



FAULT CLEAR[®]

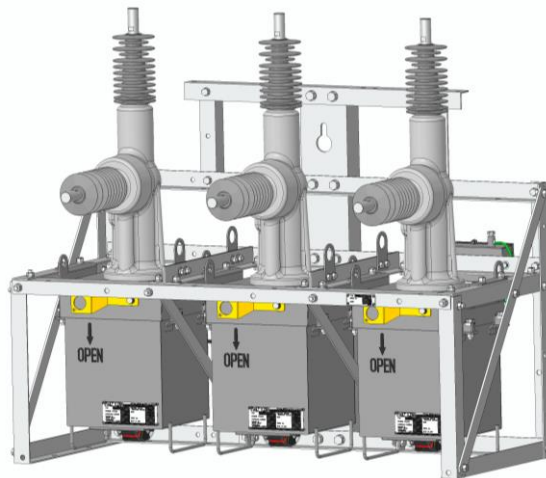
TRIPLE-SINGLE AUTO RECLOSER

Solid Dielectric

27kV-800A

VBN20-A3-Y
Series

INSTRUCTION MANUAL



- This instruction manual describes the operation and maintenance for the correct and safe use of FAULT CLEAR[®] Triple-single Auto Recloser. Please thoroughly read and understand the information contained in this instruction manual before operating.
- After reading, keep this instruction manual for future reference.

February 2024
No. 01185i

Togami Electric Mfg.Co.,Ltd.

CONTENTS

1. PURPOSE	2
2. SAFETY PRECAUTIONS	2
3. WARRANTY PERIOD AND COVERAGE	3
4. SCOPE OF APPLICATION	3
4.1. STANDARDS	3
4.2. SERVICE CONDITION	3
4.3. CONTROLLER COMPATIBILITY	3
5. PRODUCT OVERVIEW	4
5.1. MODEL / PART NUMBER COMPARISON	4
5.2. NAME OF PARTS	5
5.3. SPECIFICATIONS	6
5.3.1. Ratings	6
5.3.2. Sensors	6
5.3.3. Input & output	6
5.4. CIRCUIT DIAGRAM	7
6. INSTALLATION	8
6.1. UNPACKING AND HANDLING	8
6.1.1. Packing and scope of supply	8
6.1.2. Unpacking	9
6.1.3. Handling (Lifting)	9
6.2. CHECK PRIOR TO INSTALLATION	9
6.2.1. Product check	9
6.2.2. Accessory check	9
6.3. MOUNTING ON THE POLE	10
6.3.1. Terminal pad/connector attachment	10
6.3.2. Lightning arrester mounting	12
6.3.3. Lifting	14
6.3.4. Pole mounting	15
6.3.5. Grounding	20
7. CONNECT TO CONTROLLER	21
7.1. CONNECTOR CONFIGURATION	21
7.1.1. Pin assignment	21
7.1.2. Precaution when connecting	21
7.1.3. Control cable connection	22
7.2. RATIO CORRECTION FACTORS (RCF) FOR VOLTAGE SENSORS	23
8. OPERATION	24
8.1. OPERATION BY CONTROLLER	24
8.1.1. Check prior to the operation by controller	24
8.1.2. Operation by controller	25
8.2. OPERATION OF FAULT CLEAR® BY OPERATING HANDLE	25
9. MAINTENANCE	26
9.1. APPEARANCE CHECK	26
9.2. FUNCTIONALITY CHECK	26
9.2.1. Controller	26
9.2.2. FAULT CLEAR® Recloser	26
10. AFTER SERVICE	27

1. Purpose

This Triple-single Solid Dielectric Auto Recloser (called the “FAULT CLEAR®”) shall be installed and used in the system voltage up to AC 27kV overhead power distribution lines.

- Open and close operation by controller
- Open operation by operating handle

FAULT CLEAR® shall have the compatibility with SEL-651R-2 of Schweitzer Engineering Laboratories, Inc. Operation and function of SEL-651R-2 shall be referred the instruction manual supplied by Schweitzer Engineering Laboratories, Inc.

2. Safety precautions


- For safe use, the FAULT CLEAR® shall be handled and operated by the personnel who have the adequate knowledge and skills.
- FAULT CLEAR® shall be connected to the earth by the grounding terminals. Grounding shall be carried out according to the regulation in the area of installation.
- Thoroughly read and understand the information contained in this instruction manual and correctly use the FAULT CLEAR®.
- Use the FAULT CLEAR® after acquiring proficiency in the knowledge of this equipment, safety information, and safety precautions. After reading, keep this instruction manual for future reference.
- Safety precaution levels are classified as “DANGER” and “CAUTION”.



If operation is incorrect, a dangerous situation may occur, resulting in death or serious injury.



If operation is incorrect, a dangerous situation may occur, resulting in moderate impairment or minor injury or physical damage to the equipment.

However, items in  may cause serious consequences depending on the situation. Items in both DANGER and CAUTION are very important.

DANGER

- Electric shock hazard:
 - Do not touch the high voltage energized part.
 - Properly connect the FAULT CLEAR® to the earth depending on the ground condition of installation site.
 - Make sure to check that no voltage is applied to low and high voltage parts prior to starting any work with the FAULT CLEAR®.
- Fall and injury hazard:
 - Do not stand or sit on the FAULT CLEAR® itself nor mounting bracket.
 - Make sure to fix the ropes on the lifting lugs firmly and lift the FAULT CLEAR® slowly by keeping the balance.

CAUTION

- Fall and injury hazard:
 - Never carry or operate the FAULT CLEAR® upside down.
- Electric shock and injury hazard:
 - Always wear rubber insulated gloves/personal protective equipment when handling and operating.
- Electric shock, injury, and fire hazard:
 - Never disassemble nor modify the FAULT CLEAR®.
- Fire and injury hazard:
 - Never use when any abnormality can be identified.
 - Dispose as an industrial waste.
- Damage hazard:
 - Never energize the FAULT CLEAR® without control cable and controller connected.
 - Do not disconnect control cable while the FAULT CLEAR® is energized.

3. Warranty period and coverage

The warranty period of the FAULT CLEAR® shall be one year after the date of shipment. However, if another warranty period is specified in the contract, the period of the contract shall be applied. Manufacturer will repair the product free of charge, provided that such degradation is determined to be due to defects in materials or workmanship under normal operation within the warranty period.

Warranty coverage does not apply when:

- (1) the failure is caused by user's negligence and force majeure,
- (2) the failure is caused by the modification and service by anyone other than the manufacturer or the authorized personnel,
- (3) the failure is caused by operation, connection, or assembling other than the procedures or methods mentioned in this instruction manual, and
- (4) the failure is caused by using accessories or parts other than specified by manufacturer.

This warranty is limited to the coverage of only the delivered product itself and does not extend to the compensation for consequential damage that has occurred by the supplied product.

4. Scope of application

4.1. Standards

FAULT CLEAR® complies the following standard.

IEC 62271-111(Ed.2.0) / IEEE Std C37.60-2012 High-voltage switchgear and controlgear - Part111: Automatic circuit reclosers and fault interrupters for alternating current systems up to 38 kV

Reference standard:

IEC 62271-1 Ed.2.0 b: 2007 High-voltage switchgear and controlgear - Part 1: Common specifications for alternating current switchgear and controlgear
--

4.2. Service condition

FAULT CLEAR® can be used under the environment indicated in the following table and the normal operation environment specified in IEEE C37.60 / IEC62271-111.

In case of using the FAULT CLEAR® under conditions other than indicated below, please consult the manufacturer.

Site and Service conditions	
Installation site	Outdoor
Altitude	3,280ft (1,000m) or less
Ambient temperature	-40 to +140°F (-40 to +60°C)
Pollution level (IEC 815)	Class IV (Very heavy)

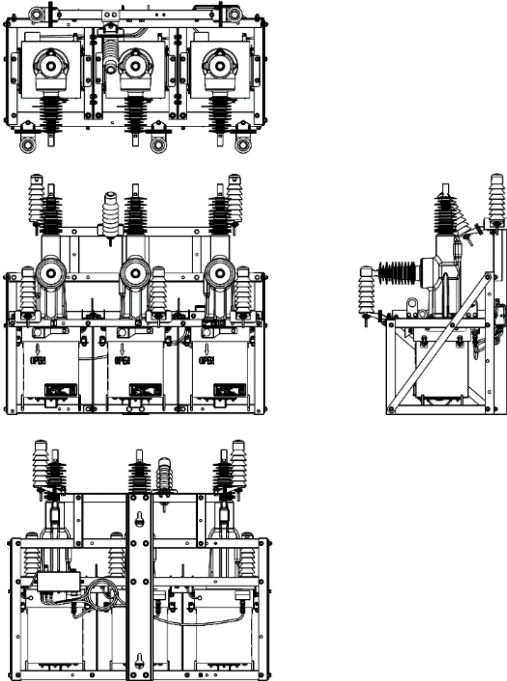
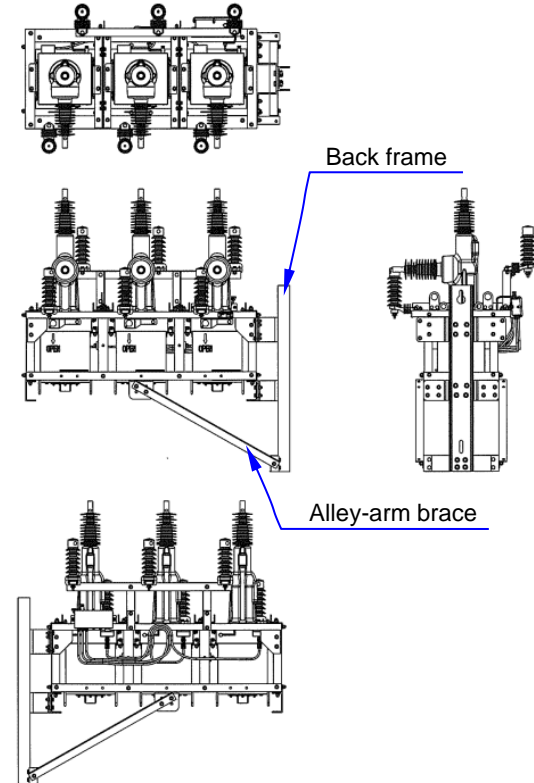
4.3. Controller compatibility

FAULT CLEAR® is compatible with the following Schweitzer Engineering Laboratories' controller.

