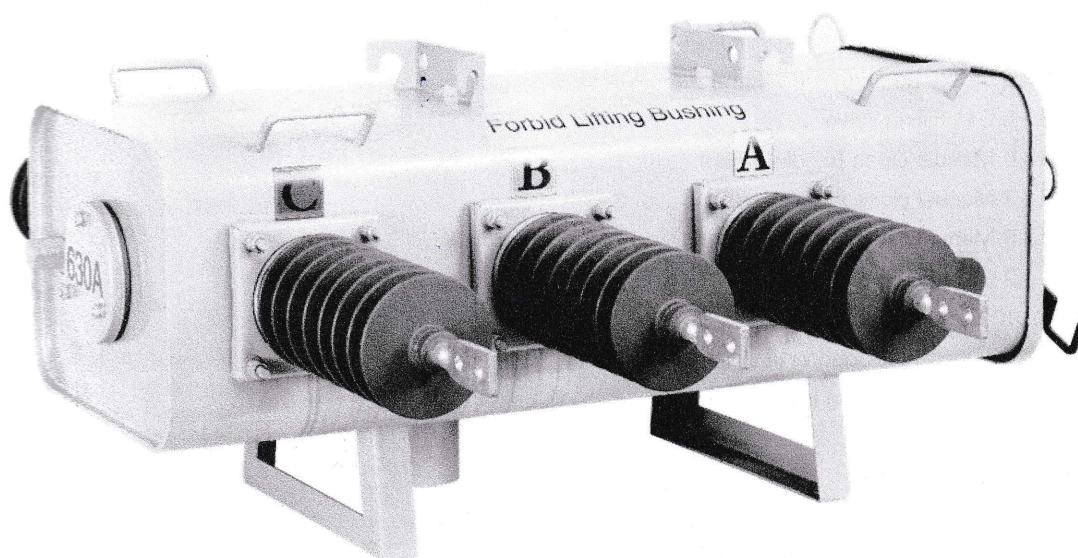


NOVAw Load Break Switch User Manual



Cooper Edison (Pingdingshan) Electronic Technologies Co., Ltd.

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Powering Business Worldwide

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1. Product Overview

NOVAw Load-break switch/Sectionalizer is designed to overcome the shortcomings of VT voltage-time mode and IT current-time mode of traditional load-break switch by collecting voltage, current, time and counting information to meet the requirement of distributing network automation. It is suitable to well work both in radioactive network and ring network whether for earthed neutral systems or isolated neutral systems. The application of the load-break switch can effectively reduce the operation times of the switch, and also can reduce the power-outage duration.

NOVAw Load-break switch/Sectionalizer has sectionalizer mode with multiple protection functions such as: over-current, over-voltage, under-voltage, phase-deficient disconnection, high-impedance ground fault etc. NOVAw Load-break switch/Sectionalizer can directly open and disconnect the over-load fault or ground fault under the locking current (900A). For short-circuit fault higher than locking current of 900A, the backup apparatus breaks the fault and then NOVAw Load-break switch/Sectionalizer operates and disconnects the faulted segment.

NOVAw Structure

NOVAw Load-break switch/Sectionalizer uses SF6 gas as dielectric of insulation and arc-extinguishing. The open stroke is big and there is no capacitive current through the open stroke by comparing with load-break switch with vacuum interrupter. The load-break switch is equipped with spring mechanism. NOVAw Load-break switch/Sectionalizer is also well compatible with automatic reclosers, automatic sectionalizers or other FTU distribution automotive switches.

NOVAw Load-break switch/Sectionalizer is optional to equip with three voltage sensors on both the source and load side. It is also optional to equip with two or three current transformers and zero sequence current transformer.

NOVAw Load-break switch/Sectionalizer can judge whether a short-circuit fault or a ground fault, as well as in a main line or a user branch line by sensing parameters of I0 or V0I0.

NOVAw Load-break switch/Sectionalizer has the below characteristics:

1. Use high-purity (99.9% or more) SF6 gas for good insulation and arc extinguishing inside the main body with extremely short arc-extinguishing time (1/2 cycle) and good insulation recovery property. In addition, the arc-extinguishing time is short and the electrical erosion is small during breaking load current, and therefore it has long electrical endurance.
2. The switch is equipped with spring mechanism with charged energy by motor
3. Insulation and arc-extinguishing performance can be guaranteed even at zero gauge pressure (0 kg·f/cm²). Even if SF6 gas in the switch enclosure leaks and reduces to zero gauge pressure, the insulation and switching performance can still be guaranteed.
4. The enclosure of the NOVAw switch is made of stainless steel. The spring mechanism and the related moving parts are assembled inside the enclosure, therefore there is no corrosion to cause operation malfunction.
5. The built-in voltage sensors and current transformers provide the voltage and current data for distributing automation.
6. The moving contacts in the main circuit are tulip contacts with strong breaking ability, high thermo-shock capability and high reliability.

