SF6 GAS INSULATED
PAD MOUNTED

Load Break Switch

SSPGS SERIES
15kV, 25.8kV
400A, 600A

SHINSUNG INDUSTRIAL ELECTRIC

Introduction

SSPGS is SF6 gas insulated SF6 gas interrupting pad mounted load-break switch for underground systems up to 25.8kV, 600A, enclosed in stainless steel tank.

It incorporates grounding switch in every way to provide added safety and efficient maintenance. SSPGS series pad mounted load-break switch has been fully certified in accordance with IEC 60265-1 and ANSI/IEEE 37.71 (1984) to meet and exceed customers specifications. SSPGS pad mounted switches are suitable for operation under the following environmental conditions.

- ☐ Ambient air temperature : -25~70 ℃ (MANUAL Type: -40~70 ℃)
- ☐ Maximum Radiation : 1,100 W/m2
- ☐ Relative humidity: up to 100%
- ☐ Altitude: up to 1000m above sea level
- ☐ Climatic condition: tropical climate

Features

All-in-one Design for SCADA system

- CT's, Voltage Sensors, Built-in Capacitor-Power Transformer are all fitted at SSPGS. This all-in-one SSPGS RMU is easily applicable to DAS or SCADA System without any extra costs.
- Integrated Capacitor-PT achieves a self-power supply system for the control circuit. With this, customers can reduce the costs for a separate PT installation, connection cable, protection fuse cutout, installation accessories etc. It is integrated with a short-circuit protection system and power fuse in itself.

Microprocessor Based Control

- Combined with CT's and voltage sensors externally fitted at bushings, micro-processor based control and RTU measure and report current and voltage values of distribution lines.
- Rogowski coil CT's are available instead of ordinary core type CT if a higher level of CT functions are required. Resistive voltage sensors are also available instead of capacitive voltage sensors if more precise voltage metering is required. Resistive voltage sensor has ±0.5% accuracy and Capacitive has ± 3% accuracy.

Maintenance Free, Robustness and Long Service Life

- Using SF 6 gas as an insulating medium, it eliminates the necessity for periodical oil maintenance.
- Stainless steel Tank is TIG welded and the other sealing points (bushings, operating shafts, gas filling valve) are sealed by EPDM rubber, so the Tank keeps good gas and water sealing characteristics for its service life.
- The leakage rate of the SF6 gas from the Tank is less than 2.5×10^{-7} cc/sec, 0.0075% per year and 6,600 years theoretical service life (based on 4 ways configuration).
- To maintain the insulating capacity of SF6 gas during the service life,

there is an absorber for moisture and decomposed gas inside the tank.

- Quick close quick open spring toggle mechanism is located inside the mechanism case on the switching tank. Therefore, the mechanism parts are protected from every physical and environmental attack.
- Control Unit (by its switches and input part) provides automatic protection to CT's from its second side opening (shorting) and also to control circuit from the surge generated at the voltage sensors.
- Stainless steel Tank made of SUS 304L with 3-5 mm thickness is designed for its maximum robustness with minimum welding lines. Therefore, even at a bursting pressure of the safety membrane (4-6 kgf/cm ^{2} G), the switching operation is not disturbed, and the Tank and bushings are not damaged up to that pressure. Its minimum welding line on stainless steel Tank minimizes its corrosion.
- SSPGS experienced 5,000 times mechanical operation test and 10,000 times mechanical operations are guaranteed.

Quick Close/Open, Operator-independent Mechanism

- The operation mechanism is spring toggle action mechanism with three phase group-operating principle.
- Manual close/open of Main and Earthing Switch is carried out by an operating shaft. Electrical operation is performed by driving motor and close/open button on the control panel.
- Spring toggle mechanism shows operator-independent closing/opening speed, quick close quick open (700 ms) closing/opening time.
- Since manual operating mechanism is independent of relevant electrical operating mechanism, manual operation is always guaranteed, even when driving motor or any part of electrical operation module is out of order.