Model	
SEL-651R-2	
Specified configuration	
Control cable interface	32-pin

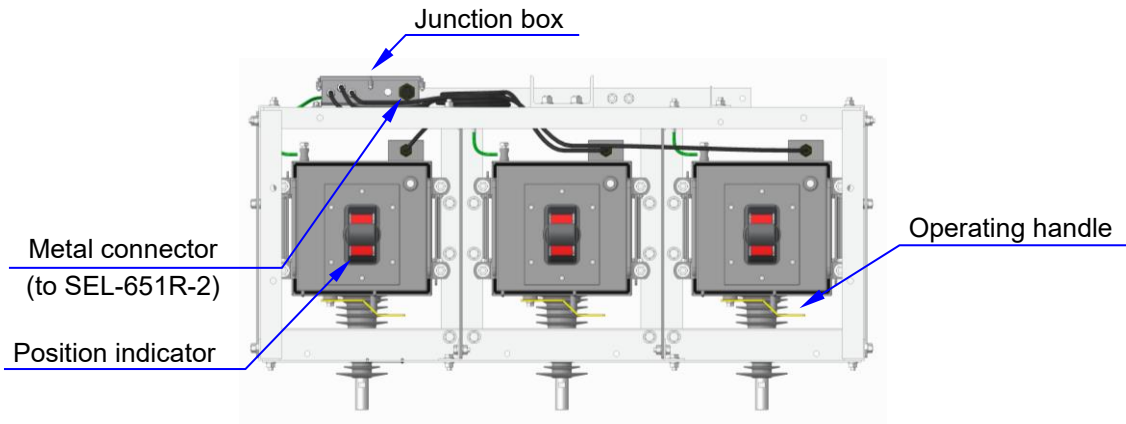
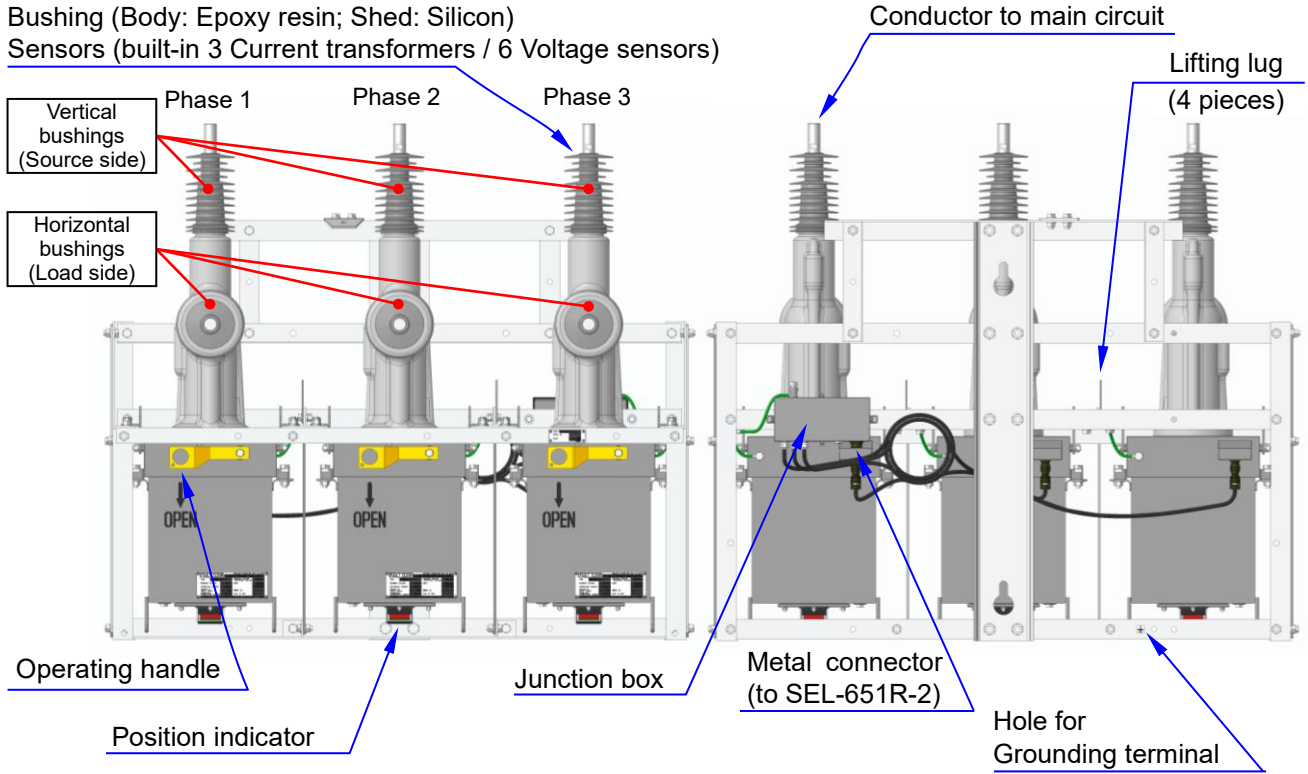
5. Product overview

5.1. Model / Part number comparison

Model / Part number	Example of frame structure with lightning arresters mounted
<p>VBN20-A3-YQ1</p>	
<p>VBN20-A3-YQ2</p>	 <p>Back frame</p> <p>Alley-arm brace</p>

5.2. Name of parts

Bushing (Body: Epoxy resin; Shed: Silicon)
 Sensors (built-in 3 Current transformers / 6 Voltage sensors)



Weight	
VBN20-A3-YQ1	VBN20-A3-YQ2
518lbs (235kg)	609lbs (276kg)

5.3. Specifications

5.3.1. Ratings

Item	Rating	
Rated voltage	27kV	
Rated current	800A	
Eight(8) hour overload current	960A	
Rated frequency	60Hz	
Rated short-time withstand current	16kA, r.m.s.	
Rated short-circuit making current	41.6kA, peak	
Rated duration of short-circuit	3 s	
Power frequency withstand voltage	Dry	60kV, 1 min
	Wet	50kV, 10 s
Lightning impulse withstand voltage	150kV	
Rated cable charging current	25A	
Rated line charging current	5A	
Creepage distance / Pollution level	32.95 in / 837 mm or more Class IV: Very heavy (IEC815)	
Operating sequence	O-0.5s-CO-2s-CO-5s-CO	
Closing time	38 ms ±10 ms	
Opening time	14 ms ±5 ms	
Duty cycle	116 operations	
Mechanical endurance	10,000 operations	

5.3.2. Sensors

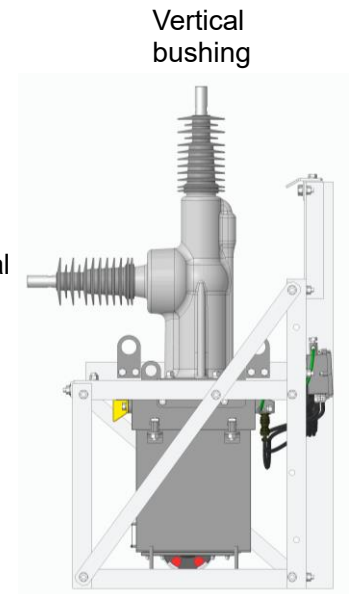
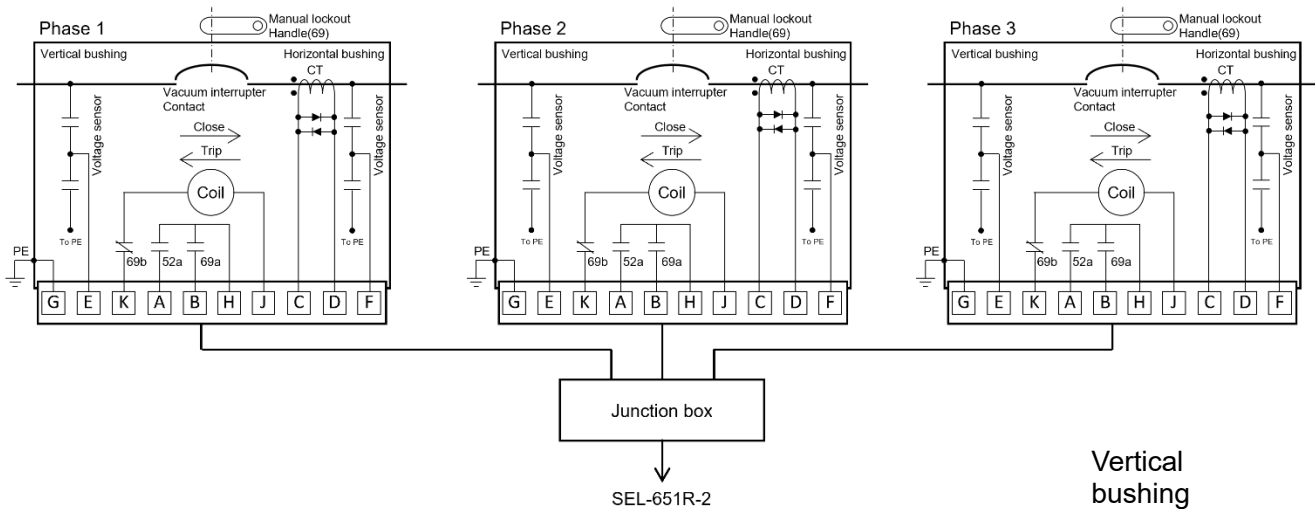
Item	Rating
CT for current measurement	
Rated ratio	1,000:1
Accuracy	±1.0%
Capacitive voltage sensor (VS)	
Rated ratio	10,000:1
Accuracy	±1.0%

5.3.3. Input & output

Description	Detail
Input	
Actuator (+)	Coil voltage: 155 +5 / -3 Vdc
Actuator (-)	
Output	
RECLOSER "Close" status	Dry contact
RECLOSER "Open" status	Dry contact
"Open" Lockout status	Dry contact
Current measurement Phase 1, 2 and 3	Analog signal output Each phase of horizontal bushings, total 3 units
Voltage measurement Phase 1, 2 and 3	Analog signal output Each phase of vertical & horizontal bushings, total 6 units

FAULT CLEAR® shall be controlled by the SEL-651R-2 manufactured by Schweitzer Engineering Laboratories, Inc. with a 32-pin interface control cable.

