. Remove the six mounting screws (Fig. 7.1).

Figure 7.1. Front Cover



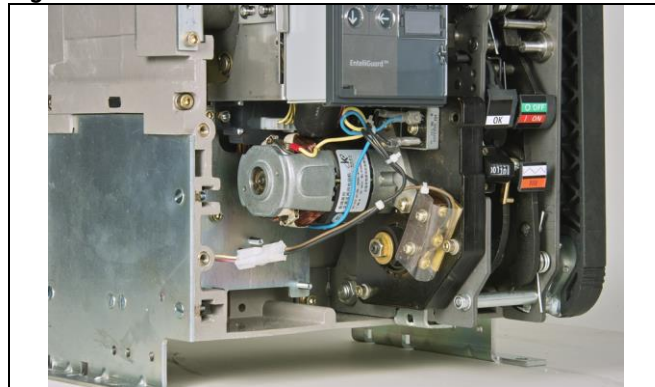
2. Pull the charging handle while easing the cover upwards (Fig. 7.2).

Figure 7.2. Charging Handle Position for Cover Removal

MOTOR OPERATOR - SPRING CHARGING UNIT
INSTALLATION

1. Slide the coupling bushing on to the camshaft.
2. Place the gearbox bearing on to the protruding motor drive shaft, pushing it home until flush with the mechanism sideplate. If it does not move easily to the flush position, pull the charging handle gently down to ease movement.
3. Mount the device using three M5 bolts through the holes provided in the gearbox endplate, torque to 7 N m.
4. Manually charge the closing springs and carefully locate the plastic switch actuator over the protruding drive shaft (Fig. 7.3), ensuring the switch operating arm is correctly positioned (switch arm should be in the 'cut out' portion of the motor switch actuator).

Figure 7.3. Motor Switch Actuator



- 5. Use an M8 nylock nut to mount the motor switch actuator onto the shaft end, torque to 14.5 N m.
- 6. Connect the motor connector on to the motor harness.
- 7. Connect the remaining ground wire from the filter to the grounding point on the rear of the motor body.

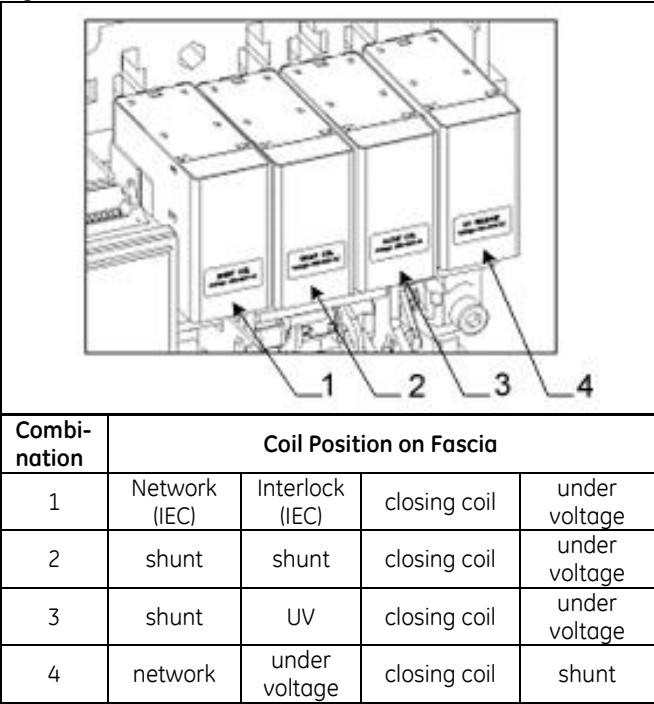
Reverse the above procedure to remove the motorized spring charging unit

SHUNT TRIP, CLOSING COIL AND UNDER VOLTAGE
RELEASE DEVICE INSTALLATION

NOTICE

The mounting positions of the four devices can be arranged in the locations as specified in Figure 7.4.

