

No. SSIEC-GLS-00100



**SF6 GAS INSULATED**

## **POLE MOUNTED Load Break Switch**



**SPGAS SERIES**

**15kV, 25.8kV, 38kV**

**400A, 630A**

 **SHINSUNG INDUSTRIAL ELECTRIC**

## Introduction

SPGAS is 3 phase, SF<sub>6</sub> gas insulated load break switch (LBS) for overhead power distribution system. SPGAS series switches have been designed to meet the growing requirements for oil-less, maintenance free, long life, maximum safety and all-in-one design for application to Distribution Automation System (DAS) or SCADA System.

SPGAS series switches have been fully certified in accordance with IEC 60265-1, 60694 or their equivalent standards to meet or exceed customer specifications. SPGAS switches are suitable for operation under the following conditions.

- Ambient air temperature : -25~70 °C (MANUAL Type: -40~70 °C)
- Maximum Radiation : 1,100 W/m<sup>2</sup>
- Relative humidity: Up to 95% RH
- Wind Velocity: 45 m/sec
- Altitude: Up to 2500m above Sea Level
- Climatic condition: Tropical Climate
- Pollution Level: Heavy Pollution (ESDD 0.35 mg/cm<sup>2</sup>)

## Prominent Features

### All-in-one Design for SCADA system

- CT's, Voltage Sensors, Built-In Internal Potential Transformer are all fitted in SPGAS switching tank. These make SPGAS Switch to be easily applicable to DAS or SCADA System without any extra costs.
- Especially with the built-in integrated PT, customers can reduce the costs for external PT installation fee, connection cable, protection fuse cutout, installation mounting frame etc.

### Oil-less, Maintenance Free

- Using SF<sub>6</sub> gas as an insulating and interrupting medium eliminates the necessity for periodical oil maintenance.
- Compact operation mechanism assembly is located inside the thoroughly sealed tank case. Therefore, the mechanism assembly is protected from corrosion and every environmental attack.

### Robustness and Long Life

- Stainless steel Tank Case with more than 3 mm thickness is designed for its maximum robustness and minimum welding line to minimize corrosion.
- The robust 'tulip' type contact made of copper-tungsten tips ensures long contact life.
- Advanced TIG welding technique on stainless steel tank and double sealing technique with EPDM rubber for bushing mounting shows 0.02% gas leakage rate per year and 2,500 years service life.
- SPGAS Switch has so robust mechanical construction that it experienced 5,000 times mechanical operation test and 10,000 times operations are guaranteed.

### Quick Close/Open, Operator-independent Mechanism

- The simple toggle action spring mechanism shows operator-independent quick

close, quick open operation (below 0.7 sec operation time when electrical operation).

- Driving motor is coupled with manual operating handle through the medium of one way rotating bearing, therefore, manual operation is guaranteed even though driving motor gets out of order.

### Reliable Insulation and Interruption Capacity

- Experienced and mastery breaking part design including pure puffer principle makes the arcing time just half a cycle. Due to this, decomposition of SF<sub>6</sub> gas from the arc is negligible and the insulation capacity of SF<sub>6</sub> gas doesn't decrease during all service life.
- With the breaking part design, all insulation and interrupting ratings of the switch are guaranteed at atmospheric gas pressure (0.0 kgf/cm<sup>2</sup>G).
- The heavy duty tulip type contacts made of copper-tungsten arc resistance material ensures 5 times making current test and 400 times load current switching test.

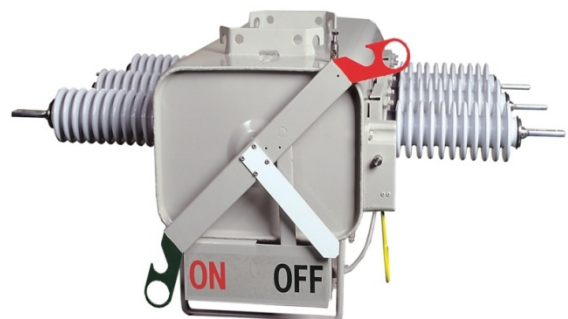
### Multiplex Safety Solutions

- In the event of an internal arc fault, Safety Bursting Membrane on the side of the SPGAS Switch ruptures to release over-pressure gas. This eliminates the risk of explosion or detachment from the power pole.
- Since SPGAS switch is not oil-filled, a major fire hazard is eliminated. In addition, two additional safety devices are available in the SPGAS switch.
- Firstly, Manual Lockout provides lockout to the operating mechanism when it is pulled down to the lock position using a hook stick.
- Secondly, Low Pressure Interlock or Low Pressure Sensor locks the operating mechanism or gives signal to the controller if the gas pressure in the tank drops below a pre-set value.
- SPGAS switch has passed Internal Arcing Test with 20 kA for 0.1 sec in accordance with IEC 62271-200 and Insulation Coordination Test in accordance with IEC 60071-1.

## Detailed Descriptions

### Bushing

- **Porcelain bushing** is standard. It is horizontally mounted to the enclosure tank. The inside bushing hole walls are treated with semi-conductive painting to shorten the gap between the copper stud and the bushing wall. This enables the switch to have good RIV characteristics and also good partial discharge control.
- Alternatively, **epoxy bushing and silicon rubber boot** is also available. Silicon rubber boot is put on the epoxy bushing to increase the voltage insulation and to protect inner bushing from external impact. We have both IEEE 386 and DIN cable connecting interface standard. Silicon Rubber Boots are changeable without gas leakage or tank disassembling.