2. Rated Parameters

2. Rated Parameters

2.1 Service conditions

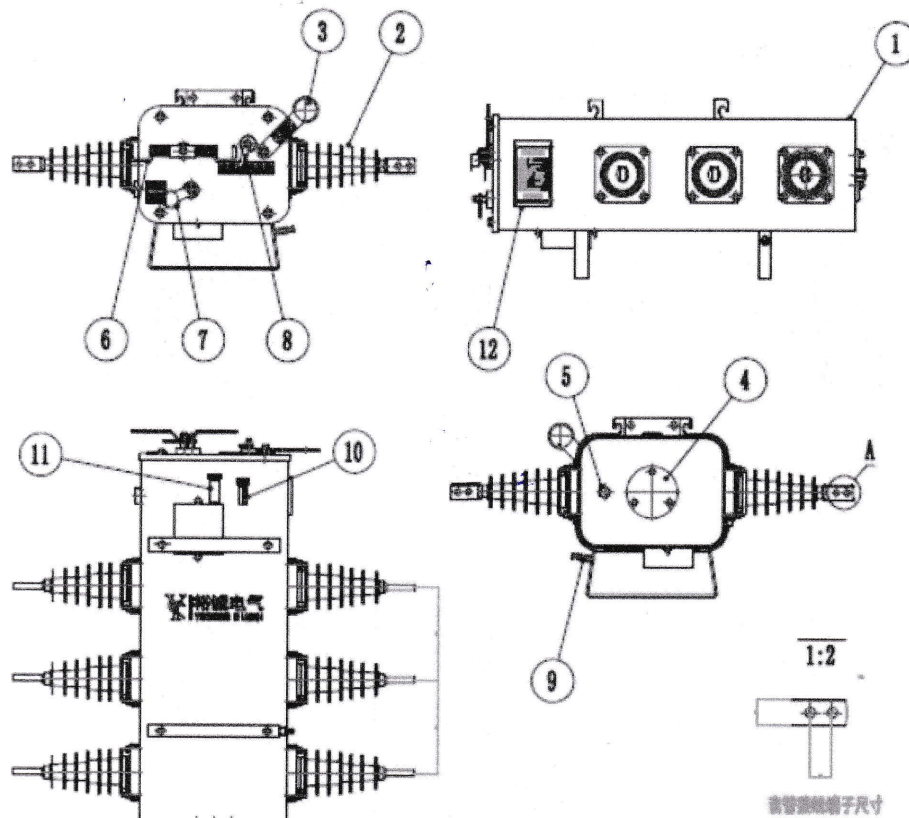
1. Ambient temperature : -40 ~ 65 °C, and maximum daily temperature difference: ≤25°C
2. Humidity: 0 ~ 100% (relative humidity)
3. Altitude: Up to 3000m
4. Wind pressure does not exceed: 700pa (equivalent to wind speed 34m/s)
5. Earthquake resistance: 8 degrees (horizontal acceleration 0.25g, vertical acceleration 0.125g)
6. Installation site: no fire, explosion hazard, no chemical corrosion and frequent severe vibration.
7. Pollution level: Class IV
8. Ice thickness: 10mm
9. Snow intensity: 35mm
10. Sunshine intensity: 0.1W/cm²
11. Average Annual Thunderstorm Day: ≤40 days

2.2 Technical Parameters

Item		Unit	NOVAW-24
Rated voltage		kV	24
Rated current		A	630
Rated frequency		Hz	50/60
Rated cable-charging breaking current		A	16
Rated short-time withstand current		kA	20
Rated short-circuit making current (peak)		kA	52
Power Frequency Withstand Voltage	Phase-to-phase, phase-to-earth	50	50
	Across open gaps	60	60
Lightning impulse withstand voltage	Phase-to-phase, phase-to-earth	125	125
	Across open gaps	145	145
Breaking locking current		A	630A
Mechanical endurance		times	10000
Breaking times at rated current		times	400
Filling pressure		MPa	0.07
Operation counter		times	0~9999