Figure 7.4. Device Location



Closing Coil Installation (Fig. 7.5)

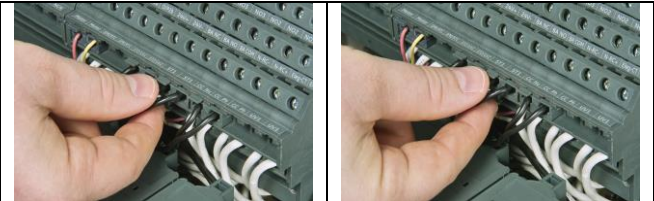
- 1. Tilt the device forward and engage the front hooks into the top support plate.
- 2. Tilt the device backwards until the rear hooks engage in the slots
- 3. Press down into position.

Figure 7.5. Closing Coil Installation



Connect the wire plugs (Fig. 7.6) according to the wiring schematic in Section 3.

Figure 7.6. Wiring



Closing Coil Removal

- 1. Disconnect the device and tilt it forward until the rear hooks disengage.
- 2. Lift to release the front hooks.

NETWORK INTERLOCK INSTALLATION

When the network interlock is used with the EntelliGuard G, it will use the C and D positions of the coils as shown in Fig. 7.4. The mounting procedure is same as the coils.

Trip Alarm/Bell Alarm Switch Installation


- 1. Remove the 40 pin harness (if installed) from the trip unit.
- 2. Remove the trip unit from the PMU base.
- 3. Assemble the trip alarm assembly as shown using four screws.
- 4. Reassemble the trip unit back on to the PMU base
- 5. Install the connector from the trip alarm in the specified location of the SD.
- 6. Reassemble the 40 pin harness.

Ready to Close Switch Installation

- 1. Slide the RTC switch assembly on to the mechanism side sheet.
- 2. Assemble the screw and washer.
- 3. Assemble the snap-on connector to make the electrical connection.
- 4. Using the cable tie, tie the wires to the PMU base.

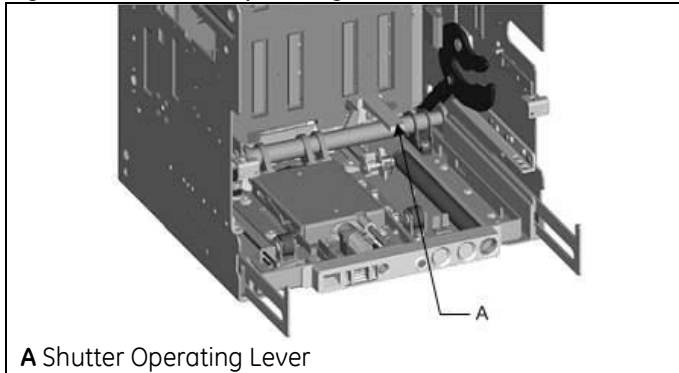
SHUTTER PROP OPEN FEATURE

This feature allows the main fixed contacts to be inspected.

 **DANGER**

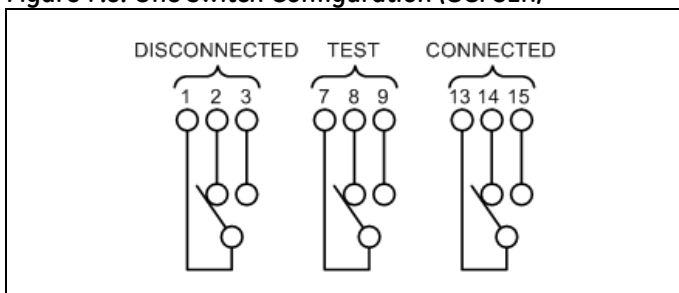
ELECTROCUTION
Ensure the fixed contacts on the incoming side are isolated prior to installing the Shutter Prop Open Feature.
Failure to comply with these instructions will result in death or serious injury.

1. Remove the circuit breaker from its cassette.
2. Rotate the shutter operating lever to open the shutter (Fig. 7.7).
3. Release the shutter operating lever to close the shutters.