### Bushing Terminal

NEMA type flat bare terminal made of copper alloy is standard for bushing terminal. According to local environments, customers can choose alternatives as following.

- Standard NEMA type flat bare terminal
- Universal Clamp Type Terminal
- Eyebolt Type Terminal
- Mold cone and 2 meter long conductor lead wire of insulated copper conductor

### Tank Case

SUS 304 Tank Case with more than 3 mm thickness is designed for its maximum robustness. Therefore, even at a maximum bursting pressure of the tank (4-6 kgf/cm<sup>2</sup> G), switching operation is not disturbed. And its minimum welding line on stainless steel tank case result in minimum corrosion.

### SF 6 Gas

- The insulator of SPGAS Switch is SF6 gas whose quality meets the requirement of IEC60376. The leakage rate of the SF6 gas is less than  $1.0 \times 10^{-6}$  cc/sec in other words, 0.02% per year.
- To maintain the insulating capacity of SF6 gas during the service life of Switch, a moisture and de-composed gas absorber is also contained in the tank.

### Operation Mechanism

- The simple toggle action spring mechanism enables the switch to have operator-independent quick close, quick open operation. The electrical operation time is below 0.7 sec, and close/open operation can be done more than 500 times with fully charged battery.
- Driving motor is coupled with manual operating handle through one way rotating bearing, therefore, during a manual handle operation (required force: 17- 18 kg.m/sec<sup>2</sup>), the driving motor is actually disconnected with driving shaft. This means that manual operation is guaranteed in spite of the driving motor's trouble.



### Motor Box

Driving Motor, Auxiliary Contacts, and Protection PCB are located inside the Motor Box and these devices is connected to the control unit through control cable and connector. Stainless steel Motor Box is thoroughly welded underneath the Tank Case.

### Protection PCB

The CT's are connected to automatic CT shorting protection PCB installed in the Motor Box, passing through the rubber gasket sealing.

- Automatic CT shorting device protects the CT's when the CT cable is disconnected.
- This PCB also protects control circuit from surge current caused by voltage sensors in the tank.

### Interrupting Parts

- SF 6 Gas provides excellent load breaking capacity, high insulating ability and invincible arc-extinguishing performance combined with pure air puffer. Therefore, the arcing time is just half a cycle. Due to this extremely short arcing time, the decomposition of SF 6 gas are negligible, even after duty test, and the insulation and interrupting ratings are guaranteed at atmospheric gas pressure (0.0 kgf/cm<sup>2</sup>G).
- There is no plastic insulating material in SPGAS LBS between open contacts, so there is no problem caused by plastic material's deterioration by arc or leakage current.
- Unique puffer principle: the compressed SF6 gas concentrates arc though the

nozzle and then exhausts it through the hole of fixed contact, condensing and cooling the arc plasma.

- The robust tulip contacts comprised of 9 piece copper-tungsten tips have 5 times making operation and 1000 times load current breaking capacity guaranteed (400 times tested).

#### **CT's and Voltage Sensors**

- CT's and Voltage Sensors are installed inside the tank case. CT's and Voltage Sensors are connected to control unit after passing through gas sealing and Protection PCB.
- Rogowski coil is available instead of ordinary core type CT if higher grade CT function is required and Resistive Voltage Sensor is also available instead of Capacitive Voltage Sensor if more precise metering is required. Resistive has  $\pm 0.5\%$ , Capacitive has  $\pm 3\%$  accuracy.

#### **Built-in Internal PT**

Built-in internal potential transformer installed inside the tank achieves self-power supply system for switch control.

- With this internal PT, customers can reduce the costs for external PT installation fee, connection cable, protection fuse cutout, installation mounting frame etc.
- It has a short-circuit protection system, so even if secondary side of the PT is short-circuited, the current level in the control circuit is limited within an acceptable range and the PT is protected by a fuse fitted inside itself.

#### **Safety Bursting Membrane**

- Safety Bursting Membrane bursts at a pressure of 4- 6 kgf/cm<sup>2</sup> G and release the excessive gas pressure (caused by internal fault) to outside of the enclosure tank, before the tank or bushings are destroyed.
- The membrane is located opposite to the manual operating handle and sends out the excessive gas in the safe direction.
- The specially selected and designed aluminum plate is precisely machined and its thin part is perfectly water sealed to protect internal part of the tank from corrosion. If the bursting membrane operates, the SF6 gas is completely exhausted and Low Pressure Interlock or Low Pressure Sensor prevents any electrical and manual operation.

#### **Manual Lockout**

- If it is pulled down, it is toggle-acted, keeps the present position, mechanically locks out close or open operation and it gives dry contact to the control.
- When it is pushed up, it keeps the present operated position and remove the lockout and gives dry contact to the control.

#### **Low Pressure lockout**

The snap acted SUS diaphragm pressure sensor senses low gas pressure and then activates the Low Pressure Lockout, and its stick is pushed out and then any more electrical and mechanical operation is not possible.

#### **Low Pressure Target**

Low Pressure Target works together with the move of the Low Pressure Interlock. It is visual indicator of the position of the Low Pressure Interlock. However, this device only can be work without Low Pressure Interlock if the pushed-out stick of the Low Pressure Interlock is cut off.

#### **Low Pressure Sensor and Gas Pressure Gauge**

Through Gas Pressure Meter (gauge) at the bottom side of the tank, you can monitor the gas pressure in the tank. Low Pressure Sensor gives dry contact signal to the control when it is low gas pressure state, so electrical operation is prevented in the low gas pressure condition.