Reliable Insulation and Interruption

- SF 6 gas is non-flammable, odorless, color-less, non-toxic and very stable insulation medium by nature. SF 6 gas quality used in SSPGS meets the requirement of IEC60376. Insulation and interruption are all carried out by SF 6 gas.
- Mastery breaking part design including pure puffer principle makes the arcing time just half a cycle. Thus the decomposed SF 6 gas quantity by the arc is negligible and the insulation capacity of SF6 gas doesn't decrease during its service life.
- In the breaking parts, every interruption and insulation ratings or characteristics are guaranteed at atmospheric gas pressure.
- The heavy duty tulip type contacts are made of copper-tungsten arc resistance material. The contacts experienced 5 making current operations and 100 load current switching operations. However, since the contacts are common with pole top Switch, we can guarantee for 400 times load current switching operations, citing the test reports of SPGAS pole top Switch.
- Epoxy Bushings are installed in-line at the front. Cable terminal and connectors are connected with these epoxy bushings. Both ANSI/IEEE 386 and DIN standard bushings are available to SSPGS.
- One front Earthing Circuit Bushing can be installed for every way, for every two ways or for the whole ways, for easy main cable testing.

Multiplex Safety Solutions

- In the event of an internal insulation failure, Safety Bursting Membrane at the rear side of the Tank ruptures (at 4-6 kgf/cm^2 G) and release over-

pressure gas in the safe direction. This eliminates the risk of the Tank explosion.

- Since SSPGS is using SF 6 gas instead of oil, a major fire hazard from the internal insulation failure is eliminated and it can be located close to more sensitive outdoor locations.
- Mechanical Interlock between Main Switch and Earthing Switch: Closed state of Main Switch blocks Earthing Switch operation, and also closed state of Earthing Switch blocks Main Switch operation.
- Low Pressure Sensor detects minimum gas pressure (0.1 kgf/cm^{2}G) and gives dry contact to control unit to raise an alarm and/or lockout the electrical operation.
- Gas Pressure Gauge at front side can always monitor the gas pressure. It's pressure graduation is divided into safe range and dangerous range in colors.
- A padlock arrangement for Manual Operating Shaft Hole is provided to its lid in order to secure safety for maintenance persons.
- SF 6 gas is filled into the Tank normally at 0.7 kgf/cm^{2}G. However all the electrical ratings and characteristics of SSPGS are guaranteed at atmospheric gas pressure, as far as the gas in the Tank leaks out within 40% of its normal quantity?
- SSPGS is totally dead-tank design for the safety of maintenance persons.

Operation Types

AUTOMATIC TYPE

Every bushing in the SSPGS- AUTOMATIC Type Pad Mounted Load Break Switch is installed with a CT and voltage sensor, so most electrical values of a connected distribution system can be measured. And, combined with SCADA-ready control and RTU, this switchgear can be operated from a remote control center. You can see the photo of this type product in the cover page of this catalog.

Standard construction

- 4 (or 3) ways configuration : 2 ways Switches and 2 (or 1) ways CB's
- Gas Filling Valve in the front side
- Safety Bursting Membrane
- Gas Pressure Gauge
- Epoxy Bushings of ANSI/IEEE 386 standards
- Core Type CT's at every bushing with ratio 1:1000
- Capacitive Voltage Sensors at every bushing with output voltage 4 VAC
- CT Shorting and Surge Protection Devices at the control unit
- Earthing Switch fitted to every Main Circuit
- One polymer Earthing Circuit Bushing and its insulation cable
- One Clamp type Earthing Terminal for the whole ways
- On/Off Position Target of every Main and Earthing circuit
- Hot Line Lamp
- Main Cable Earthing Terminal for all Main Cables
- Separate Manual Operating Handle for the Main and Earthing Switches
- Padlock Arrangement for every Manual Operating Shaft Hole
- Control Panel
- Battery of 35 Ah
- English Language Marking