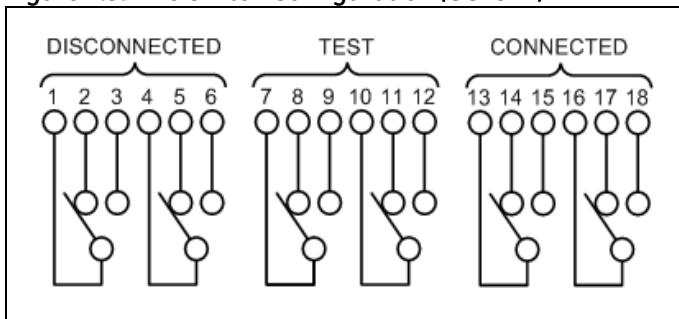
Figure 7.7. Shutter Operating Lever Location**CARRIAGE POSITION SWITCH INSTALLATION**

Two configurations are available:

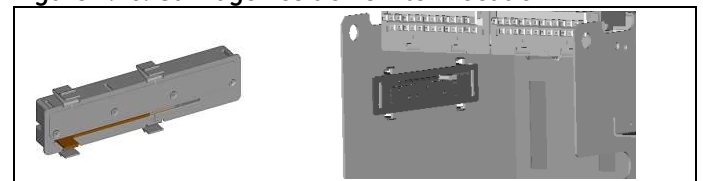
- One device for each position (Fig. 7.8).

Figure 7.8. One Switch Configuration (GCPS1R)

- Two devices for each position (Fig. 7.9).

Figure 7.9. Two Switch Configuration (GCPS2R)

- Each switch has a 1.5 m long wire for each switch terminal. Each wire is identified with a ferrule.
- The device will indicate DISCONNECTED even when the circuit breaker is fully withdrawn or removed.
- Mounted on the left-hand side of the cassette for all frames.
- Mounted on right hand side when used with the optional side mounted secondary disconnect for frame 1 ANSI/UL circuit breaker. No fasteners are required. To insert, feed the wires through the large opening on the side of the cassette. Seat the carriage position switch in the front side of the hole first. Then use this as a pivot and ensure that all four tabs lock in place (Fig. 7.10).

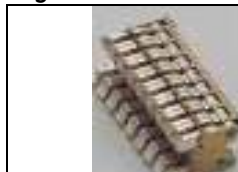
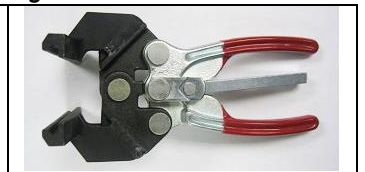
Figure 7.10. Carriage Position Switch Location**BUSBAR/CABLE GROUNDING (OPTIONAL)**

This feature is used for grounding the circuit breaker terminals on the busbar or the cable side. The pack contains:

- Isolating contact (cluster) pliers for removal of the main isolating contacts.
- Grounding bar with spring-pressured ground contact. The bar is reversible to fit top or bottom terminal sets.
- Necessary mounting M10 bolts and washers.
- Anti-trip plate.