## Product Operation Types

### **AUTOMATIC TYPE**

SPGAS-AUTOMATIC Type Switch integrates current transformers and voltage sensors inside the tank as a standard to obtain the power line information. This Type Switch is combined with L3 Switch Control for the local or remote operation through RTU (optional item) in DAS or SCADA system.

### **MOTOR TYPE**

The SGPAS-MOTOR Type Switch is developed to meet the need for easy, simple and safety local operation of load-break switch with LD Motor Control Unit. This product consists of SPGAS-MANUAL Type Switch, Motor assembly in the Motor Box attached underneath the tank case and LD Motor Control Unit.

### **MANUAL TYPE**

SPGAS-MANUAL Type Switch operates manually without any CT's, Voltage Sensors, electric control unit or power source, so it has all the benefits of simplicity and reliability of manually operated equipment.

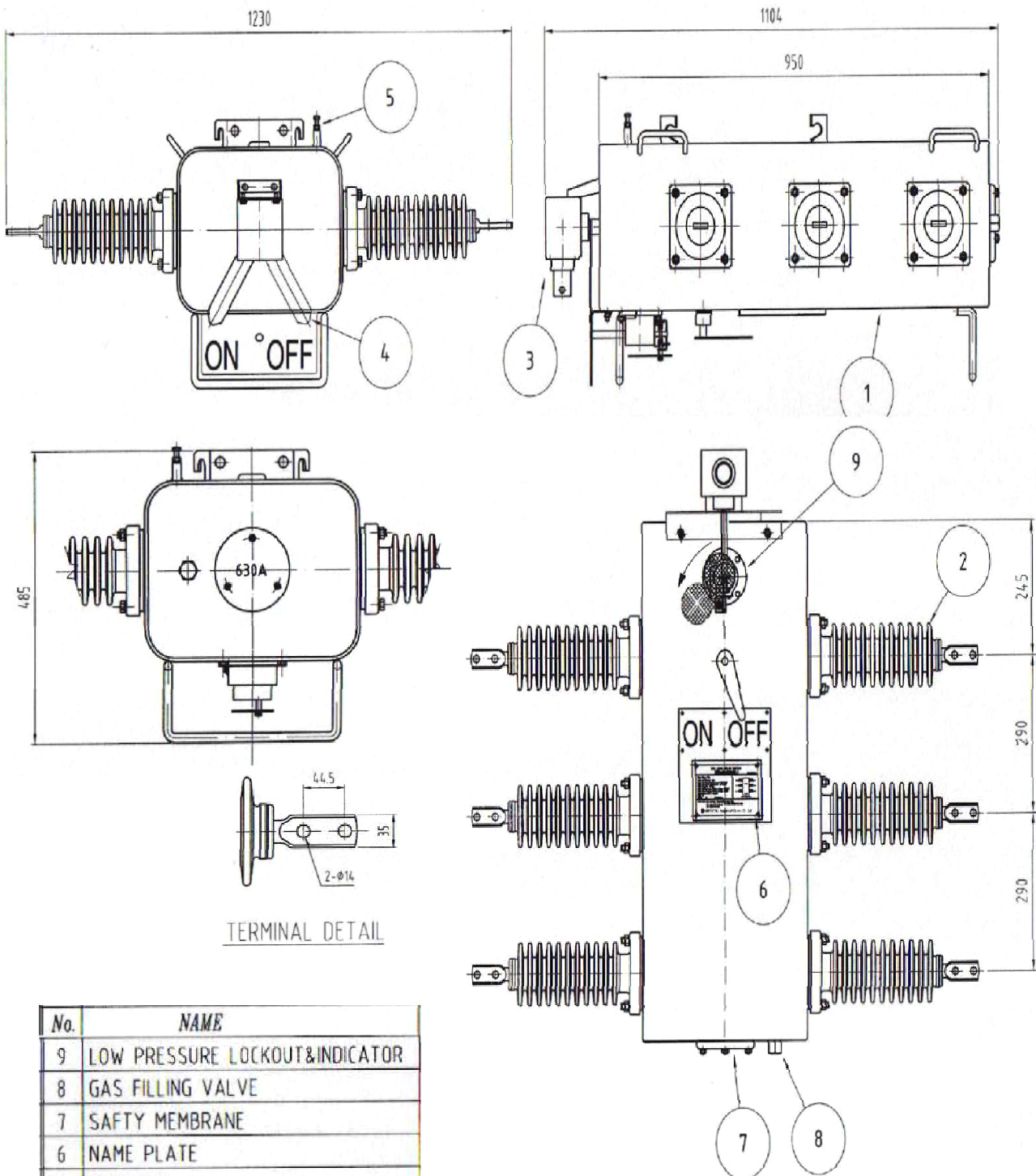
### **EXPANDABLE (BASIC) TYPE**

SPGAS-EXPANDABLE(BASIC) Type Switch is supplied without any CT's, Voltage Sensors, electric controller and power source in the same way as SPGAS-MANUAL Type, but this type products have enough preparation for the future installation or combination with external CT's, external voltage sensors, motor assembly and motor box and further simple Motor Operation control (LD) or SCADA-ready (L3) control unit for remote control.