Optional parts

- Other circuit configurations (2,5,6,7 ways are available)

- CT ratio and voltage sensor’s output voltage
- Epoxy Bushings with DIN standards
- Rogowski Coil CT’s and Resistive Voltage Sensors
- Operation Counter at each Main Circuit
- Number of Earthing Circuit Bushings
- Integrated Auxiliary Power Source for Control Circuit
- Hot-line Sensor
- Phase Adjustment Device
- Outer Enclosure
- RTU
- Other Marking Language

MANUAL TYPE

SSPGS-MANUAL Type Pad Mounted Load Break Switch operates manually without any CT's, Voltage Sensors, electric controller and power source, so it has all the benefits of simplicity and reliability of manually operated equipment.

Standard Parts

- 4 (or 3) ways configuration : 2 ways Switches and 2 (or 1) ways CB’s
- Gas Filling Valve in the front side
- Safety Bursting Membrane
- Gas Pressure Gauge
- Epoxy Bushings of ANSI/IEEE 386 standards
- Earthing Switch fitted to every Main Circuit
- One polymer Earthing Circuit Bushing and its insulation cable
- One Clamp type Earthing Terminal for the whole ways
- On/Off Position Target of every Main and Earthing circuit
- Hot Line Lamp
- Main Cable Earthing Terminal for all Main Cables
- Separate Manual Operating Handle for the Main and Earthing Switches
- Padlock Arrangement for every Manual Operating Shaft Hole
- English Language Marking

Optional parts

- Other circuit configurations (2,5,6,7 ways are available)
- Epoxy Bushings with DIN standards
- Operation Counter at each Main Circuit
- Number of Earthing Circuit Bushings
- Hot-line Sensor
- Outer Enclosure
- Other Marking Language

P2 Switch Control

This control is designed to work with the SSPGS-AUTO Type pad mounted load-break switch. It can communicate with SCADA system or DAS through RTU and modem.

Local Control Board

- The control case mounted and fixed on top of the pad mounted load-break switch is fabricated from sheet steel of not less than 2 mm thickness.

- General control part
  - Auxiliary power on/off switch
  - Auxiliary power (220 Vac or 110 Vac) outlet
  - LED lamp test button
  - Low gas pressure status LED
  - Control wake-up button
  - Battery and battery charger test button and each status LED
  - Battery voltage and current metering terminals
  - 2 AC power fuse holder
  - 15A motor protection fuse holder
  - 10A control protection fuse holder
  - Voltage magnitude of voltage sensors

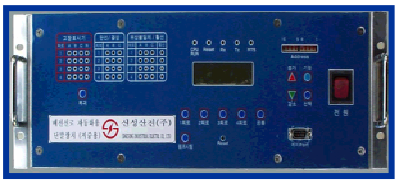
- Individual Circuit control part
  - Local/remote control selection switch
  - Operation lockout/ unlock selection switch and lockout status LED
  - Main Switch close/open button and each status LED
  - Earth Switch closed status LED

Power Supply

- It is available to select one power source system among 2 alternatives, separate PT and built-in PT for the control circuit power. The built-in power source consists of an integrated capacitor and potential transformer.
- AC power source inputs 220 V (or 120 V) to Control Cubicle, and Low Voltage Transformer (and diode) convert it to DC 24 V. This DC 24 V is connected with the control circuit.
- A battery charger and battery (lead acid 35 Ah, 24 Vdc) is parallel-connected with DC 24V power circuit. Therefore the control circuit usually receives DC 24V from both Low Voltage Transformer and battery at the same time.
- The lead acid battery has sufficient capacity to sustain more than 24 hour operation while AC power supply's failure, with 3 years minimum lifetime.
- The battery is automatically disconnected from the control circuit when the battery voltage drops below a preset value in order to prevent its deep discharge.
- The battery charger has two modes: one is a rapid charging mode with higher current and the other is a trickle charging mode with lower current.