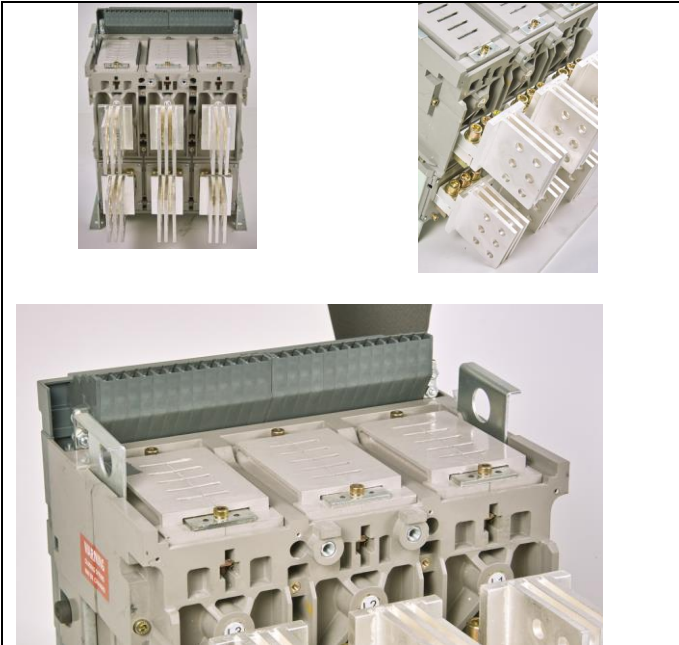
CLUSTERS

Clusters are the main isolating contacts which are installed on the rear terminals on the moving portion of the withdrawable unit. Cluster contacts may be easily and quickly removed and replaced using cluster pliers (Figs. 7.11 and 7.12).

Figure 7.11. Clusters**Figure 7.12. Cluster Pliers**

Clusters are mounted horizontally and vertically through cluster pads for different frame sizes. The slot is provided on the terminals for locking the clusters. For higher current and short circuit ratings the clusters are assembled in parallel (Fig. 7.13).

Figure 7.13. Cluster Views



Upper Cluster Contact Grounding

1. Using the cluster pliers, remove the upper cluster contacts the rear of the circuit breaker.
2. Position the grounding bar on the exposed top of the top terminals, ensuring the spring-loaded grounding contact is facing left when viewed from the rear.
3. Install bolts and washers using the threads in the grounding bar, one bolt per pole. Torque to 30 N m.
4. The spring loaded grounding contact will engage with the top fixed grounded contact block in the cassette when the breaker is racked to the CONNECTED position (Fig 7.14).

Figure 7.14 Cluster Contact Grounding Top Location



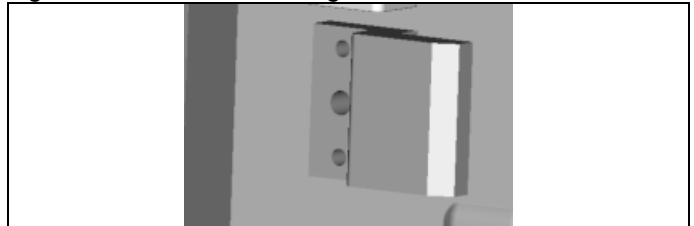
Lower Cluster Contact Set Grounding (Figs. 7.15 and 7.16)

1. Using the cluster pliers, remove the lower cluster contacts at the rear of the circuit breaker.
2. Position the grounding bar on the exposed top of the bottom terminals, ensuring the spring-loaded grounding contact is facing left when viewed from the rear
3. Install bolts and washers using the threads in the grounding bar, one bolt per pole. Torque to 30 N m.
4. The spring loaded grounding contact will engage with the bottom fixed grounded contact block in cassette when the breaker is racked to the CONNECTED position.

Figure 7.15. Cluster Contact Grounding Top Location



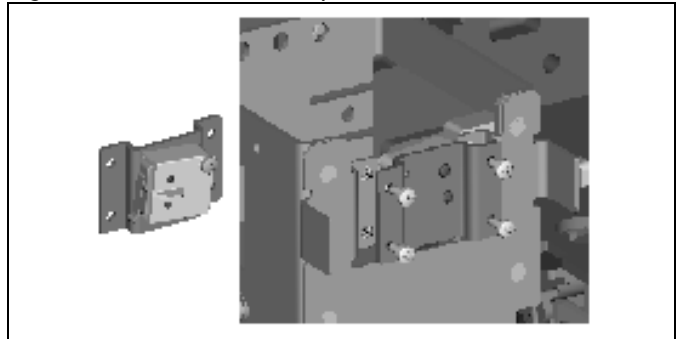
Figure 7.16. Fixed Grounding Contact in Cassette



MECHANICAL TRIP ALARM INSTALLATION

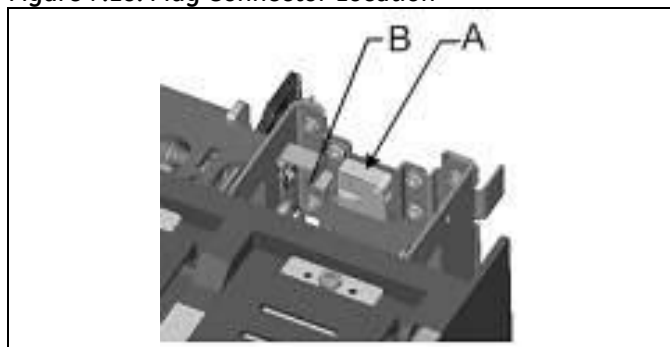
1. Remove the front cover.
2. Remove the trip unit.
3. Install the mechanical trip alarm as shown in Fig. 7.17.