If a Manual type LBS is expected to be installed with Automatic Control and CT's in the future, there will be stud bolts underneath and lateral side of the tank to fit external CT's, external voltage sensors and motor in motor box when supplying. Motor, auxiliary contacts and protection PCB will be installed underneath the tank, housed in the motor box in the future.

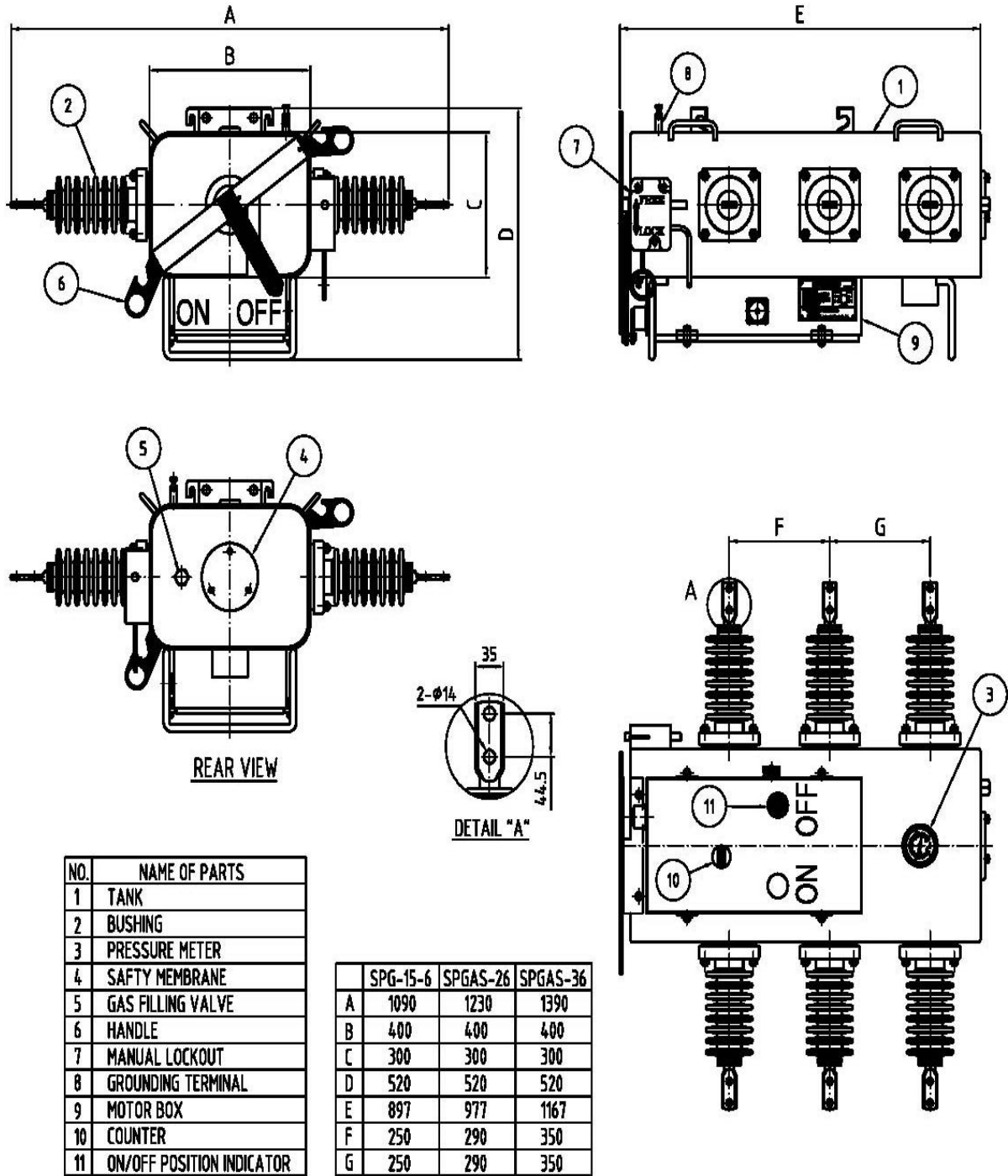
If a Manual type LBS is expected to be installed with motor in the motor box and motor controller in the future, there will be only stud bolts underneath the tank when supplying.

## Dimension & Part Names – Manual Type (Ground Actuator)



No.	NAME
9	LOW PRESSURE LOCKOUT&INDICATOR
8	GAS FILLING VALVE
7	SAFTY MEMBRANE
6	NAME PLATE
5	TERMINAL
4	ON/OFF INDICATOR
3	GROUND ACTUATOR
2	BUSHING
1	TANK

## Dimension & Part Names – Automatic Type



The dimensions in above table are applicable to all the operation types, except for the Manual Type product's height (D). The height (D) of Manual Type Switch is 490 mm regardless of voltage class. And, the dimensions in above table are based on Porcelain Bushing, NEMA Type bare terminal without down-rod ground actuator.

## L6 Control Unit

### Overview

RTU based VIT LBS control to be installed at power distribution line is automated equipment that controls a load break switch (LBS) according to the pre-established coordination schemes. It is an automated remote control unit for distribution automation with various functions such as detection and isolation of fault, remote control of trip/close operation, measurement and monitoring of voltage and electric power at a specific power distribution line, acquisition of data, transmission of such data to the host.

### Features

L6 VIT LBS control is a microprocessor-based controller unit which provides measurement, control, protection, status monitoring, data logging and other functions, in cooperation with the pole-mounted type sectionalizer switch. It provides protection coordination function of fault detection and isolation based on not only scheme but also voltage-time controlled, and voltage-current-time controlled coordination scheme which is of the combination of both.