3. Structure and operations

3.1 Main Components introduction

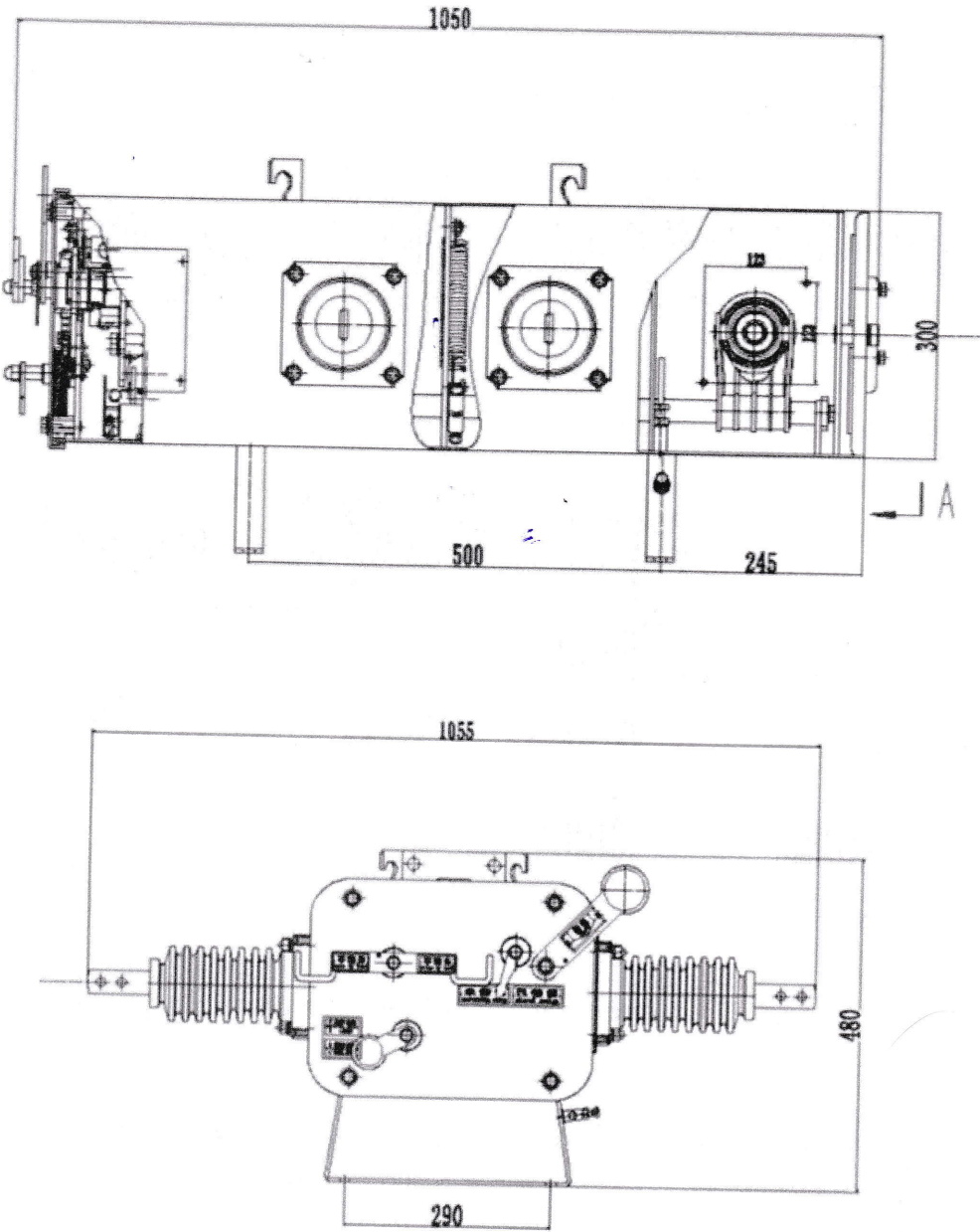


Appearance and Main Components

(1)	Enclosure (stainless steel)	(7)	Manual locking handle (yellow)
(2)	Ceramic or silicon bushing(optional)	(8)	Charging indicator (red)
(3)	Manual charging handle	(9)	Grounding terminal
(4)	Safety bursting membrane (explosion proof)	(10)	Operation counter
(5)	Gas Filling Valve	(11)	Status indicator (open/close)
(6)	Manual opening and closing handle (green / red)	(12)	Nameplate

3. Structure and operations

Outline drawing



3.1.1 Enclosure

The enclosure is made of USU304L stainless steel sheet with excellent anti-corrosion outdoor performance, and fully welded to seal by TIG argon arc welding technology with long service life of at least 30 years.

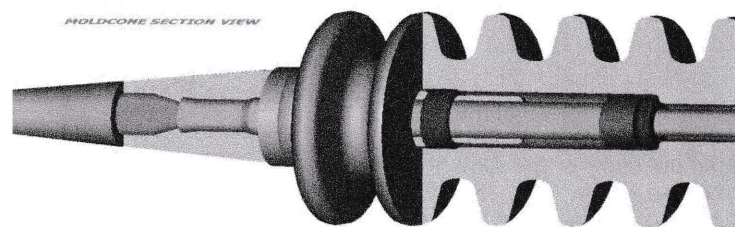
3.1.2 Bushings

There are two kinds of bushings by ceramic or silicon and the creepage vs. distance is 38mm/1kV.

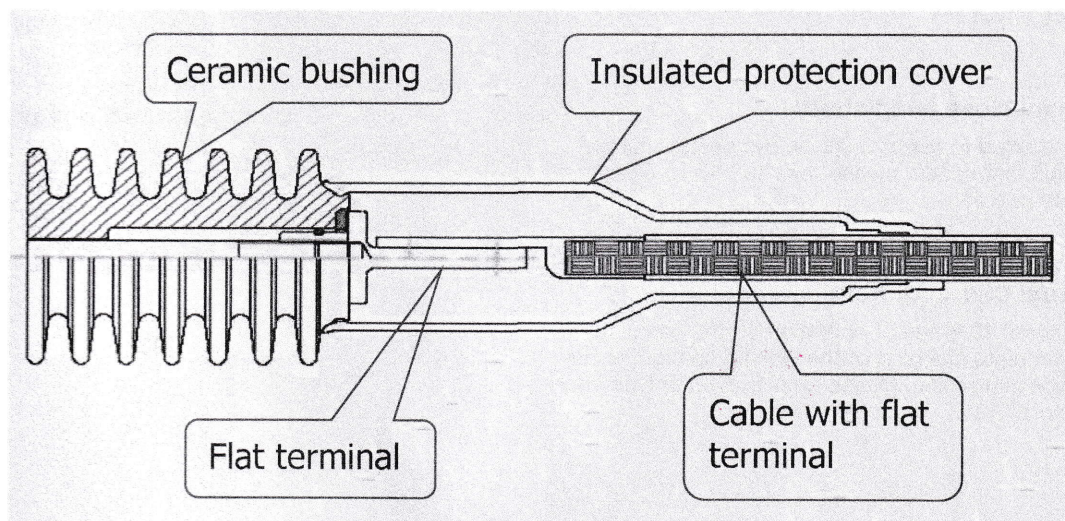
- The ceramic bushing is made from alumina porcelain with high dielectric strength and mechanical strength. The connection area between ceramic and conductor is coated with a semiconductor painting enable to effectively prevent discharge at service.
- The polymer bushing is made of imported silicone rubber, completely eliminating the cracking risk of the ceramic bushing caused by external force and lightning, as therefore improves the reliability.
- The polymer bushing also has a split-type mounting structure. The epoxy bushing is integrated with switches and is designed with standard interface according to ANS/IEEE 386, which can be connected with the elbow type cable plug or the integrated outer silicon bushing.
- The shed bushing and the terminal (wiring cable) are integrated. When the switch is installing, it can complete wiring works just by tightening integrated shed terminal onto the epoxy bushing. The transportation volume is small, and it is also convenient to replace the integrated shed terminals as per the project needs.

3.1.3 External terminals

- When using the molded cable lead, the high-voltage insulated cable has good flexibility and weather resistance. The conducting cross-section area for 400A rated current is more than 125 mm² (159/1.0), and the one for 630A is more than 200 mm² (194/1.0), and the cable length is optional in the range of 1.5m ~ 2 m.



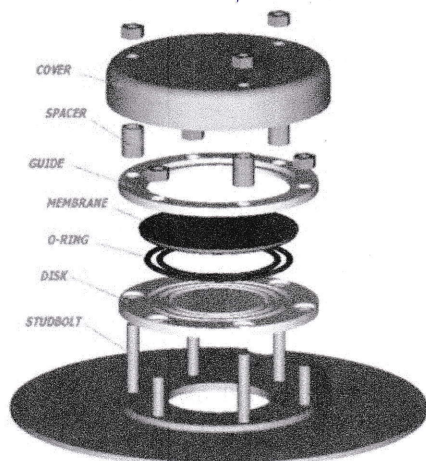
- When using flat terminal, the terminals are made by tinned-plated copper. The overlap area is 76mm×40mm and compatible for 630A rated current, moreover the insulated protective covers are optional.