Figure 7.17. Mechanical Trip Alarm



4. Connect the wires via the plug connectors to the respective locations of the secondary isolating contacts A33, A34 and A35 (Fig. 7.18).

Figure 7.18. Plug Connector Location



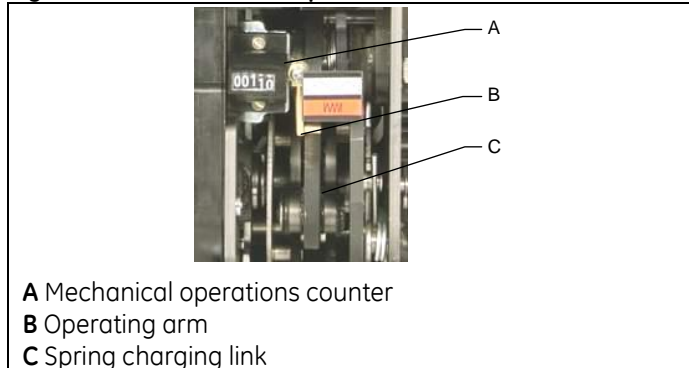
5. Replace the front cover.
6. Connect the wires via the plug connectors to the respective locations of the secondary isolating contacts A33, A34 and A35.
7. Replace the front cover.

MECHANICAL OPERATIONS COUNTER INSTALLATION (OPTIONAL)

This device is mounted to the inside of the front cover. It cannot be reset.

1. Remove the front cover.
2. Position the mechanical operations counter (Fig. 7.19) over the two holes provided inside the cover, ensuring the indicator face is aligned to show through the window in the cover.

Figure 7.19. Mechanical Operations Counter Location



3. Ensure the operating arm on the counter rides over the spring charging link of the circuit breaker mechanism.
4. Mount in position using the screws provided.

REJECTION FEATURE

This factory-installed, pin and gate device prevents the insertion of a circuit breaker into a cassette if the nominal rating of the breaker is incompatible with that of the cassette and its ancillary equipment. Recommended configurations are provided with the rejection feature for the entire EntelliGuard range (Fig. 7.20).

Figure 7.20. Rejection Feature

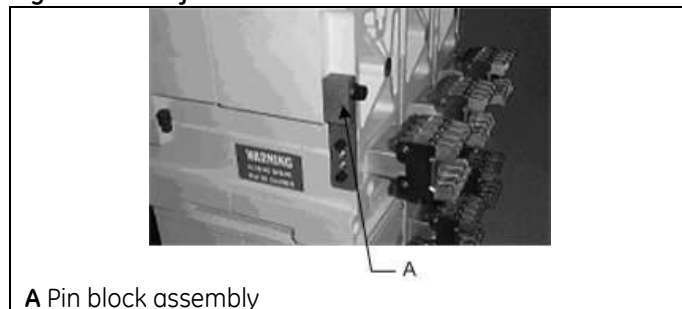


Fig. 7.21 shows the corresponding restrainer assembly mounted on the cassette with one M4 nut and lock washer. There are two of these assemblies, one on each side of the cassette.

Figure 7.21 Corresponding Restrainer



SECTION 8 – MAINTENANCE, TESTING AND TROUBLESHOOTING

WARNING

IMPROPER INSTALLATION, OPERATION, SERVICE AND MAINTENANCE

Ensure only qualified personnel install, operate, service and maintain all electrical equipment.

Failure to comply with these instructions could result in death or serious injury.