5.4. Circuit diagram



The polarity of CTs equipped in the FAULT CLEAR[®] is subtractive; therefore, when the main circuit current flows from the vertical side bushing to the horizontal side bushing, CT output flows in the direction shown by the red arrows in the wiring diagram above. Confirm the setting of “CTPOL CT Polarity” under “Global > Current and Voltage Connection Settings” in SEL-651R-2 as “NEG” as shown below.

AcSElerator® QuickSet - [Settings Editor - Sample_A (SEL-651R-2.006 v6.5.4.10)]

File Edit View Communications Tools Windows Help Language

Global

- General Settings
 - Current and Voltage Connection Settings**
 - Current Transformer Settings
 - Alarm Equations Settings
 - Optoisolated/Status Input Debounce Timers
 - Setting Group Selection Settings
 - Voltage Ratio Correction Factors
 - Voltage Phase Angle Correction
 - Breaker Monitor Settings
 - Data Reset Control
 - Synchronized Phasor Measurement Settings
 - DNP
 - Time and Date Management
- Group 1
- Group 2
- Group 3
- Group 4
- Group 5
- Group 6
- Group 7
- Group 8
- Front Panel
- Report
- Port F
- Port 1
- Port 2
- Port 3
- Port 5
- DNP Map Settings 1
- DNP Map Settings 2
- DNP Map Settings 3
- Modbus User Map

Current and Voltage Connection Settings

Current and Voltage Connections

RECL_CFG Recloser Configuration
A1 Select: A1, A2

IPCINN I123 Terminal Conn.
ABC Select: ABC, ACB, BAC, BCA, CAB, CBA, CBA

EGNSW Enable Ground Current Switch
Y Select: Y, N

CTPOL CT Polarity
NEG Select: POS, NEG

BKTYP Breaker Type (Single-Phase=1,Three-Phase=3)
1 Select: 1, 3

VYCONN VY Terminal Connections
ABC Select: OFF, ABC, ACB, BAC, BCA, CAB, CBA, A, B, C, AB, BC, CA

VZCONN VZ Terminal Connections
OFF Select: OFF, ABC, ACB, BAC, BCA, CAB, CBA, A, B, C, AB, BC, CA

EPHANT Enable Phantom Voltage Source
OFF Select: OFF, VY, VZ

VSELECT Voltage Source Selection
VY Select: OFF, VY

FSSELECT Frequency Source Selection
VY Select: OFF, VY

METHRES Meter Cutoff Threshold
M Select: Y, N, F

Part#: 0651R22DXGABAE2113B7XX Global: Current and Voltage Connection Settings

Displaying Alias Values sample_A.rdb

TXD RXD Disconnected 192.168.1.2 23 Terminal = Telnet File transfer = YModem

6. Installation

6.1. Unpacking and handling

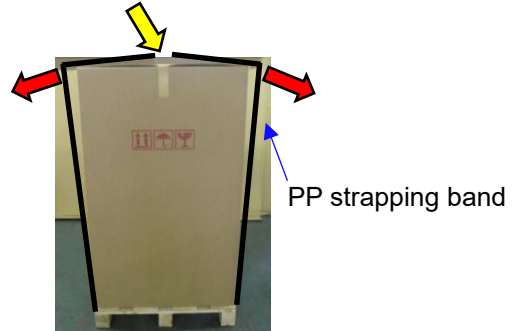
6.1.1. Packing and scope of supply

FAULT CLEAR® is packed in a reinforced corrugated cardboard box as below.

<Front view>



<Side view>



If you cut the band here, the band may spread out forcefully and cause injury.



- Make sure no one is around when you cut the PP strapping bands to unpack the box. PP strapping bands may spread out forcefully. Do not stand where the bands may spread.

Confirm the following components are enclosed in the package.


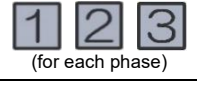

① VBN20-A3-YQ1

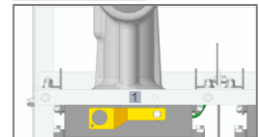
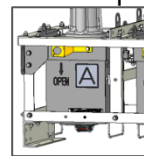
		Components	Quantity
1)	FAULT CLEAR®	Single-phase recloser	3
		Center pole frame	1
2)	Instruction manual		1
3)	FAULT CLEAR® - Voltage ratio correction factors		1
4)	FAULT CLEAR® Routine Test Report		1
5)	Phase identification labels: 1, 2, and 3		1 each

② VBN20-A3-YQ2

		Components	Quantity
1)	FAULT CLEAR®	Single-phase recloser	3
		Alley arm main frame	1
		Back frame (Both direction in Alley arm can be installed)	1
		Alley-arm brace	1
		Pre-lubricated stainless bolts (UNC1/2-13x1-3/4)	1 set
2)	Instruction manual		1
3)	FAULT CLEAR® - Voltage ratio correction factors		1
4)	FAULT CLEAR® Routine Test Report		1
5)	Phase identification labels: 1, 2, and 3		1 each

Phase identification labels can be changed to **A**, **B**, and **C** depending on customer request.

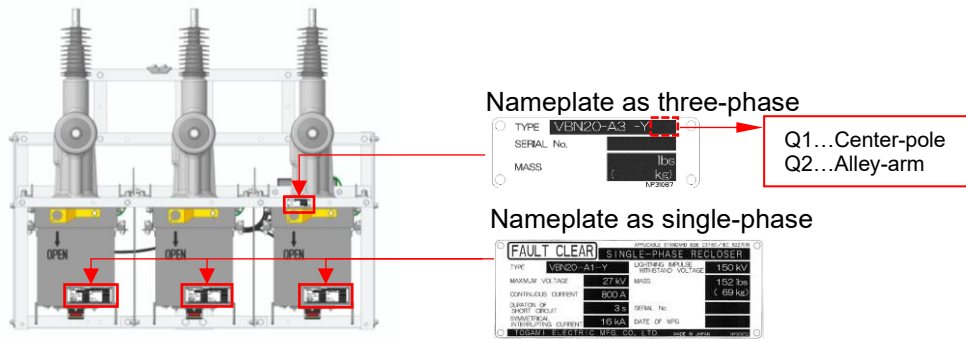
Figure	Phase	Size	Material
 (for each phase)	A, B, and C	4.7" x 4.7" (120mm x 120mm) 0.1mm×	SUS304-CP
 (for each phase)	1, 2, and 3	3" x 3" (75mm x 75mm) 0.1mm×	SUS304-CP
 (for aluminum frame)	1, 2, and 3	1.2" x 1.2" (30mm x 30mm) 0.1mm×	SUS304-CP



Labeling image

6.1.2. Unpacking

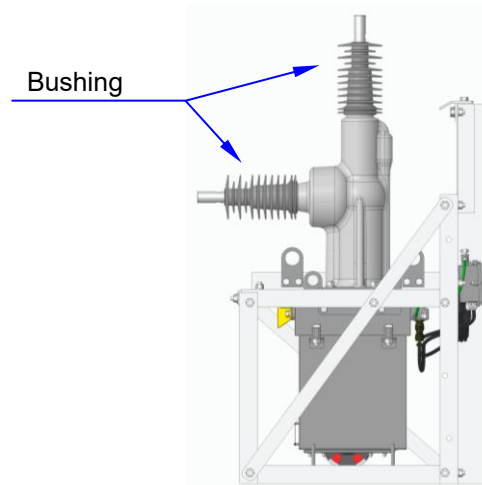
- Do not overturn or make a strong impact when opening the package.
- Make sure to check the type and ratings listed on the nameplate are correct for what you ordered.



6.1.3. Handling (Lifting)



- Do not hold bushings but mounting bracket (aluminum frame) when supporting the FAULT CLEAR® by hands.
- When moving the FAULT CLEAR® by forklift, make sure to use the pallet. Refer 6.3.3 for lifting the FAULT CLEAR®.



6.2. **Check prior to installation**

6.2.1. Product check

Confirm the product supplied is the one ordered by checking the rating plate attached on the product.