3. Structure and operations

3.1.4 Safety bursting membrane

A safety bursting membrane is provided to prevent dramatically increasing of internal SF₆ gas pressure to cause enclosure crack due to possible abnormal failure happened inside the enclosure. The safety bursting membrane has a burst pressure of 4~6 kg·f / cm², installed in the opposite direction of the operator and thus protecting the operator in case of failure happened.



3.1.5 Gas Filling Valve

The switch enclosure has gas filling valve for vacuuming and the SF₆ gas injection. Removing the cover of the valve may cause SF₆ gas leaking, so the cover of the valve cannot be opened under normal use.

3.1.6 Manual Open handle(green)

The handle is used to manually open the switch. For further operation instruction, please refer to *Switch Operation* in sub-clause of 3.2

3.1.7 Manual close handle(red)

The handle is used to manually close the switch. For further operation instruction, please refer to *Switch Operation* in sub-clause of 3.2

3.1.8 Manual Charging Handle(white)

It will take about 10 times of operation on the charging handle to complete charging of the closing spring. For further operation instruction, please refer to *Switch Operation* in sub-clause of 3.2.

3.1.9 Close/Open Indicator

At the bottom of the switch enclosure, there is a closing/opening indicator to show the closing or opening status of the switch.

3.1.10 Grounding Terminal

The switch enclosure is grounded by the grounding terminal, which can directly connect 12~38mm² grounding wire. For the connection of the grounding wire, please refer to "4.2.6 Grounding installation diagram".

3.1.11 Operation Counter

A counter recording the numbers of switching operation can be observed from the bottom of the switch. The counting number cannot be reset.

3.1.12 Manual locking handle (yellow)

It is used to prevent operating the switch during repairing or maintenance. To guarantee safety during maintenance, pushing up the manual locking handle will lock the switch mechanism in the "on" or "off" position and the switch cannot operate any more. After maintenance, pulling down the manual locking handle will unlock the switch mechanism, and the switch can be operated normally.

3.1.13 Name Plate

The nameplate lists switch type, ratings, manufacturing year, and series numbers etc.

3.1.14 Receptacle

The receptacle transmits various status information from the switch to the control or the command from the control by the cable.

3.1.15 Insulating SF6 gas

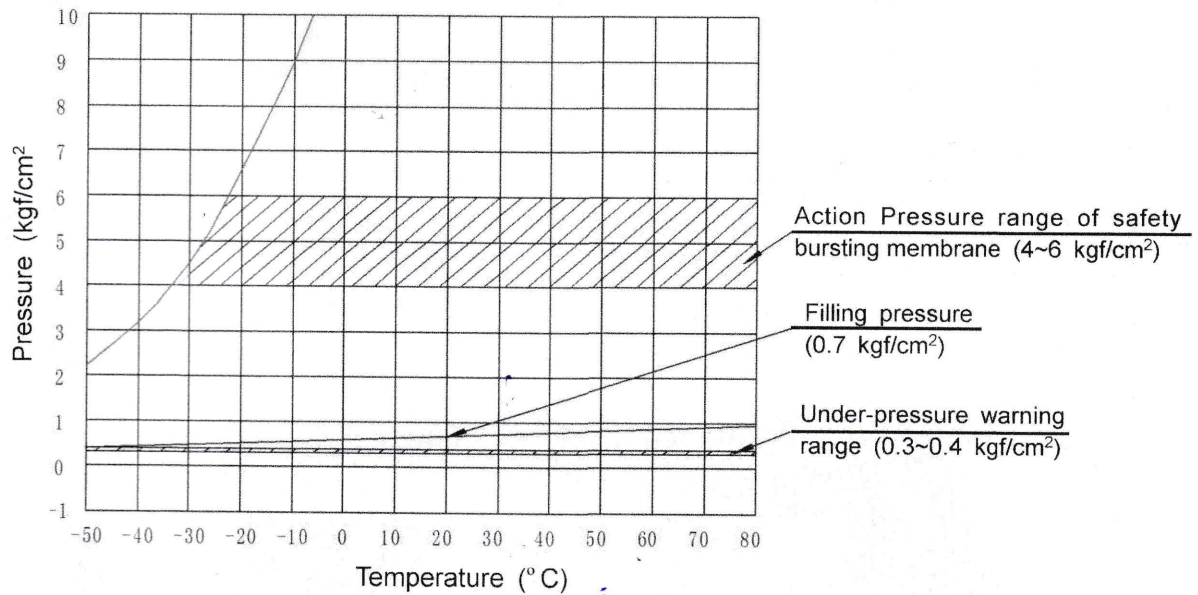


Figure 8) Temperature – Pressure Curve

Filling pressure (0.7kgf/cm²)

Rated working pressure (0.7kgf/cm²)

Relief pressure at high pressure (4-6kgf/cm²)

Warning and locking pressure at low pressure (0.3-0.4kgf/cm²)

3.1.16 Warning and locking device at low pressure

The pressure sensor is installed in the switch box. When the gas pressure drops below 0.3~0.4kgf/cm², the locking device will be triggered to lock the mechanical and the electrical operation. At the same time, a status signal is sent and the gas pressure indicator in control will light up and show a warning.