In this respect, VIT LBS operates not only as conventional sectionalizing switch in recloser-sectionalizer coordination with current-time controlled coordination scheme but also as reclosing sectionalizing switch with voltage-current-time controlled coordination scheme.

Regarding protection coordination schemes on the distribution network, it can be said that there are three major coordination schemes which are current-time controlled (IT), voltage-time controlled (VT) and voltage-current-time controlled (VIT) coordination scheme. Each coordination scheme has advantages and disadvantages in realizing protection for the distribution network and performing coordination operation.



With respect to fault identification and isolation of the distribution line, there are a few key factors which are crucial to choosing an effective coordination scheme and method on how to design the protection coordination network and which coordination scheme is mostly proper to the distribution network.

Regarding feeder automation, VIT LBS control provides a function to communicate with a host based on Distributed Network Protocol (DNP 3.0) and reserves remote terminal unit (RTU) functions, so building a centralized feeder automation, hybrid feeder automation and self restoration feeder automation is available with this VIT LBS switch and control through current-time controlled coordination scheme and high level communication infrastructure, voltage-current-time controlled coordination scheme respectively.

With respect to protection elements, it was designed fundamentally based on overcurrent element and additionally based on crucial secondary elements such as load encroachment, sympathetic tripping avoidance and directional element which enable to improve quality and performance of fault identification and protection coordination.

The customers can utilize this control for the powerful protection and distribution automation demands at present and in the future.

## Function

### ■ Main Protection Function

- Fault indication**
  - Phase fault / ground fault
  - Permanent fault / temporary fault
- Open line / loss of phase detection
- Phase synchronization failure detection
- sectionalization**
- Current-time controlled protection coordination(IT)**
- Voltage-current-time controlled protection coordination(VIT)**
- Inrush current restraint**
- Load encroachment**
- Sympathetic tripping avoidance**
- Directional overcurrent**

### ■ Measurements

- Magnitude and phase angle of voltages & currents (Fundamental frequency)
- RMS and phase angle of voltages & currents (Fundamental frequency)
- Active, reactive and apparent power for each phase and 3-phase
- Demand current
- Daily maximum current
- Symmetric component
- Power factor
- Frequency
- Phase difference between source and load-side voltage

### ■ Control

- Manual LBS switch Open / Close at local or remote (SBO operation)
- Interlocking (Gas low, Handle lock, Sync. Fail, Live Load)
- Battery test
- External Trip and Close

### ■ Status Monitoring

- Contact inputs
  - Switch Open / Closed
  - Gas pressure low
  - **External AC power loss**
  - **Handle status**
  - **Enclosure door open**
- Battery status**
- Temperature**
- Frequency**
- Switch operation count**

### ■ Recording

- Sequential events record**
- Fault events report**
- Fault wave form report**
- Demand Current**
- Daily maximum current**

### ■ Additional Control and Communication Function

- Two (2) selectable setting groups ideal for loop scheme application.
- Hot line tag against unexpected local and remote operation
- Local and remote operation
- RS 232 and RS 485 port
- DNP version 3.0 level 2 for monitoring/ MODBUS for setting, analysis, control, maintenance and PC communication
- Dead Line Operation (option): Consisting of Battery, DC/DC converter and Capacitor, it achieves dead line operability that is necessary for reconfiguration of the power line during the line outages.

## L3 Switch Control

### Overview

The L3 Switch Control has been designed to work with SPGAS- AUTOMATIC Type Switch. This control is ready for SCADA or DAS application with RTU, modem, CT's and Voltage Sensors fitted inside the switching tank case. It has good thermal insulation and ventilation, and prevents water penetration.

### Power Supply

- AC power supply from power source inputs 220 Vac or 120 Vac to the control unit, and DC power 24 Vdc is connected in a parallel with the battery and the other parts of the control circuit.

- Battery charger has 2 modes: one is a rapid charging mode with higher current and the other is a trickle charging mode with lower current.

- Battery: lead acid battery 24 Vdc input toward the control circuit.



### Local Control Board

- Electric surge protection and impedance-matching circuit board

- Battery testing terminal to check the battery voltage on load condition, and battery charger

- Local/remote control selection switch

- Local close/open button

- Separate Open (green) and Close (red) status LED

- Low gas pressure status LED

### RTU

The RTU is developed to communicate with a remote control center, to measure the electrical quantities and to get the fault information. It can measure the V, I, VA, W, VAR and power factor, detect the fault current and memorize the wave-form for further analyzation.



### ■ Measurement

#### Instantaneous Metering

Currents	I a,b,c,n	input currents
Voltages	V a,b,c	wye-connected voltage inputs
Power	MW a,b,c	megawatts (wye-connected voltage inputs only)
	MVAR a,b,c	megavars (wye-connected voltage inputs only)
Power factor	PF a,b,c	power factor; leading or lagging

#### Demand Metering

Currents	I a,b,c,n	input currents
Power	MW a,b,c	megawatts (wye-connected voltage inputs only)

	MVAR <sub>a,b,c</sub>	megavars (wye-connected voltage inputs only)
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Max./Min. Metering

Currents	I <sub>a,b,c,n</sub>	input currents
Power	MW <sub>3p</sub>	three-phase megawatts
	MVAR <sub>3p</sub>	three-phase megavars

### ■ Events

Many kinds of events with time tags are useful for analysis of the switch, RTU, communication and power line.