MAINTENANCE

DANGER

ELECTROCUTION

Ensure the circuit breaker has been tripped, indicating OFF, and the main springs are fully discharged when performing circuit breaker maintenance.

Failure to comply with these instructions will result in death or serious injury.

WARNING

PERSONAL INJURY

- Avoid risk of injury from moving parts while handling the circuit breaker.
- If advisable, use a cable/busbar lockable grounding device (optional accessory) to provide additional safety during system maintenance.

Failure to comply with these instructions could result in death or serious injury.

Inspection Schedule

- Normal working conditions:
 - Annually, or
 - Following interruption of a short circuit, or
 - After repeated high value overload faults.
- Dusty/polluted environments:
 - Every six months, or
 - Following interruption of a short circuit, or
 - After repeated high value overload faults.

Cleaning Procedure

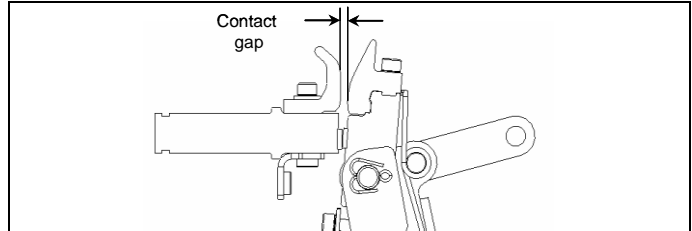
1. Inspect external surfaces for dust/dirt.
2. Clean with compressed air and dry cloth.

Contact Wear Indicator Inspection (Optional)

The contact wear indicator indicates the condition of the contact tip when the circuit breaker is viewed in the closed condition from the top side. It indicates the relative position of the back edge of each contact tip with the area marked on the wear indicator.

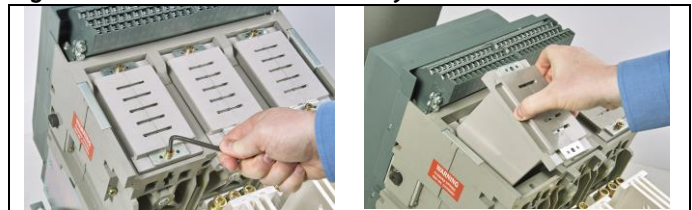
The back edge of each contact tip should line up with the outer edge of the marked area on the wear indicator. As the contacts erode, the gap between the back of the contact tip and the rear housing becomes smaller. If the back edge of the contact tip crosses into the marked area, the tip is heavily eroded, and it needs to be replaced (Fig. 8.1).

Figure 8.1. Contact Gap



1. Remove the arc chamber assemblies as shown in Fig. 8.2.

Figure 8.2. Arc Chamber Assembly Removal



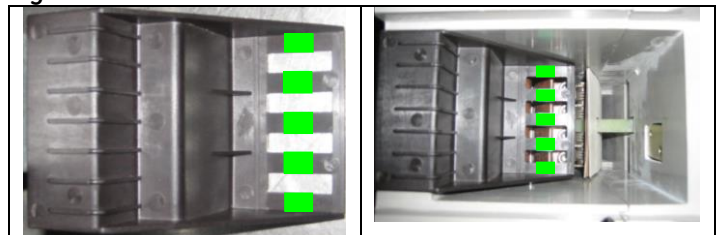
2. Insert the wear indicator in each pole as shown in Fig 8.3.

Figure 8.3. Wear Indicator Insertion



3. View the back end of finger with the arcing contact edge with respect to the marked area on the wear Indicator. The marked area indicates the allowable erosion for main tips (Fig. 8.4).

Figure 8.4. Wear Indicator in Place



1. Inspect the arc splitter plates and sides of the moldings for signs of wear or damage. Replace as necessary.
2. With the circuit breaker in the ON position, check the size of the gaps between the fixed and moving arcing contacts.
 - If the gap is greater than 2.5 mm:
 - No evidence of contact damage: loosen the fixed contact screw and adjust the gap to 2.5 mm. Retighten the screw (12 N m torque).
 - Evidence of excessive contact wear or damage: Replace the fixed arcing contacts and set the gap set to 2.5 mm.
 - Even if gaps are within operating tolerance (1 mm to 2.5 mm) always check contact screws for tightness to 12 N m torque.
3. Assemble the arc chamber. Torque to 2 N m.