3.1.17 Lifting Lug and handles

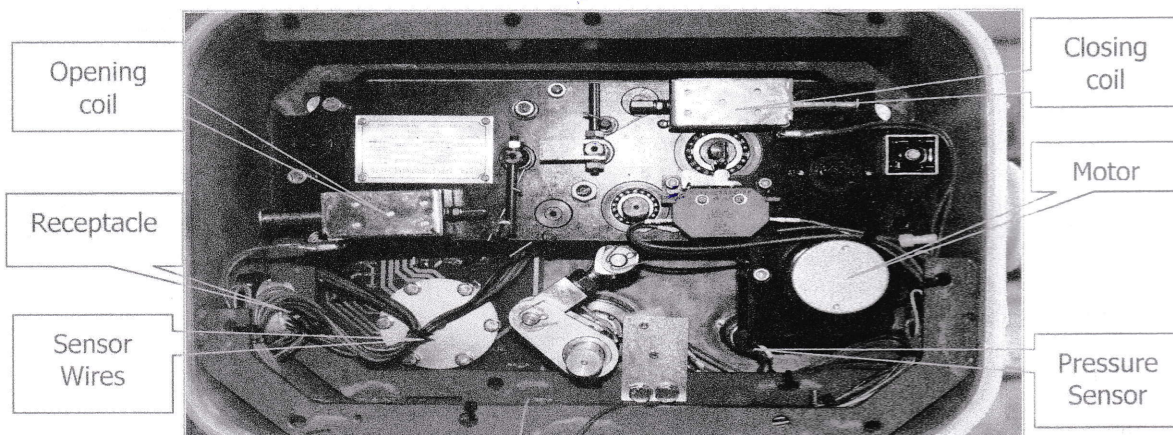
There are four lifting lugs for transportation and four carrying handles on the top of the main enclosure for easy transportation and lifting.

3. Structure and operations

3.1.18 Spring mechanism

The spring mechanism is sealed in the main body free from condensation and corrosion. The closing and opening speed of the switch can be ensured without relation with the strength or skill of the operator, and the instability of the power supply.

- The mechanism is a miniaturized spring mechanism, which can latch opening/closing position and is of low closing and closing energy consumption;
- The spring mechanism is installed in a sealed tank to prevent the mechanism corrosion and improve the reliability. The switching operation can be operated manually, electrically or by remote control.
- The closing spring can be charged manually or electrically. After the switch is closed, the charging motor automatically charges the closing spring. Once completing the charging, the secondary circuit for charging is switched off and the energy storage is reserved for further quick action.
- The opening spring is charged after the switch is closed.



3.1.19 Arc extinguishing principle

The arc is extinguished by pressing SF₆ gas during breaking, as is one of excellent arc extinguishing methods.

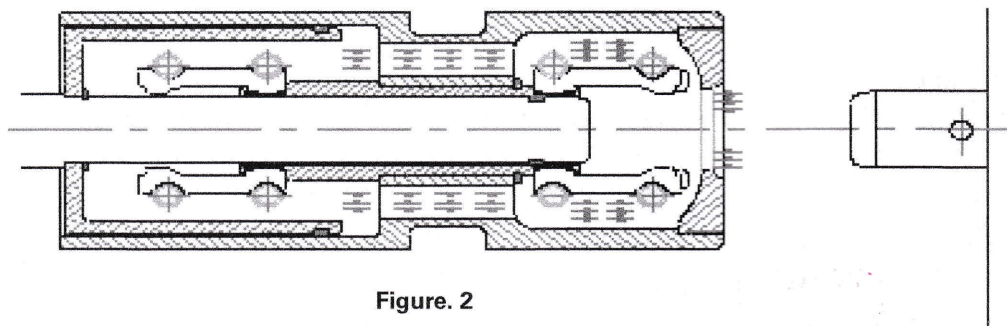


Figure. 2

During opening operation, the moving contacts quickly move away from the static contact, and the gas in the pressure chamber is rapidly blown to the static contact through the nozzle, and the compressed SF₆ gas will rapidly extinguishes the arcing.

During closing operation, the fresh SF₆ gas goes inside the pressure chamber and ready for next breaking.

3.2 Switch operation

3.2.1 Manual opening operation

Before operating the switch manually, please confirm the closing/opening status of the switch. The closing/opening status indicators are located at the front panel and the bottom of the switch and shown by green or red.

The red means that the switch is closed and the opening operation is enable. After using the insulating rod to pull down the green opening handle, the switch will be manually opened and latched at opening position, and then the closing/opening indicator will turn green.

3.2.2 Manual closing operation

Before operating the switch manually, please check the closing/opening status of the switch.

After checking that the closing/opening indicator is shown as green and the charging indicator is shown as charged status; After pulling down the manual closing handle by the insulating rod, the switch will be manually closed and latched, and then the indicator will turn red.

3.2.3 Charging operation

Electrical charging operation can be automatically performed after closing the switch and connecting to the power supply.

Manual charging operation can be performed if no electrical power supply. The charging handle (white) should be pulled down about more than 10 times until there is no drag force on insulating rod, and then the charging indicator will point to the label of "charged".

3.2.4 Electrical closing/opening operation

For the electrical closing/opening operation, please refer to related control manual.

4. Storage, installation and management

4. Storage, installation and management

4.1 Product storage

Please refer to the following items during storage period before installation:

Short-term (within 3 months) storage

- Don't unpack the package and keep it as ex-factory state;
- Please avoid storage in places with high ambient temperature or direct sunlight;
- Please avoid storage in places with high humidity or underground waterlogging area.

Long-term (more than 3 months) storage

- Please avoid storage in a place with high ambient temperature or direct sunlight;
- Please avoid storage in places with high humidity or underground waterlogging area.
- For long-term storage, the natural discharge of the battery in the control will reduce the battery performance. Therefore, it is necessary to periodically check and charge the battery.

4.2 Installation

4.2.1 Checking before installation

※ Care should be taken to lift the switch by the mounting hangers for transportation (above the body) after unpacking the package. It is forbidden to lift the ceramic or silicon bushings or the operating handles, that will cause damage to the switch.

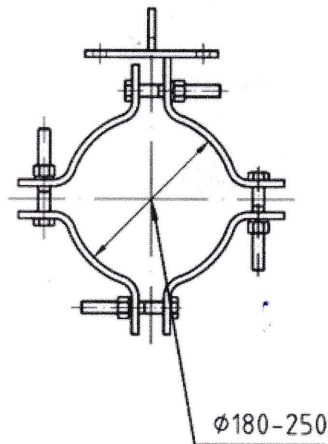
※ If there is abnormality during the above steps, please refer to "5 trouble-shooting" Solve problems.