RTU

The RTU is developed to communicate with remote center control, to measure the electrical quantity 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)
	MVARa,b,c	megavars (wye-connected voltage inputs only)

Max./Min. Metering

Currents	I a,b,c,n	input currents
Power	MW3p	three-phase megawatts
	MVAR3p	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

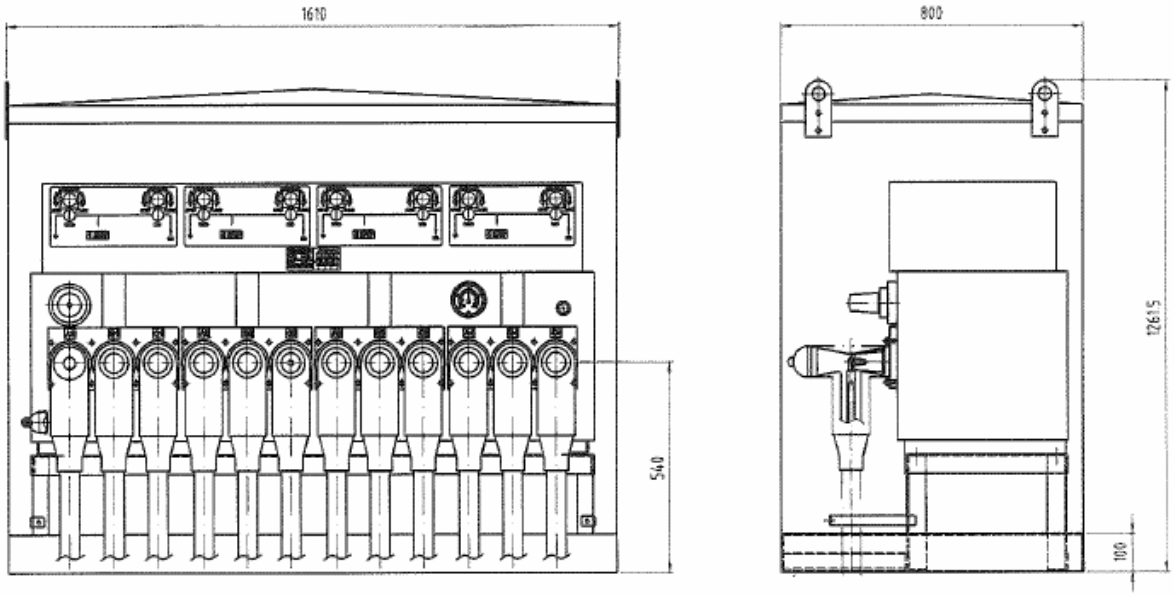
■ PORT 1	modem	DNP 3.0 level 2
	communication rate	9600 bps (programmable)
	interface	RS-232C
■ PORT 2	note book computer	
	communication rate	57600 bps
	interface	RS-232C