6.2.2. Accessory check

- 1) Optional accessories (provided upon request)

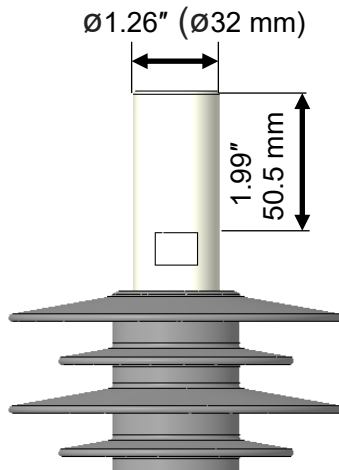
Item
2-hole NEMA terminal connectors
4-hole NEMA terminal connectors
Clamp type terminal connectors (#2 STR - 750 MCM)
Wildlife protector / Animal guard
Controller (SEL-651R-2)
32-pin interface control cable
Lightning arrester (including fasteners, arrester grounding straps, jumper cables, etc.)
Power transformer with bracket

6.3. Mounting on the pole

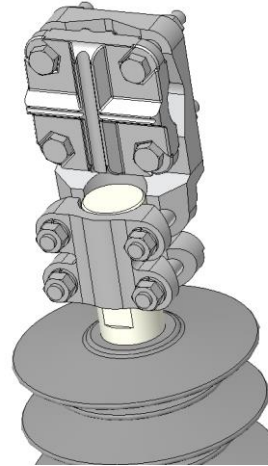
6.3.1. Terminal connector attachment



- Dimensions of conductor of main circuits where the terminal connectors can be attached are shown as the figure below.
- Use the terminal connectors which is suitable to the size of conductor.

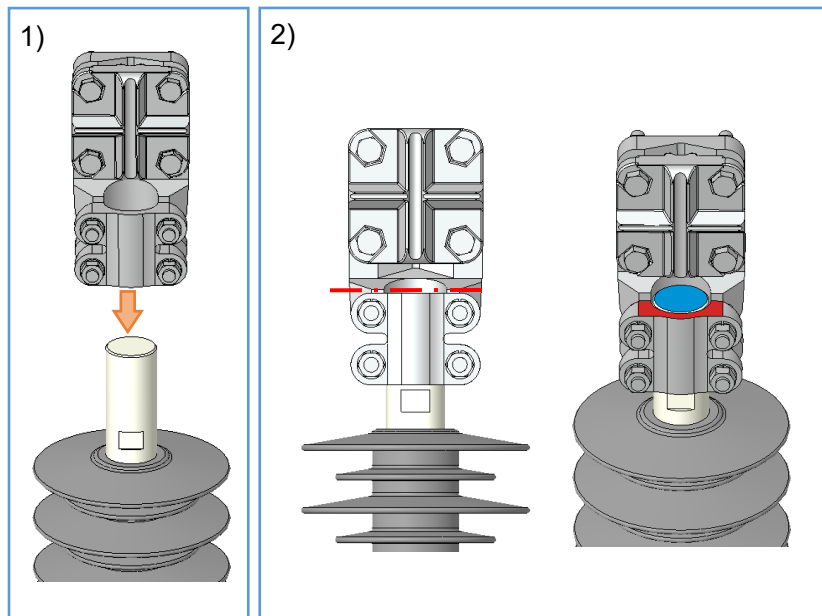


Main circuit conductor



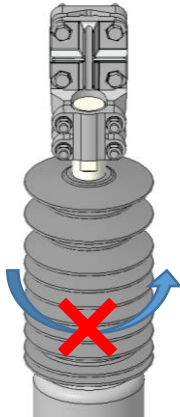
Example of terminal connector

- 1) Insert NEMA terminal connectors to the terminals of solid dielectric vertical and horizontal bushings each after cleaning inside of connecting part of NEMA terminal connectors and the terminals of solid dielectric.
- 2) Insert NEMA terminal connectors until the top of terminal of solid dielectric indicated as blue color and red colored part of NEMA terminal connectors are leveled as indicated in the diagram below.





- DO NOT APPLY FORCE TO TWIST THE SILICONE SHEDS TO A COUNTER-CLOCKWISE DIRECTION WHEN CONNECTING THE NEMA TERMINAL CONNECTORS. By applying the force to a counter-clockwise direction, screw parts of the silicone sheds may get loose.



6.3.2. Lightning arrester mounting

① **VBN20-A3-YQ1**

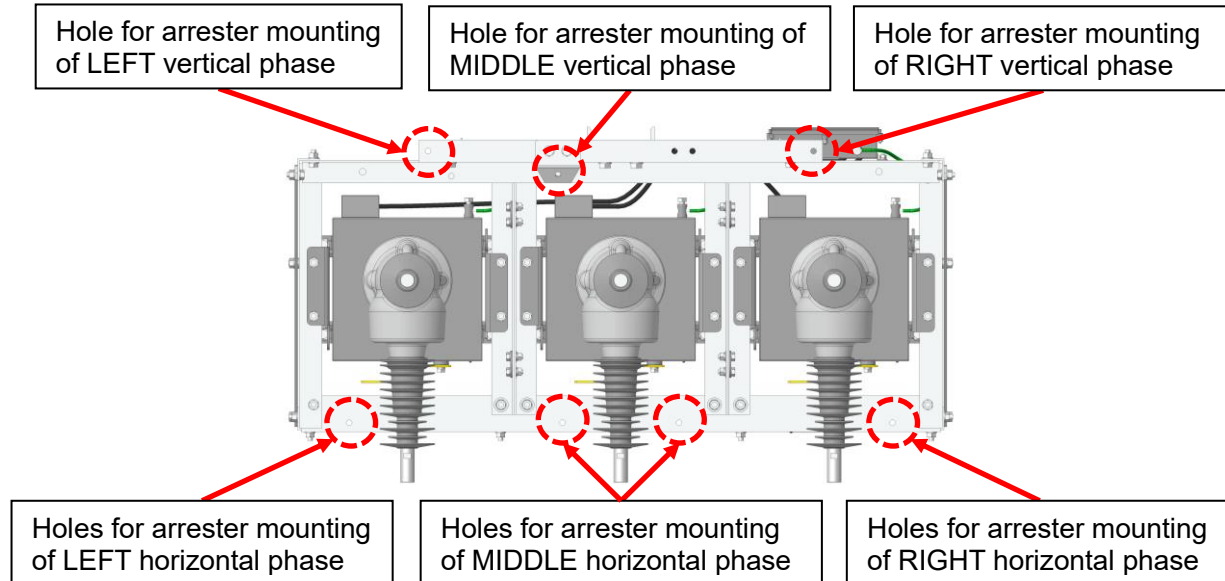
FAULT CLEAR®: VBN20-A3-YQ1 is equipped with aluminum frame having holes and additional frame structure for arrester mounting as indicated in the drawings below.

Choose the holes for arrester mounting for the horizontal phases depending on the utility's installation regulation and site condition.

1) Fix the lightning arresters on the holes as indicated in the drawing below.



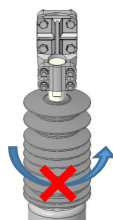
- Make sure that all fasteners are fastened at the torque specified in the instruction manual of the lightning arresters.



2) Based on the specifications, requirements, and/or regulations of utilities, connect the lightning arresters to the terminal connectors and to the frame for grounding.



- Make sure to keep the sufficient distance between the aluminum frame and the jumper wires connecting between terminal connectors and lightning arresters.
- Make sure to fasten the bolts for grounding straps at the torque value specified in the instruction manual of the lightning arresters.
- (Photos) Example of lightning arrester mounting and grounding:



DO NOT APPLY FORCE TO TWIST THE SILICONE SHEDS TO A COUNTER-CLOCKWISE DIRECTION WHEN CONNECTING THE NEMA TERMINAL CONNECTORS.

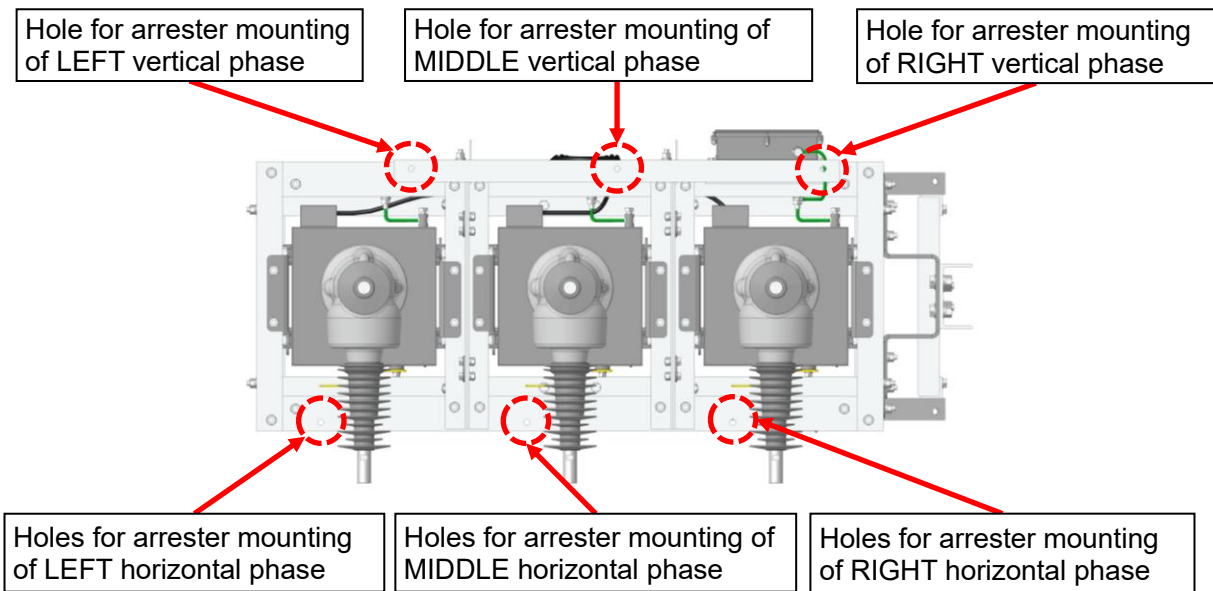
By applying the force to a counter-clockwise direction, screw parts of the silicone sheds may get loose.