- After unpacking, compare products and components with the packing list in accordance with order;
- Visually Check the appearance of the switch whether the ceramic bushing, closing/opening indicator, manual handle, gas pressure gauge, etc. are damaged or abnormal;
- If the switch has a gas pressure gauge, the gas pressure should be within the normal gas range ($0.7 \pm 0.1 \text{ kg}\cdot\text{f}/\text{cm}^2$);
- Manually close/open the switch at least 5 times;
- Connect the switch and the control by the cable and turn on the power supply to confirm whether all the indicator lights work normally;
- Electrically close/open the switch by the control at least 5 times;
- After the above process, the installation can start if no abnormality;

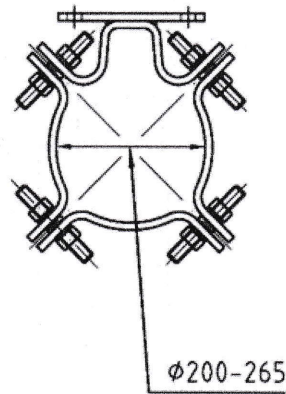
4.2.2 Standard pole mounting

Install the switch as per the following steps:

- Mount upper and lower hanger bands on the pole. Upper hanger band is mounted on the pole firstly and lower hanger band is mounted consequently.



UPPER HANGER BAND



LOWER HANGER BAND

- Assembly the brackets by reference to the below figure excluding hook bolts.

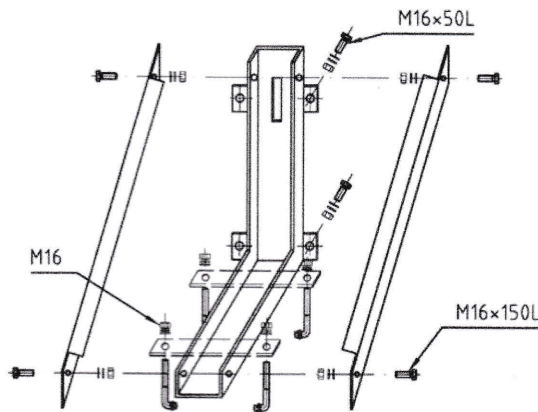


Figure 8) Temperature – Pressure Curve

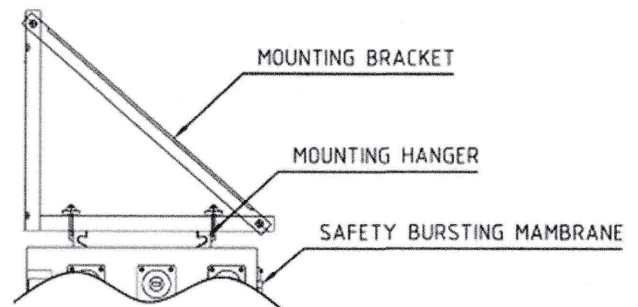
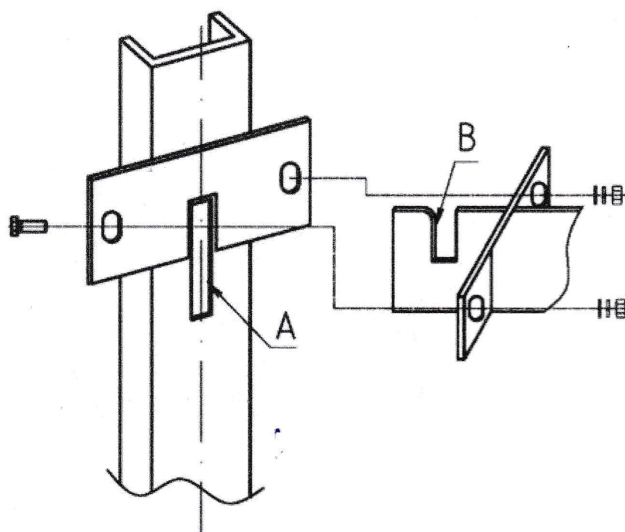


Figure 8) Temperature – Pressure Curve

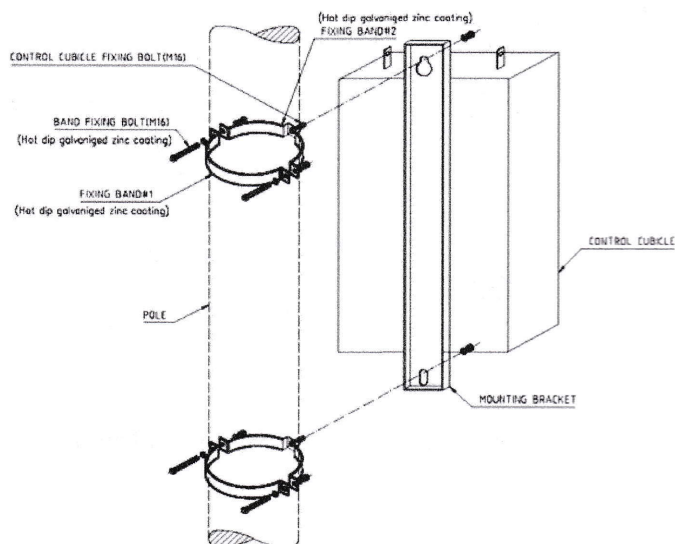
- Assembly the Hook Bolts into the top hanger holes of the switch
- Put the brackets onto the switch, connect and fasten the hook bolts and nuts by reference to the above figure.
- Lift the switch to the mounting position by the top hanger above the switch.
- Insert the upper hanger B into the slot A of bracket, and then connect screws by reference to the below figure.