Circuit Breaker Main Mechanism Inspection

- Check the circuit breaker ON and OFF action both manually and by remote means, if appropriate.
- Check tripping action by means of the under voltage release (if installed).
- Check all indicators for correct function.
- Check number of operations (if operations counter is installed) to the circuit breaker's specification.

Cassette Inspection

- Ensure the base of the cassette is clear of debris.
- Prop open the top and bottom shutters and inspect the cassette's installed contacts for excessive wear or damage.
- Check the carriage switch operation (if installed) while racking the circuit breaker into and out of the CONNECTED position.

Isolating Contacts (Drawout Type) Inspection

1. Remove the circuit breaker from the cassette housing and place it on a suitable working surface.
2. Inspect the rear cluster contacts for signs of overheating and wear.
3. Remove the cluster contacts using the special cluster pliers.
4. Clean the isolating contacts and terminals with a soft, clean cloth to remove any old grease or dirt.
5. Apply a thin film of white paraffin grease (grade 8802).

Power Terminals and Busbar Inspection

1. Inspect insulating parts for cracks. If found, replace affected component.
2. Clean dust/dirt with dry cloth.
3. Tighten screws/nuts to proper torque.
4. Inspect terminal joints for signs of overheating and oxidation. If found, clean affected component.

Lubrication

CAUTION

PRODUCT DAMAGE

Do not lubricate Auxiliary Switch, Signaling Switches, Coils, Motor and secondary disconnects.

Failure to comply with these instructions may result in product damage.

Ensure all metal-to-metal friction surfaces are kept lubricated:

1. Remove old lubrication and dirt.
2. Apply Molecote 4700.
3. Wipe off excess lubrication.

TRIP UNIT TESTING

1. Test the circuit breaker operation against selected protection settings (see Section 2) using a trip unit test box (optional accessory).
2. Continuity check the mechanical trip alarm (if installed), while test box tripping the trip unit.
3. Continuity check REF inter-trip (if installed).

TROUBLESHOOTING

Table 8.1 reviews common problems, their possible cause(s) and solution(s). If problems persist please contact our After Sales Service Department at 1-888-GERESOLVE. (1-888-437-3765).

Table 8.1. Troubleshooting

Problem	Possible Cause	Solution
Breaker won't close.	<ul style="list-style-type: none"> Breaker is between CONNECTED, TEST and DISCONNECTED positions. Trip unit has not been reset. Under voltage release coil is installed but not energized. Interlocks installed. Racking handle inserted. 	<ul style="list-style-type: none"> Rack circuit breaker to CONNECTED, TEST or DISCONNECTED remove racking handle and close circuit breaker. Push orange button on trip unit and close circuit breaker. Energize under voltage release coil and close circuit breaker. Remove interlocks. Remove handle and close circuit breaker. Check operational diagram and trip the relevant circuit breaker.
Breaker closes then opens instantaneously.	<ul style="list-style-type: none"> Breaker information module connector is not inserted. Trip unit settings are incorrect. Remote Rogowski coil is incorrectly installed. 	<ul style="list-style-type: none"> Insert breaker information module connector to breaker information module. Ensure the protection limits setting matches system loads. Ensure inputs are set to normally closed trip without a signal applied. Re-position coil.
Motor won't charge.	Ensure motor actuator is installed.	Install motor actuator.
DC closing coil or under voltage release won't operate.	Ensure the correct polarity of the connection to the secondary isolating contacts.	Refer to wiring schematic (see Section 3).
Circuit breaker won't rack into cassette.	<ul style="list-style-type: none"> Ensure breaker is pushed fully from the maintenance position to DISCONNECTED. Racking drive not in DISCONNECTED position. 	<ul style="list-style-type: none"> Push breaker into DISCONNECTED position. Ensure racking drive is in DISCONNECTED position.
Ground fault does not operate below 40% setting.	Ensure trip unit is installed and energized.	Install trip unit and energize. See Section 3 for wiring schematic.
Cannot insert racking handle.	<ul style="list-style-type: none"> Shutter padlocks are installed. Key locks are installed. 	Remove padlocks and/or key locks.
Circuit breaker will not go into the DISCONNECTED position.	<ul style="list-style-type: none"> Rejection feature is incorrectly set. Circuit breaker is incorrect for given cassette. 	<ul style="list-style-type: none"> Reset rejection feature. Ensure circuit breaker and cassette go together.
Trip unit status not working.	<ul style="list-style-type: none"> Ensure trip unit, if installed, is energized. Insufficient primary current to power the unit. 	<ul style="list-style-type: none"> Install trip unit, if not installed. Trip unit will power with 40% I_n single phase, and 20% I_n 3 phase current.
Trip unit not displaying existing fault after tripping the circuit breaker.	Trip unit set to auto reset (fault still stored).	<ul style="list-style-type: none"> Check trip history for fault type. Set trip unit reset button to manual.
MODBUS communications not responding	<ul style="list-style-type: none"> Communication incorrectly configured. Trip unit baud rate not compatible with host. 	<ul style="list-style-type: none"> Request configuration document. Set trip unit baud rate to match host.