② VBN20-A3-YQ2

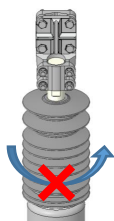
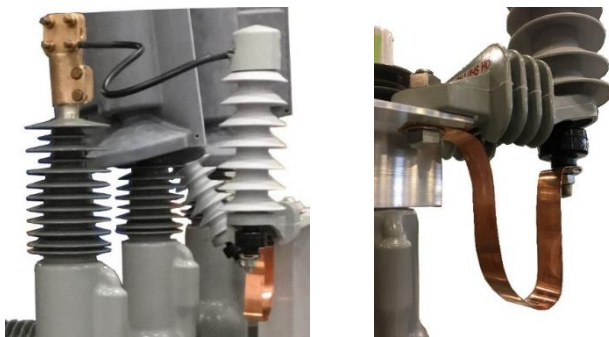
FAULT CLEAR®: VBN20-A3-YQ2 is equipped with aluminum frame having holes and additional frame structure for arrester mounting as indicated in the drawings below. Choose the holes for arrester mounting for the horizontal phases depending on the utility's installation regulation and site condition.



- 1) Fix the lightning arresters on the holes as indicated in the drawing below.
 - Make sure that all fasteners are fastened at the torque specified in the instruction manual of the lightning arresters.



- 2) Based on the specifications, requirements, and/or regulations of utilities, connect the lightning arresters to the terminal connectors and to the frame for grounding.
 - Make sure to keep the sufficient distance between the aluminum frame and the jumper wires connecting between terminal connectors and lightning arresters.
 - Make sure to fasten the bolts for grounding straps at the torque value specified in the instruction manual of the lightning arresters.
 - (Photos) Example of lightning arrester mounting and grounding:

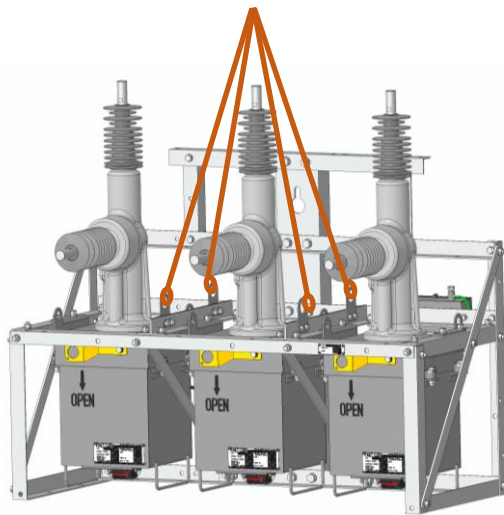


DO NOT APPLY FORCE TO TWIST THE SILICONE SHEDS TO A COUNTER-CLOCKWISE DIRECTION WHEN CONNECTING THE NEMA TERMINAL CONNECTORS. By applying the force to a counter-clockwise direction, screw parts of the silicone sheds may get loose.

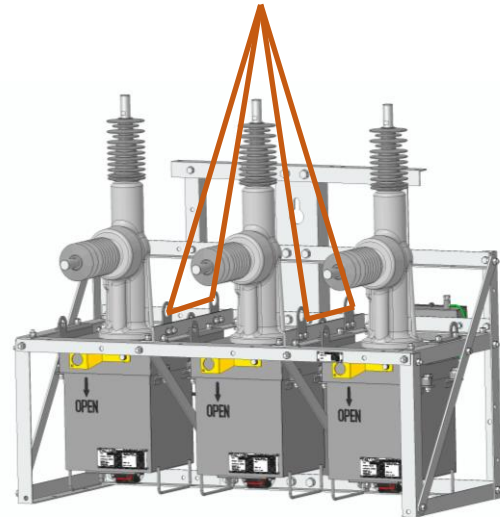
6.3.3. Lifting



- When lifting the FAULT CLEAR[®], use four (4) rope slings having the length of 5' (1.5m) or more or two (2) rope slings having the length of 10' (3m) or more and lift the FAULT CLEAR[®] as shown in the figures below and hold the weight of the FAULT CLEAR[®] with mounting brackets.
- When lifting the FAULT CLEAR[®] straight up, make sure that the ropes do not touch the silicone sheds and epoxy of bushings.
- Make sure to use the lifting lugs when lifting the FAULT CLEAR[®]. Using other parts of the FAULT CLEAR[®] or aluminum frame may cause overturn.



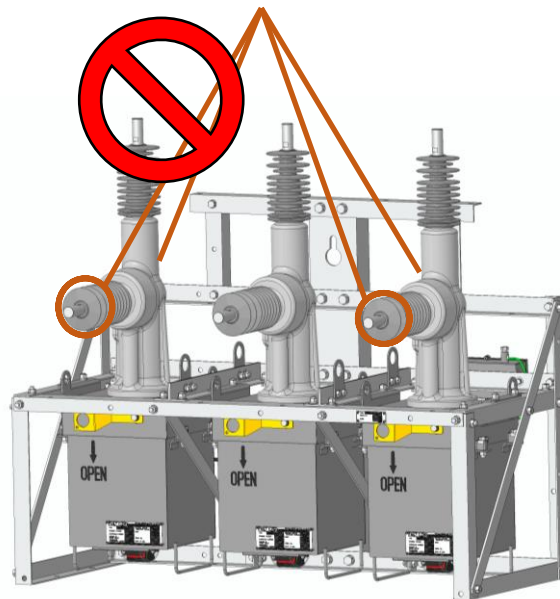
Using 4 rope slings
(Length: 5' or more)



Using 2 rope slings
(Length: 10' or more)



DO NOT HANG THE ROPES ON THE BUSHINGS TO LIFT THE FAULT CLEAR[®].



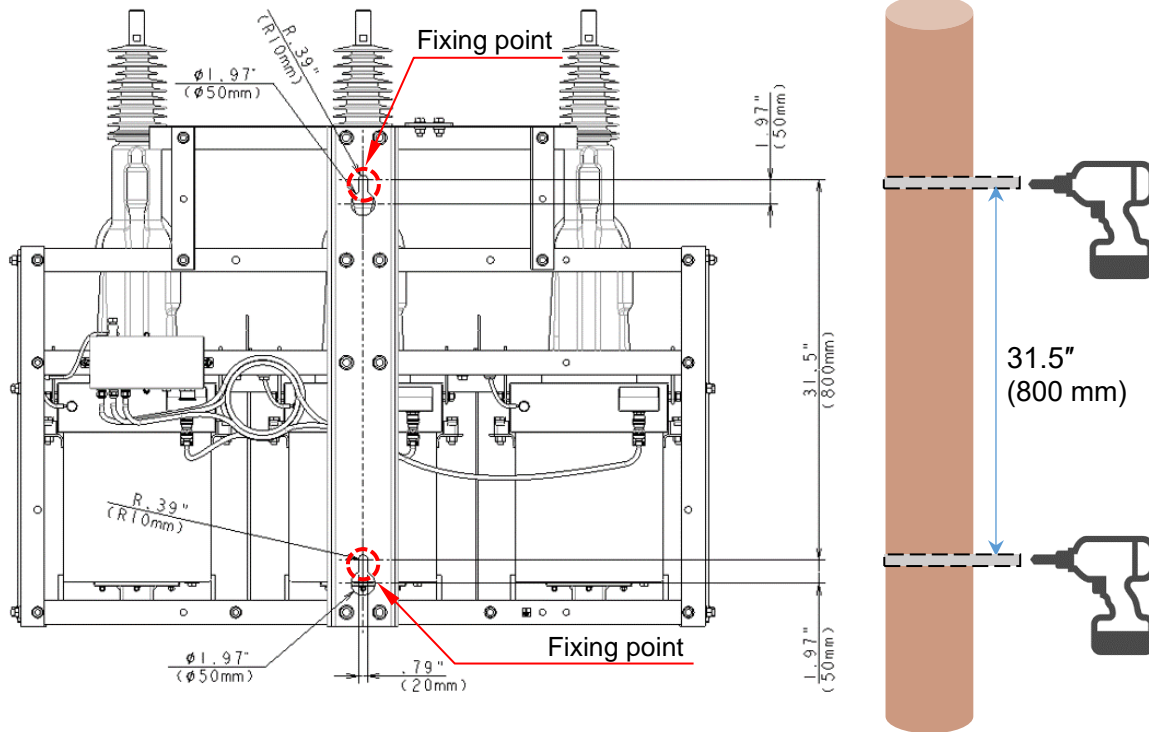
6.3.4. Pole mounting



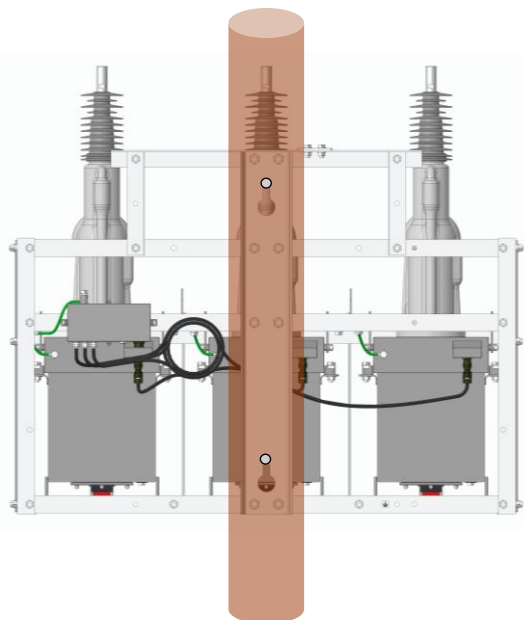
- Make sure to proceed the works by paying attention to the safety of workers.
- Mount the FAULT CLEAR® Recloser to the pole as the following procedures.