4. Storage, installation and management



Assembly figure between Bracket and upper Hanger bands

- Adjust the switch body to horizontal and then fasten the bracket assembly with the upper and lower Hanger Bands.
- Mount the control onto the pole by reference to the below figure;



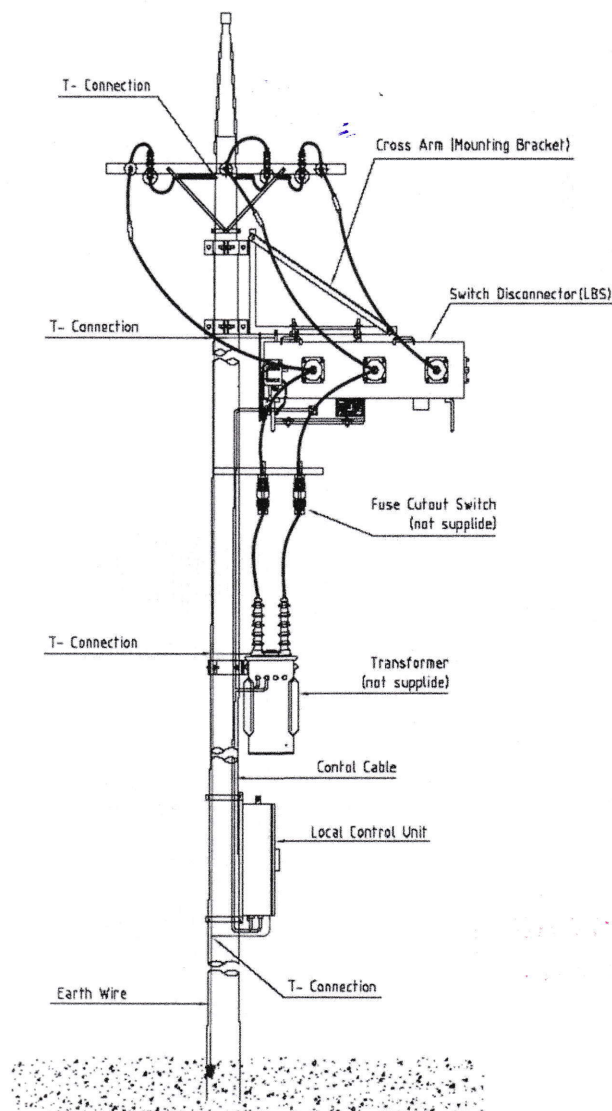
- Connect the grounding lead between the ground terminals of the switch and control, then to the grounding point, please refer to "4.2.6 Grounding installment diagram";
- Connect the control cable between the switch and control;
✘ When some problems occur during the above steps, please refer to "5 trouble-shooting".

4.2.3 Checking after installation

※Before connecting high voltage, the below procedures should be conducted for further checking the switch

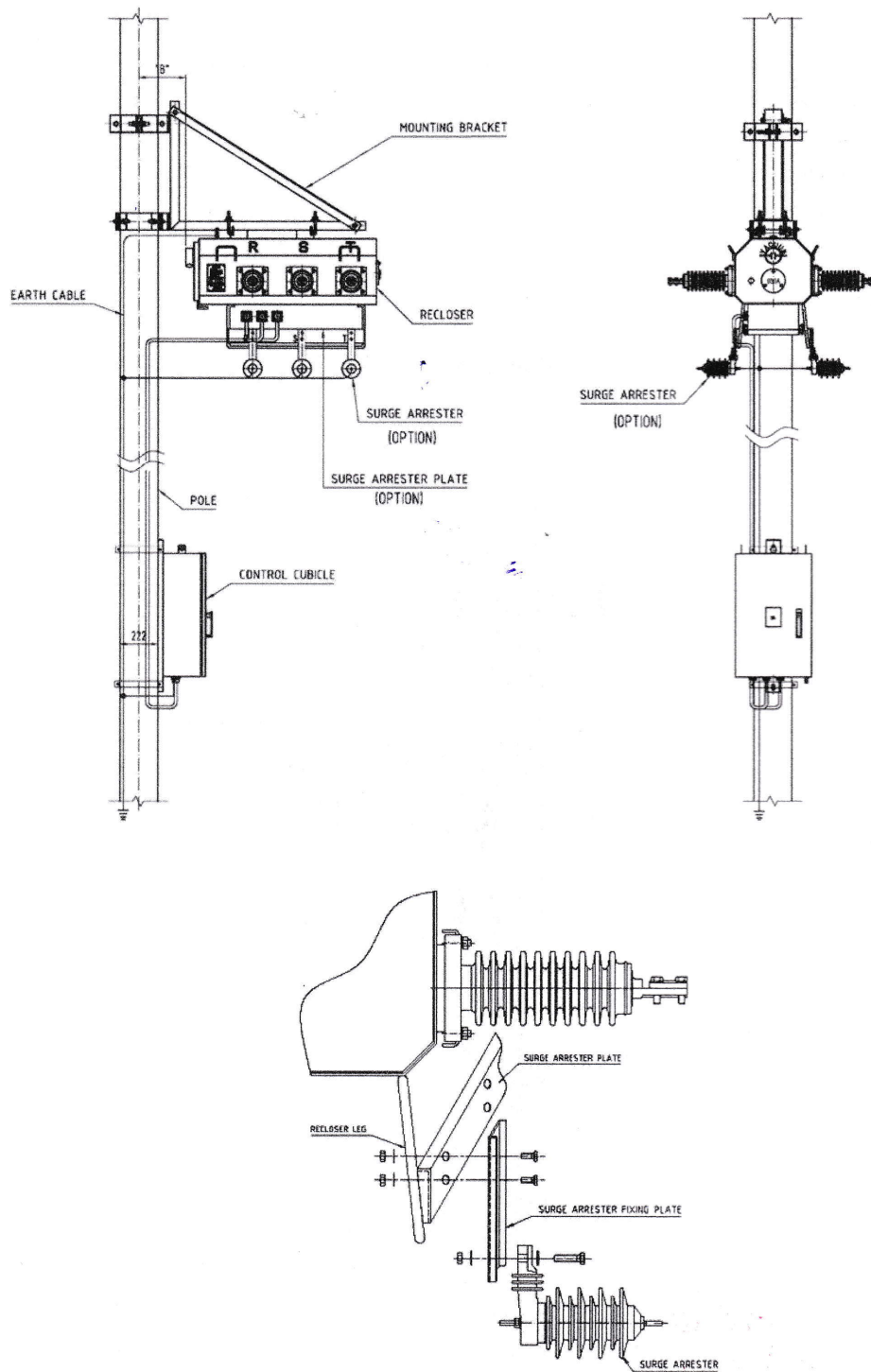
- Connect the cable to provide AC220V of power supply;
- Use the closing/opening handle manually to do 5 times of closing/opening operations.
- Open the control door and confirm that the battery terminals are connected, switch on the air switch and power on the control.
- Check the battery and charging circuit by pressing the battery test button.
- Confirm whether the closing/opening indicators light up
- Use the closing/opening button of the control to close and open the switch 5 times.