- Power - on/off
- Ext. Power - on/ off
- Self testing result
- Change the settings
- Switch - close/open (remote/local communication port)
- Lock/unlock
- Low gas
- Low battery
- Line voltage - on/off, source side/load side
- Fault - pick up/drop out
- Phase discord
- One or two loss of line voltage

### ■ Fault Indicator

The fault information is used for identifying the faulted section. It has special logics to distinguish between the temporary fault and permanent fault.

- Inrush Restraint Feature: If the current changes from normal current to 0 current, then it blocks the pick-up within preprogrammed time.
- Pre-detecting Time (software programmable): If the over current condition lasts more than this time, it is validated as the start of a potential fault
- In Progress: It memorizes the current, voltage, wave form until the over current condition finishes, and it takes the maximum rms fault current.
- Final: If the over current condition is finished and the current goes to 0 (the back up protection device clears the fault) or goes to normal current (the forward protection device clears the fault), it waits for the maximum reclosing interval of the back up device, and when the programmed time elapses it finally decides whether the over current was a temporary or permanent fault. Every effective over current condition is recorded as the events and the final temporary or permanent fault information is recorded as fault indicator information. It consists of start time, fault current level, end time, number of over load conditions and temporary or permanent fault information. The fault indicator can check the forward fault or reverse fault to give the correct fault information.

### ■ Communication Ports

■ PORT 1	modem	DNP 3.0 level 2
	communication rate	9600 bps (programmable)
	interface	RS-232C
■ PORT 2	note book computer	
	communication rate	57600 bps
	interface	RS-232C

## LD Motor Control Unit

### Overview

The LD Switch Control is designed to work with the SPGAS-MOTOR Type Load Break Switch. It simply operates the motor installed beneath the switching tank by simple close/open button.

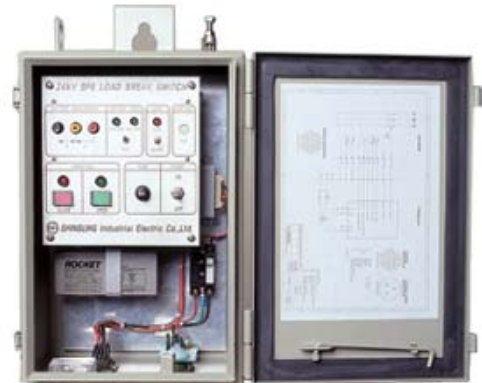
This small-sized control unit consists of control cubicle, battery and battery charger, local control panel, and control cable.

### Features

- The Control cubicle is fabricated from sheet steel of not less than 2 mm in thickness. It has good thermal insulation, air ventilation and water penetration features.
- The Local Control Panel is comprised of close/open button, power on/off switch, fuse holder, close/open lock, battery testing switch and lamp, lamp tester, and battery metering terminals.
- Battery provides DC power to the local control board whether or not AC power source fails. The battery has sufficient capacity to sustain more than 24 hours of operation during the AC power supply failure, and has a minimum lifetime of 3 years.
- The Control Cable has outdoor-rate connectors at each end to connect the mating receptacles on the Switch and on the bottom of the control cabinet.

### Power Supply

- The AC power supply from an external or integrated (built-in) power source inputs 220 VAC or 120 VAC to the control unit, and the DC power 24 Vdc comes out from the battery charger and battery.
- The Integrated Current Transformer (optional item as a power source) is also available for supplying AC power to the control unit.
- The Battery Charging has 2 modes: one is a rapid charging mode with higher current and the other is a trickle charging mode with lower current.
- The lead acid Battery with 3.2 Ah inputs 24 Vdc to the control circuit.



## Optional Parts and Accessories

- Low Pressure Interlock
- Low Pressure Target
- Lightning Arrester Plate
- Gas Pressure Gauge
- Bird Guard Cap
- Operation Counter
- Eyebolt Type Bushing Terminal or Clamp Type Bushing Terminal
- Epoxy Bushing and Silicon Rubber Boots
- Mold Cone and Lead Wire
- Mounting Bracket (Cross Arm)
- Low Pressure Sensor (For Automatic Type)
- Internal Voltage Sensors (For Automatic Type)
- RTU (For Automatic Type)
- Internal Power Supply CT (For Motor and Expandable Type)
- Internal Built-in PT for control power supply(For Automatic Type)
- External CT's and Voltage Sensors (For Expandable Type)
- Motor and Motor Box (For Expandable Type)
- LD Motor Control Unit (For Expandable Type)
- Ground Actuator (For Manual Type)