① VBN20-A3-YQ1

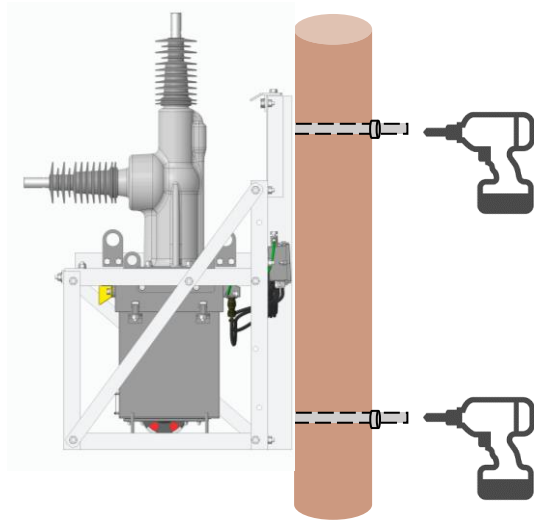
- 1) Fix two bolts on the pole at the same distance as the “Fixing points” of Recloser frame as shown in the drawing below.



- 2) Hang the FAULT CLEAR® on the pole.



3) Fasten bolts from pole side.



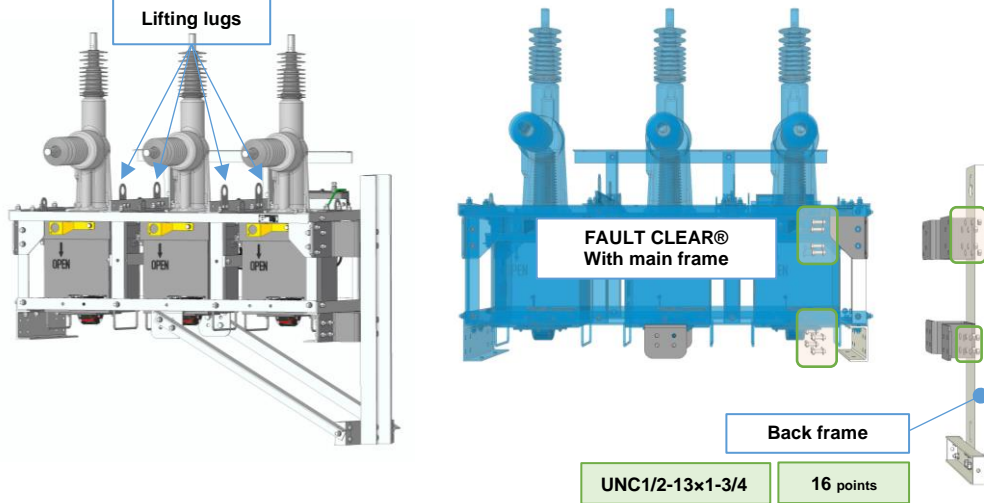
② VBN20-A3-YQ2

■ Before pole mounting (Assembly instructions of Back frame and braces)

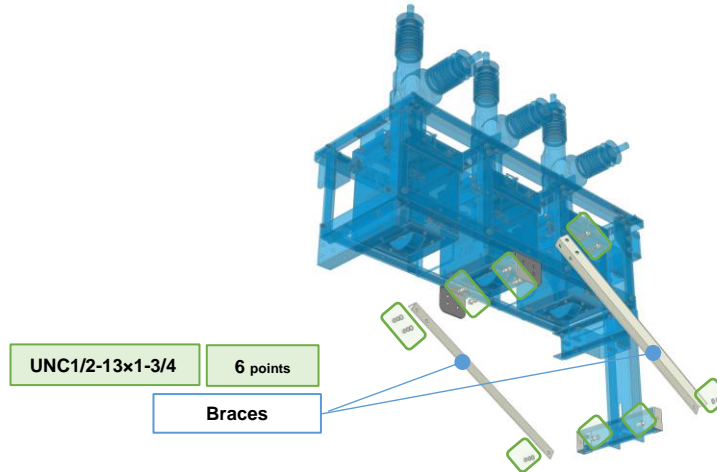
- 1) Lift the FAULT CLEAR® with main frame up to assemble the back frame.



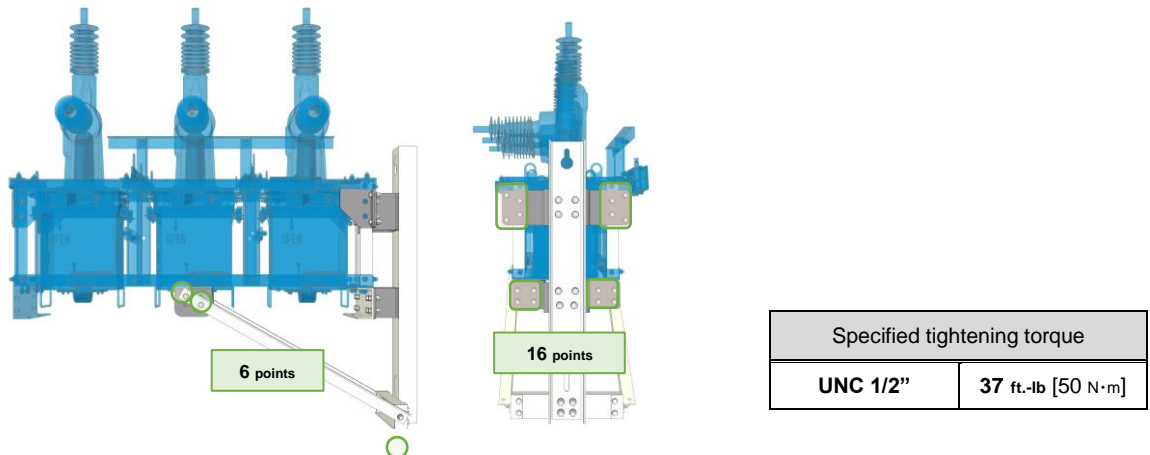
- Use the lifting lugs when lifting and mounting the equipment.
- Improper lifting can result in severe personal injury, death, and equipment damage.



- 2) Assemble the braces on the lower side of the main frame and the back frame.

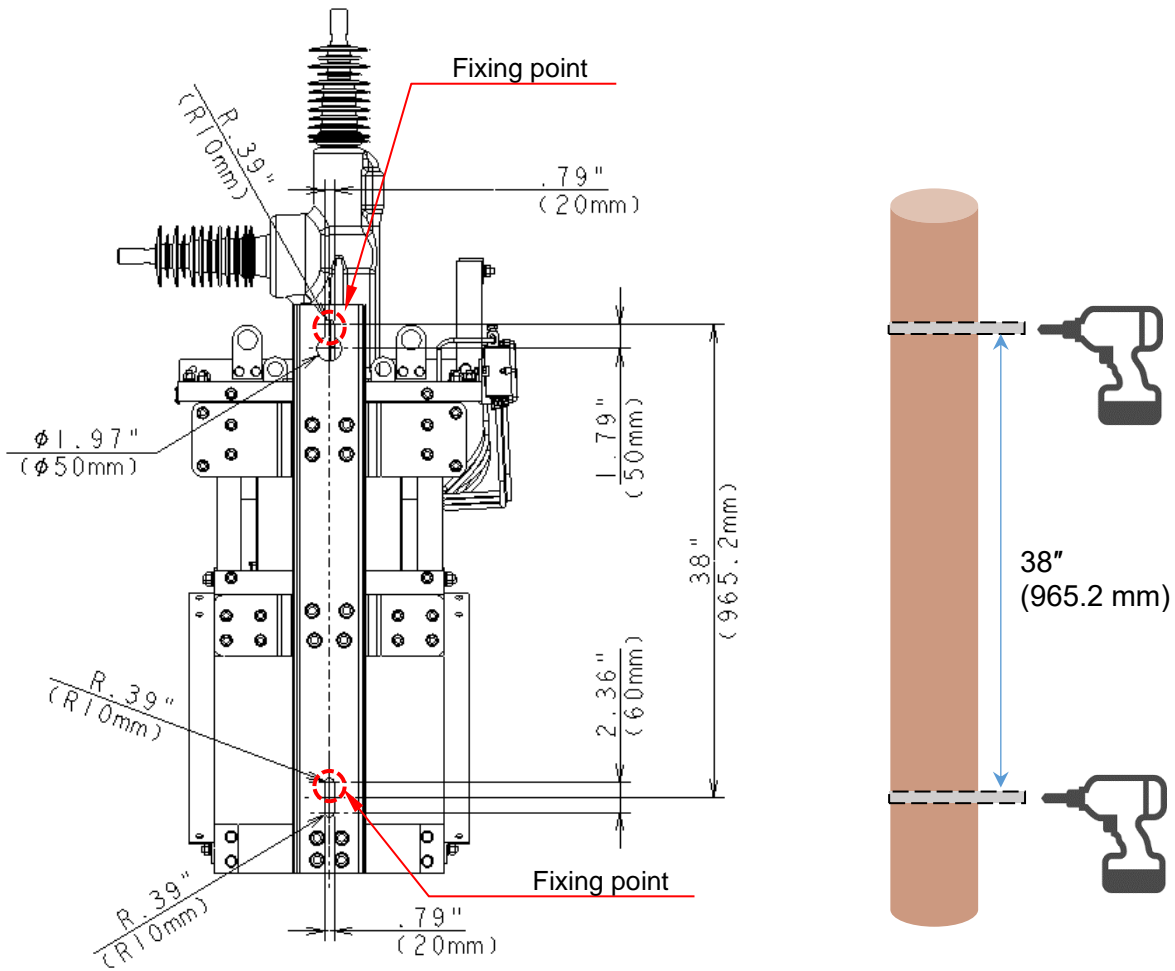


- 3) Use a torque wrench to tighten the bolts to the specified tightening torque as shown below.