4.2.4 Installation diagram with triangle hanging frame

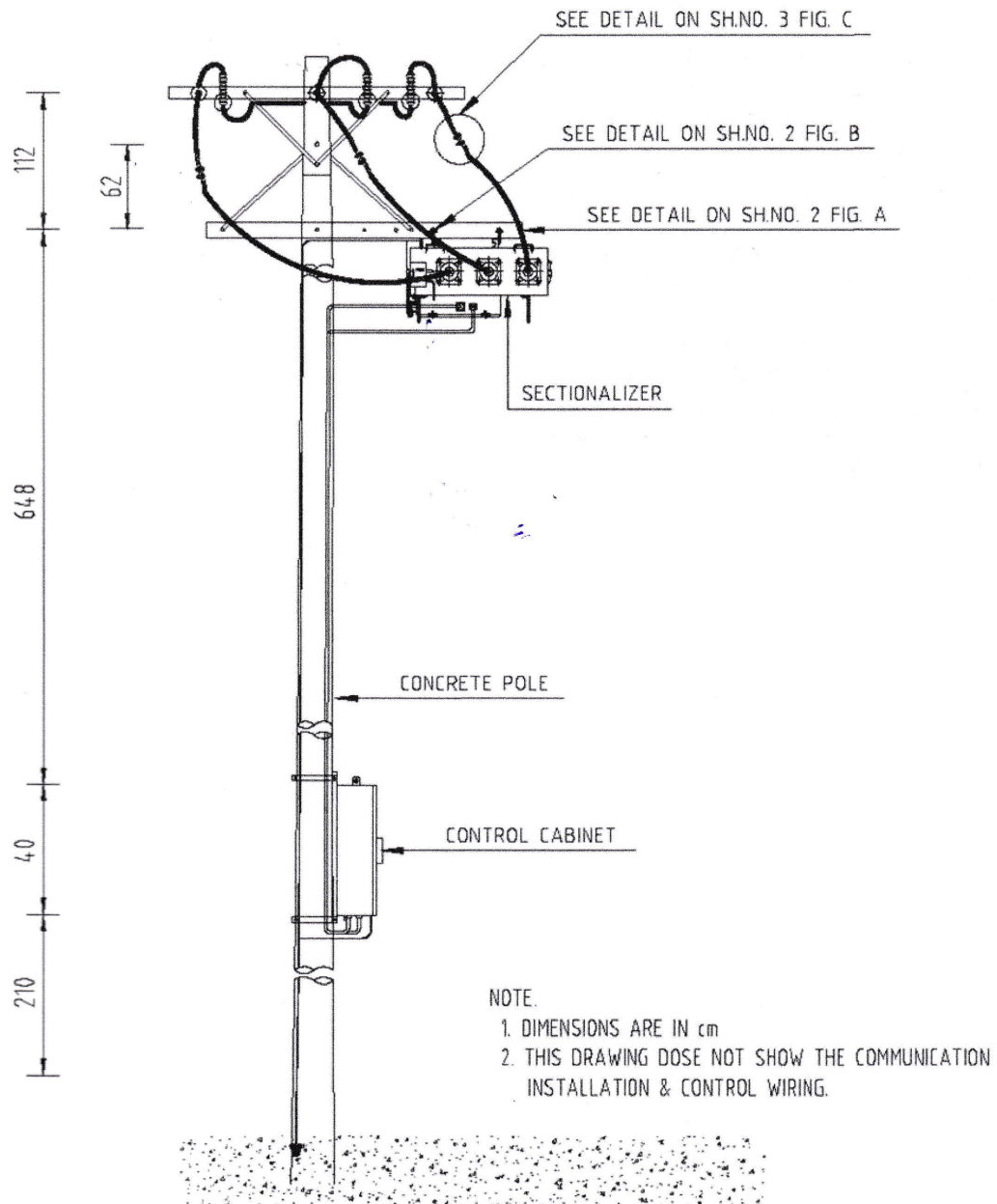


4. Storage, installation and management

4.2.5 Installation diagram of Arrestor



4.2.6 Installation diagram with Double cross-arm



4. Storage, installation and management

4.3 Inspections at service

The following are items that are periodically or non-periodically inspected after the switch is put into use.

- Visually check whether the switch enclosure is normal without any deformation;
- Check whether the gauge pressure is within the normal range. If there is a pressure gauge;
- Visually check whether the indicators of the switch are normal;
- Open the control and check whether the closing/closing indicators are in accordance with the closing/opening status shown in the switch;
- Use the battery testing button to confirm that the battery indicator and charging indicator light up;
- If necessary, use a multi-meter to measure the voltage and charging current of the battery to confirm whether there is any abnormality.

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Eaton entered the Chinese market in 1993, and has grown significantly since then. In 2004, Eaton moved its Asia-Pacific headquarters from Hong Kong to Shanghai. Today, Eaton has nearly 8,000 employees and 19 manufacturing facilities in China.

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