## Guaranteed Ratings & Specifications

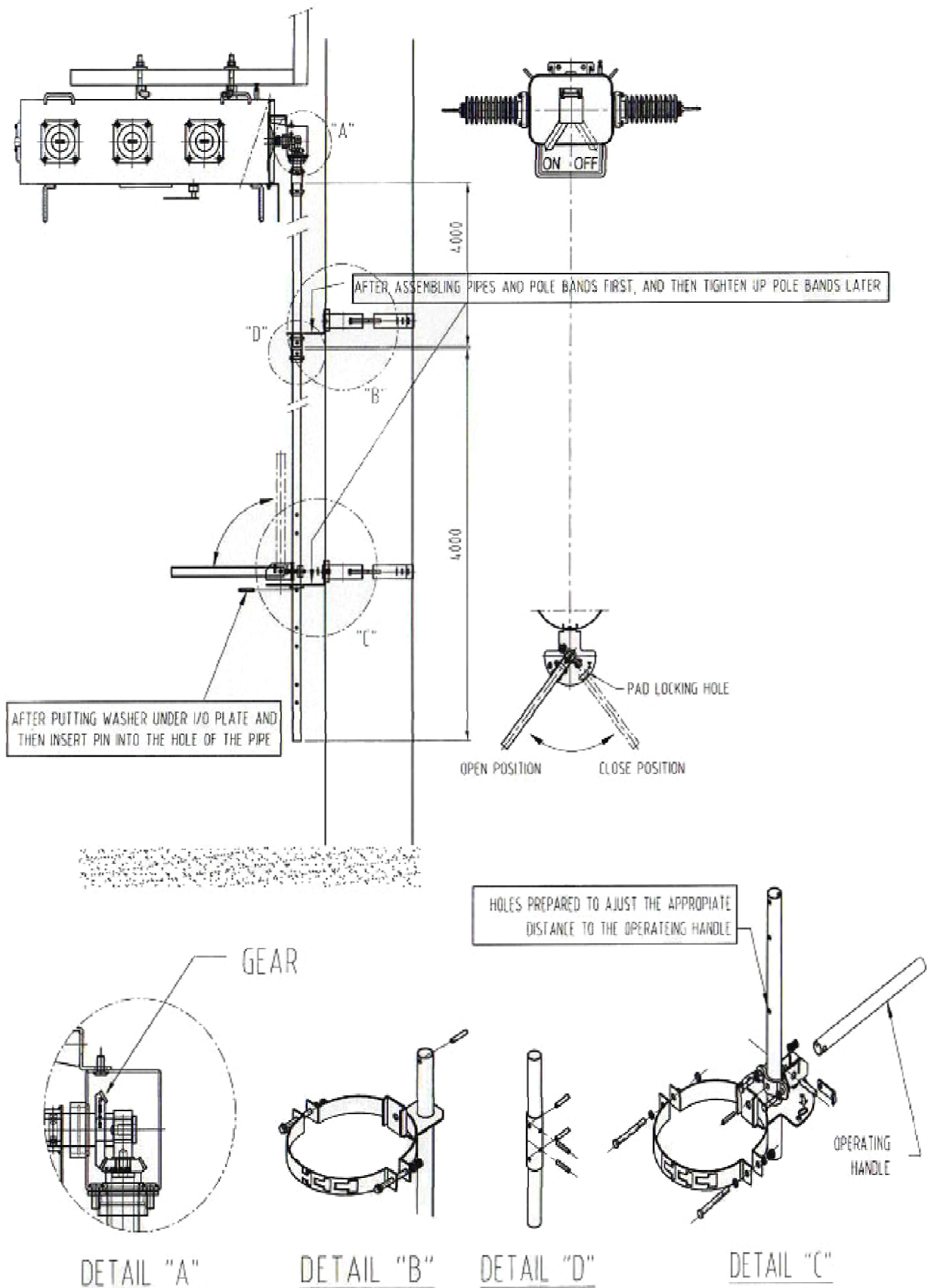
Products Type	SPG-15-6	SPGAS-26	SPGAS-36
<b>Basic Ratings</b>			
Maximum System Voltage	15 kV	25.8 kV	38 kV
Rated Continuous Current	630 A	630 A	630 A
Rated Frequency	50/60 Hz	50/60 Hz	50/60 Hz
Rated Short Time Withstand Current	20 kA/ 4sec (rms)	25kA/ 1sec (rms)	25 kA/1 sec (rms)
Rated Peak Withstand Current	50kA (peak)	65kA (peak)	65kA (peak)
<b>Making and Breaking Capacity</b>			
Mainly Active Load Current	630A	630A	630A
Number of Load-break Operations	400 times	400 times	400 times
Short-circuit Making Current (peak)	50 kAp	32.5kAp	32.5kAp
Number of Making Operations	5 times	5 times	5 times
Cable Charging Current	10A	25A (200 A)	20 A
Line Charging Current	10A	2A	2A
Closed Loop Circuit Current	630 A	630 A	630 A
Transformer Magnetizing Current	22A	22A	22A
<b>Power Frequency Withstand Current Test</b>			
Wet Condition- 10 sec (Ph- Ph, Ph-Eth, Across Interrupters)	45 kV	50kV	70 kV
Dry Condition - 1 min (Phase to Earth, Phase to Earth)	50 kV	60kV	70 kV
Dry Condition - 1 min ( Across Interrupter )	50 kV	60kV	80 kV
<b>Impulse Withstand Current Test ( 1.2 x 50 <math>\mu</math>s )</b>			
Phase to Phase, Phase to Earth	110 kV	150kV	170 kV
Across Interrupter	125 kV	150kV	195 kV
<b>Other Ratings &amp; Specifications</b>			
Internal Arc Test	20kA /0.1 sec	20kA /0.1 sec	20kA /0.1 sec
Arc Extinction Medium	SF 6 Gas	SF 6 Gas	SF 6 Gas
Insulation Medium	SF 6 Gas	SF 6 Gas	SF 6 Gas
Creepage Distance (Porcelain)	550 mm	740 mm	960 mm
Creepage Distance (Silicon)	538 mm	826 mm	1084 mm
IP Level	54	54	54
<b>Operation Performance</b>			
Closing/Opening Time	< 0.7 sec	< 0.7 sec	< 0.7 sec
Mechanical Operations (Guaranteed)	10,000 times	10,000 times	10,000 times
Operating Temperature (*Manual Type)	-25 (*-40) ~ 70° C	-25 (-40) ~ 70° C	- 25 (-40)~ 70° C
<b>Gas Pressure</b>			
Nominal Pressure (kgf/cm <sup>2</sup> G, at 20°C))	0.7	0.7	0.7
Bursting Pressure (kgf/cm <sup>2</sup> G)	4 ~ 6	4 ~ 6	4 ~ 6
Minimum Gas Pressure (kgf/cm <sup>2</sup> G)	0.1	0.0	0.0
Leakage Rate (cc/ sec)	1.1 x 10 <sup>-7</sup>	1.1 x 10 <sup>-7</sup>	8.2 x 10 <sup>-7</sup>