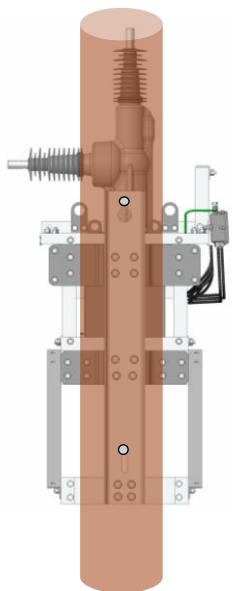


■ Pole mounting

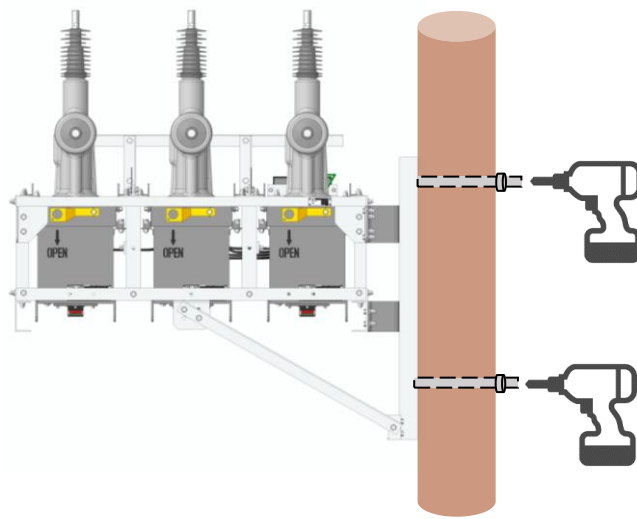
- 1) Fix two bolts on the pole at the same distance as the "Fixing points" of Recloser frame as shown in the drawing below.



- 2) Hang the FAULT CLEAR® on the pole.



3) Fasten bolts from pole side.

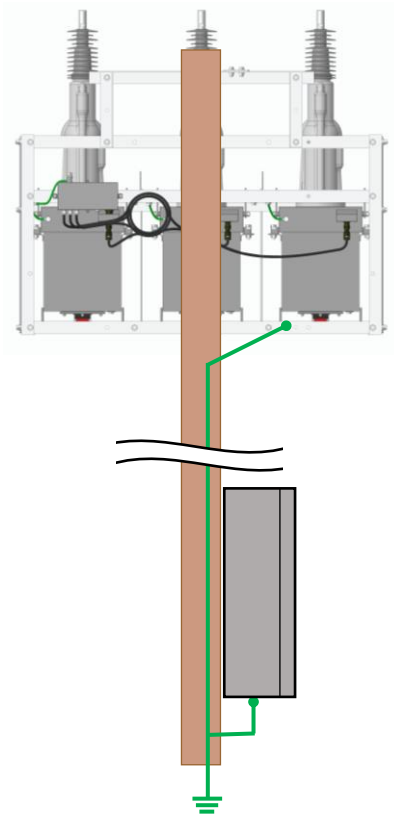


6.3.5. Grounding

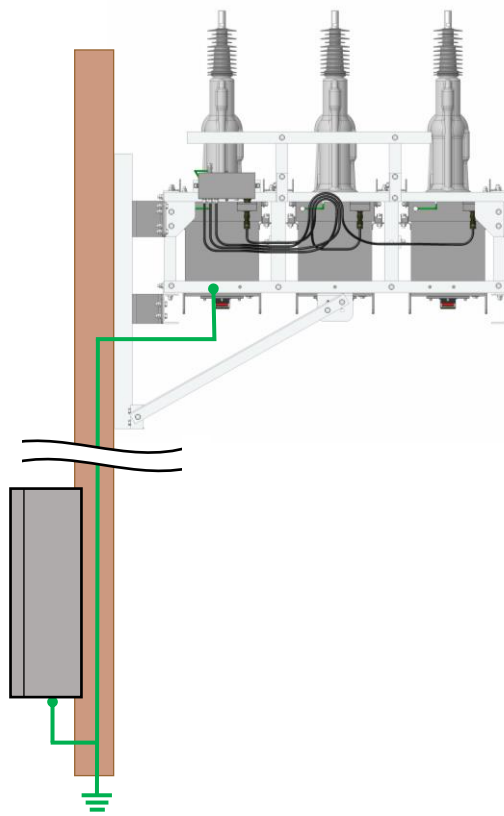
- Grounding wire can be connected to the grounding terminal located on the aluminum frame of the FAULT CLEAR® rear side.
- FAULT CLEAR® can be grounded by the grounding terminal on the aluminum frame.
- For safety of operators and protection of equipment, make sure to connect the FAULT CLEAR® to the earth by grounding wire having the suitable conductor size prior to connecting the main circuits to the power distribution lines. Make sure to ground the equipment according to the soil condition and regulation at the installation site.
- Controller enclosure shall be always grounded through the FAULT CLEAR® as per the following figures. If the grounding point of the controller enclosure is different from that of the FAULT CLEAR®, the equipment may be broken due to the potential difference among equipment in case of lightning surge which increases grounding potential.



① VBN20-A3-YQ1



② VBN20-A3-YQ2

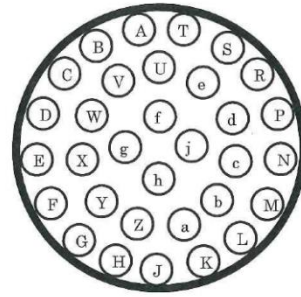


7. Connect to controller

7.1. Connector configuration

7.1.1. Pin assignment

- Diagram of receptacle from the outside of the FAULT CLEAR®
- Connector: Amphenol or Equivalent

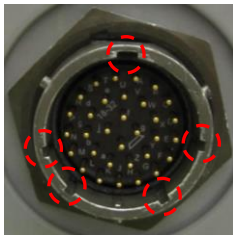


Quoted from P3 of Amphenol PT Series, Catalogue No. PT/MB-J3

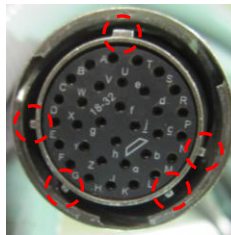
32-pin Male Connector pin assignment			
A	Terminal Current – Phase 1	T	—
B	Terminal Current – Phase 2	U	Monitored Auxiliary Contact (52a) – Phase 1
C	Terminal Current – Phase 3	V	Monitored Auxiliary Contact (52a) – Phase 2
D	Current Return	W	Monitored Auxiliary Contact (52a) – Phase 3
E	—	X	Monitored 69 Contact
F	+12 Vdc (Whetting Voltage) for monitoring recloser status	Y	Actuator Close – Phase 1
G	Recloser Ground	Z	Actuator Trip – Phase 1
H	—	a	—
J	Voltage (horizontal) – Phase 1	b	—
K	Voltage (horizontal) – Phase 2	c	—
L	Voltage (horizontal) – Phase 3	d	—
M	Voltage (horizontal) – Common	e	—
N	Voltage (vertical) – Phase 1	f	Actuator Close – Phase 2
P	Voltage (vertical) – Phase 2	g	Actuator Trip – Phase 2
R	Voltage (vertical) – Phase 3	h	Actuator Close – Phase 3
S	Voltage (vertical) – Common	j	Actuator Trip – Phase 3

(Note No wiring is needed in the cabinet. Cable shield shall be grounded at the FAULT CLEAR® side.

- FAULT CLEAR® receptacle
 Manufacturer: Amphenol
 # of pins: 32-pin
 Insert arrangement: 18-32



- Control cable connector (example)
 Manufacturer: Amphenol
 # of pins: 32-pin
 Insert arrangement: 18-32



7.1.2. Precaution when connecting



Make sure to place the key to connector on the key groove of the receptacle and connect the connector to the receptacle, and confirm the connector is firmly inserted to the receptacle.

7.1.3. Control cable connection

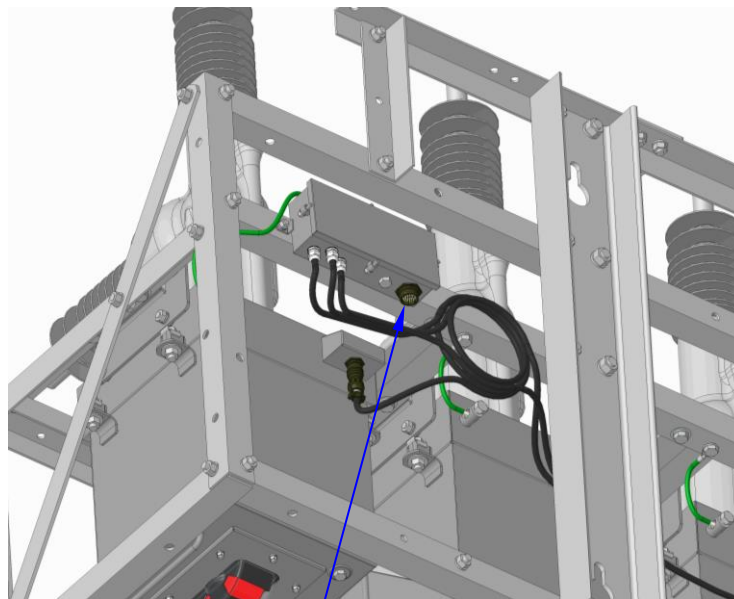
- Connect a control cable to the metal connector located on the bottom of junction box equipped on the rear side of the FAULT CLEAR®.



- Make sure to fix and hold the control cable to the pole, for example by using cable ties, in order not to apply any tension to the metal connector part.



- Never disconnect the control cable while the FAULT CLEAR® is energized.



Metal connector

7.2. Ratio Correction Factors (RCF) for voltage sensors

FAULT CLEAR® has 6 (six) voltage sensors built in, and each voltage sensor needs the Ratio Correction Factors depending on the operating voltage where the FAULT CLEAR® is installed.

The RCF sheet is enclosed in the FAULT CLEAR®. *The figure is for illustrative purposes only.