Ratings & Specifications

Pad Mounted Load Break Switch	15 kV	25.8 kV
Basic Ratings		
Rated Maximum Voltage	15 kV	25.8 kV
Rated Continuous Current	600 A	600 A
Rated Frequency	50Hz /60 Hz	50Hz /60 Hz
Making and Breaking Capacity		
Mainly Active Load Current - Main	600 A	600 A
Number of Load Current Operations - Main	100 times	100 times
Short-time Withstand Current - Main& Earth	20 kA/ 4 sec	12.5 kA / 1sec
Momentary Current / 10 cycles (sym. asym.) - Main	12 kAsym/ 19.2 kAasym	12 kAsym/ 19.2 kAasym
Short Circuit Making Current (peak) - Main & Earth	50 kAp (Main)	32.5 kAp
Number of Making Operations - Main/Earth	5 times (Main)	5 times/ 3 times
One Second Current (sym.) - Main & Earth	12 kA	12 kA
Cable Charging Current - Main	25A	25A
Line Charging Current - Main	1.5A	1.5A
Transformer Magnetizing Current - Main	21 A	21 A
Closed Loop Current - Main	600 A	600 A
Power Frequency Withstand Test		
AC Voltage Withstand Test - 1 min, Main& Earth (Phase to Earth, Phase to Phase, Across Poles)	50 kV	60 kV
DC Voltage Withstand Test - 15 min, Main (Phase to Earth, Phase to Phase, Across Poles)	53 kV	78 kV
Impulse Withstand Current Test (1.2 x 50 µs)		
Main Switch (Phase to Earth, Phase to Phase, Across Poles)	95 kV	125 kV
Earth Switch (Phase to Earth, Phase to Phase, Across Poles)	95 kV	125 kV
Interruption & Insulation Medium		
Arc Extinction Medium	SF 6 Gas	SF 6 Gas
Insulation Medium	SF 6 Gas	SF 6 Gas
Operation Performance		
Close/Open DC Voltage	24 Vdc	24 Vdc
Mechanical Operations - Main/ Earth	5000/ 1000 times	5000/ 1000 times
Operating Temperature	-25 ~ 70° C	-25 ~ 70° C
SF6 Gas Pressure		
Nominal Pressure (kgf/cm^2 G)	0.7	0.7
Bursting Pressure (kgf/cm^2 G)	4~ 6	4 ~ 6
Minimum Gas Pressure (kgf/cm^2 G)	0.1	0.1
Leakage Rate (cc/sec)	2.18 x 10^{-7}	2.18 x 10^{-7}

* SSPGS 15KV and SSPGS 25.8KV Products have contacts of the same material, isolating distance and structure.
* Electrical and mechanical specifications and ratings of MANUAL and Automatic Type products are all the same.

Layout Drawing– Manual Type



Business Network

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Certificate of Registration

The Governing Board of
Q.A. International Certification Limited
hereby grants to:

Shinsung Industrial Electric Co., Ltd.

Address to which this Certificate refers :

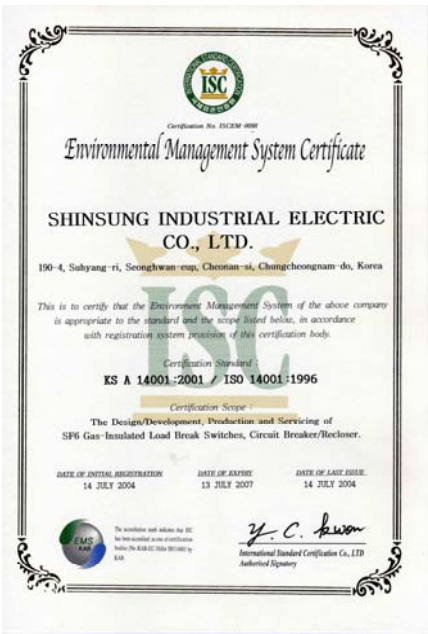
190-4, Soohyang-ri, Sunghwan-eup, Cheonan-si, Chungcheongnam-do, Korea

Approved Scope to which this Certificate refers :

The Design/Development, Manufacture and Servicing of SF6 Gas-Insulated Load Break Switches, Circuit Breaker/Recloser.

CHAIRMAN SCHEME MANAGER

QA INTERNATIONAL


Environmental Management System Certificate

SHINSUNG INDUSTRIAL ELECTRIC CO., LTD.

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This is to certify that the Environment Management System of the above company is appropriate to the standard and the scope listed below, in accordance with registration system provision of this certification body.

Certification Standard :

KS A 14001:2001 / ISO 14001:1996

Certification Scope :

The Design/Development, Production and Servicing of SF6 Gas-Insulated Load Break Switches, Circuit Breaker/Recloser.

DATE OF INITIAL REGISTRATION 14 JULY 2004 | DATE OF EXPIRY 13 JULY 2007 | DATE OF LAST ISSUE 14 JULY 2004

International Standard Certification Co., LTD
Authorized Signatory

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