\* Old catalog number or product type "SS1" and "SPG-27" for 25.8kV Voltage Class is replaced by "SPGAS-26", and "SPG-38" is replaced by "SPGAS-36". And these new catalog numbers designate the same product types respectively as the old ones did.

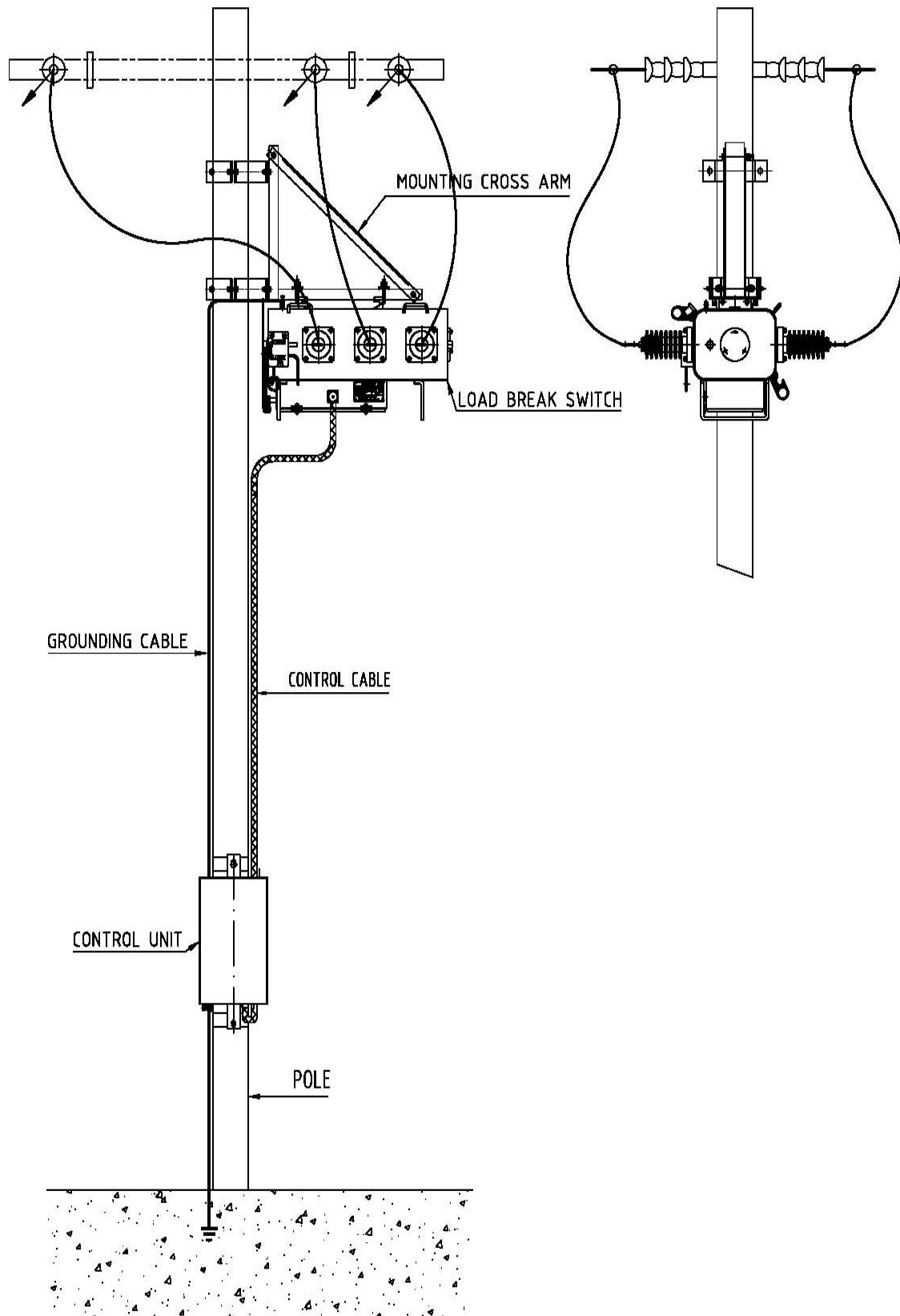
\* SPG-15-6, SPGAS-26 and SPGAS-36 have the contacts of the same material, isolating distance and structure.

\* Electrical and mechanical specifications and ratings of AUTOMATIC, MOTOR, MANUAL, EXPANDABLE Type Products are all the same if a Switch belongs to the same voltage class.

Pole Top Installation – Manual Type (Ground Actuator)



# Pole Top Installation – Automatic Type



# Worldwide Sales Location



## Headquarters in Korea

### Shinsung Industrial Electric Co., Ltd

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