FAULT CLEAR® - Voltage Ratio Correction Factors (RCF)

Phase	10kV	13.2kV	13.8kV	20kV	25kV	27kV
V1Y	0.950	0.961	0.963	0.981	0.992	0.996
V2Y	0.917	0.927	0.929	0.946	0.957	0.960
V3Y	0.916	0.926	0.928	0.945	0.956	0.959
V1Z	1.005	1.016	1.018	1.035	1.046	1.050
V2Z	0.989	1.000	1.002	1.019	1.029	1.032
V3Z	0.982	0.992	0.994	1.010	1.021	1.024

(NOTE) "Voltage Class" mentioned in the above table is Phase to Phase Voltage.

Refer the values in the graph below in case your operating voltage is not mentioned in the above table.

VBN20-A3-Y01

VBN20-A3-Y01 Serial No.	E123456
Phase-1 Serial No.	E123457
Phase-2 Serial No.	E123458
Phase-3 Serial No.	E123459

Use the values from this table according to the operating voltage of distribution line.

Confirm the serial numbers and phase indications (1, 2, and 3) match.

If your operating voltage is not 13.2 nor 25kV, refer the graph and find the RCFs.

RCFs shall be set through ACSELERATOR QuickSet SEL-5030 Software for SEL-651R-2 control.

<ACSELERATOR QuickSet SEL-5030 Software>

Start the software, and select "Global" (①) and then "Voltage Ratio Correction Factors" (②).

Enter the Voltage Ratio Correction Factors to the areas (③).

In case the Ratio Correction Factors for your operating voltage is not shown in the tables, refer the values indicated in the graph.

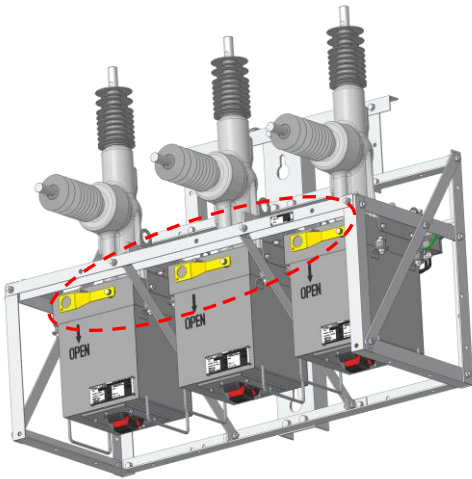
8. Operation

8.1. Operation by controller

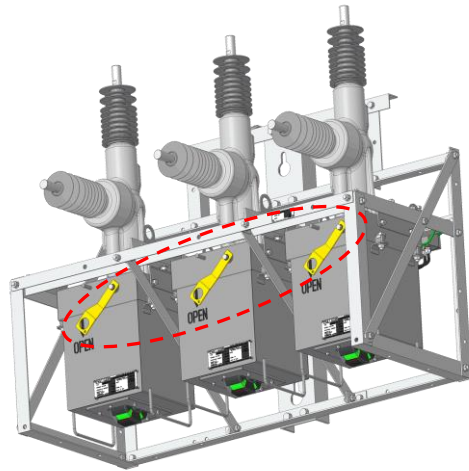
8.1.1. Check prior to the operation by controller

- Handle position

When any of the operating handles are at downward position, the FAULT CLEAR® cannot be operated by controller. Make sure that all operating handles are at upper position prior to operation.

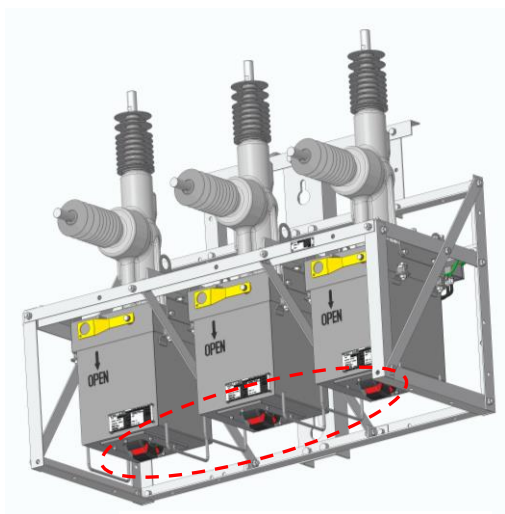


Handle at "Normal" position

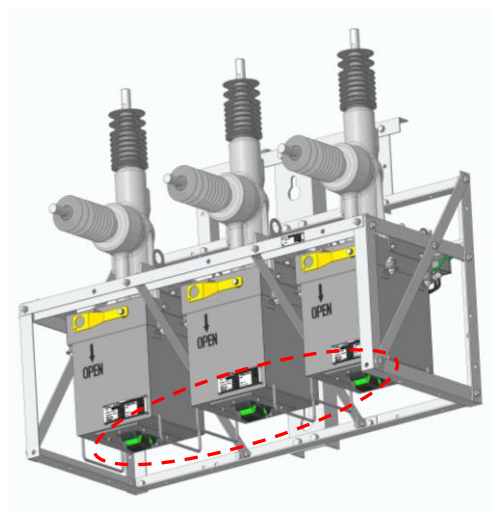


Handle at "OPEN (LOCK)" position

- Position indicator



RECLOSER "CLOSE (RED)"



RECLOSER "OPEN (GREEN)"

8.1.2. Operation by controller

- SEL-651R-2 can operate the FAULT CLEAR from the following three modes of mechanical operation depending on SEL-651R-2 settings:
 - 1) Single-phase trip / single-phase lockout
 - Each phase shall trip and lockout independently.
 - 2) Single-phase trip / three-phase lockout
 - If one phase trip, the other two phases shall also trip to lockout to prevent single-phasing.
 - 3) Three-phase trip / three-phase lockout
 - All phases trip and close simultaneously.
- Refer the instruction manual of controller for the details.
- FAULT CLEAR® can be operated by the controller manufactured by Schweitzer Engineering Laboratories, Inc.

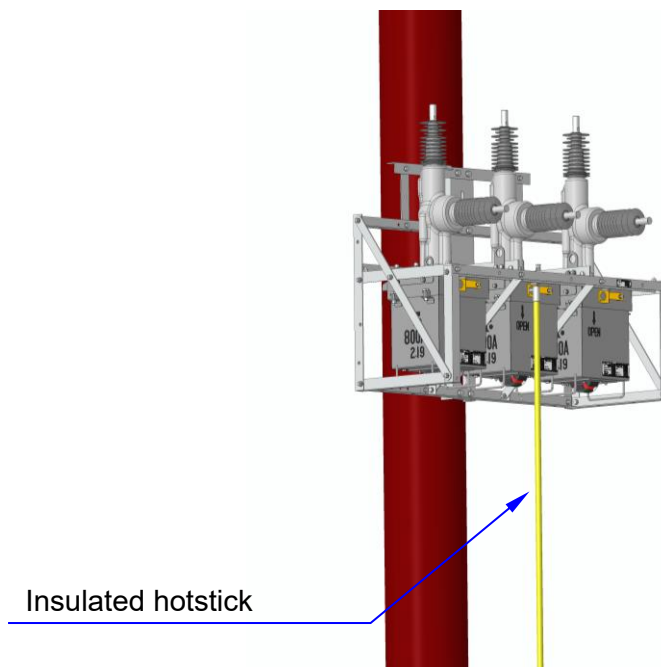


8.2. **Operation of FAULT CLEAR® by operating handle**

FAULT CLEAR® can be operated to open by operating handle with the insulated hotstick downward. By turning the operating handle toward downward position, the FAULT CLEAR® cannot be operated by controller. (LOCK-OUT)



- When operating the FAULT CLEAR® with operating handle, do not touch and scratch the bushings or mounting bracket / frame with the hotstick.



9. Maintenance

FAULT CLEAR® is maintenance-free and designed with the mechanical performance of 10,000 operations under the normal service condition specified in IEEE C37.60.

However, we recommend the following periodic checks to find any deterioration(s) and/or failure(s) prior to any problem occurs in consideration of the usage environment and economic efficiency.

It is also recommended to perform the following maintenance after a natural disaster.

9.1. Appearance check

Without suspending the power supply, carry out the appearance check of the FAULT CLEAR® visually.

Recommended checking interval: Once in one (1) year



CAUTION!

- Do not touch the medium voltage energized parts.

No.	Item
1	No damage or deformation on the FAULT CLEAR® appearance
2	Check that the color of the indicator matches the status of the recloser. - OPEN: GREEN, CLOSE: RED - Refer to Clause 8.1.1
3	Appropriate grounding of the FAULT CLEAR® - Check any signs of damage, such as frayed or corroded wires. - Refer to Clause 6.3.5

9.2. Functionality check

In addition to the appearance check, carry out the precise check by suspending the power supply.

9.2.1. Controller

Recommended checking interval: Once in six (6) months

9.2.2. FAULT CLEAR® Recloser

Recommended checking interval: Once in four (4) years



CAUTION!

- Make sure to display and carry out the necessary protection to avoid any making operation of the FAULT CLEAR® by accident.

No.	Item
<u>Controller</u>	
1	Refer to the SEL-651R operation manual and datasheet for the maintenance and inspection as well as the estimated life of the battery.
<u>FAULT CLEAR® Recloser</u>	
1	Check the protection of the recloser with an appropriate test kit. i.e. ARCO40 by OMICRON etc.
2	Insulation resistance between the main circuit and the ground shall be 2,000MΩ or more

10. After service

For technical inquiries, please contact us at the followings.

Togami Electric Mfg. Co., Ltd.

1-1 Ohtakara-Kitamachi, Saga 840-0802 JAPAN

TEL +81-952-25-4131

FAX +81-952-24-6240

WEB <https://www.togami-elec.co.jp/en/mvp/>