EntelliGuard® G Publications

To download publications like those shown below, visit WWW.LIBRARY.ABB.COM.

Publications	Pub #
EntelliGuard® G Application Guide	DET-653A
Time Current Curves: EntelliGuard® TU Trip Unit for EntelliGuard® G; Ground Fault	DES-093
Time Current Curves: EntelliGuard® TU Trip Unit for EntelliGuard® G; Instantaneous, Override (HSIOC), Reduced Energy Let-Through Instantaneous (RELT)	DES-094
Time Current Curves: EntelliGuard® TU Trip Unit for EntelliGuard® G; Long-Time Circuit Breaker Characteristics	DES-090
Time Current Curves: EntelliGuard® TU Trip Unit for EntelliGuard® G; Long-Time Fuse-Like Characteristics	DES-091
Time Current Curves: EntelliGuard® TU Trip Unit for EntelliGuard® G; Short-Time Pickup and Delay Bands	DES-092
Secondary Disconnects - Drawout	DEH-41401
CT Mounting for External Ground Fault	DEH-41402
Position Switch Kit	DEH-41403
Back Connected Terminations	DEH-41404
Front Connected Terminations	DEH-41405
Time Delay Module	DEH-41406
Key Interlock Kit - Breaker Mounted	DEH-41407
Door Interlock Kit	DEH-41408
Bell Alarm w/ Lockout	DEH-41409
Undervoltage Device	DEH-41410
Shunt Trip	DEH-41411
Remote Close Accessory Close Coil	DEH-41412
Motor Operator	DEH-41413
Pushbutton Padlock Device	DEH-41414
Aux Switch	DEH-41415
Operations Counter	DEH-41416
Secondary Disconnects - Fixed	DEH-41417
Command Close Coil	DEH-41418
Ready To Close (RTC)	DEH-41419
Coil Signaling Contacts	DEH-41420
Mechanical Interlocks (fixed and drawout)	
Key Interlock Cassette Mounted	
IP54 Door	
Finger Assembly using Cat #GUNI	
Rejection Scheme	
Arc Chute Assembly	DEH-41389
Anti-Bounce Assembly	DEH-41667
Gas Channel Assembly	DEH-41668
Cluster Pad Assembly	DEH-41447
Flat front Terminations	DEH-41463
Back connected terminations for cassette	DEH-41809
Back connected terminations for breaker	DEH-41810

NOTES:

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 ABB Inc.

—
ABB Inc.
305 Gregson Drive
Cary, NC 27511.
electrification.us.abb.com

—
We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB Inc. does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction or utilization of its contents – in whole or in parts – is forbidden without prior written consent of ABB Inc.
Copyright© 2019 ABB
All rights reserved