No. SSIE-PRC-00803-13

SHINSUNG

Solid(Dry Type) Recloser
for SCADA system

Type/Model: SIREC-38

SHINSUNG INDUSTRIAL ELECTRIC

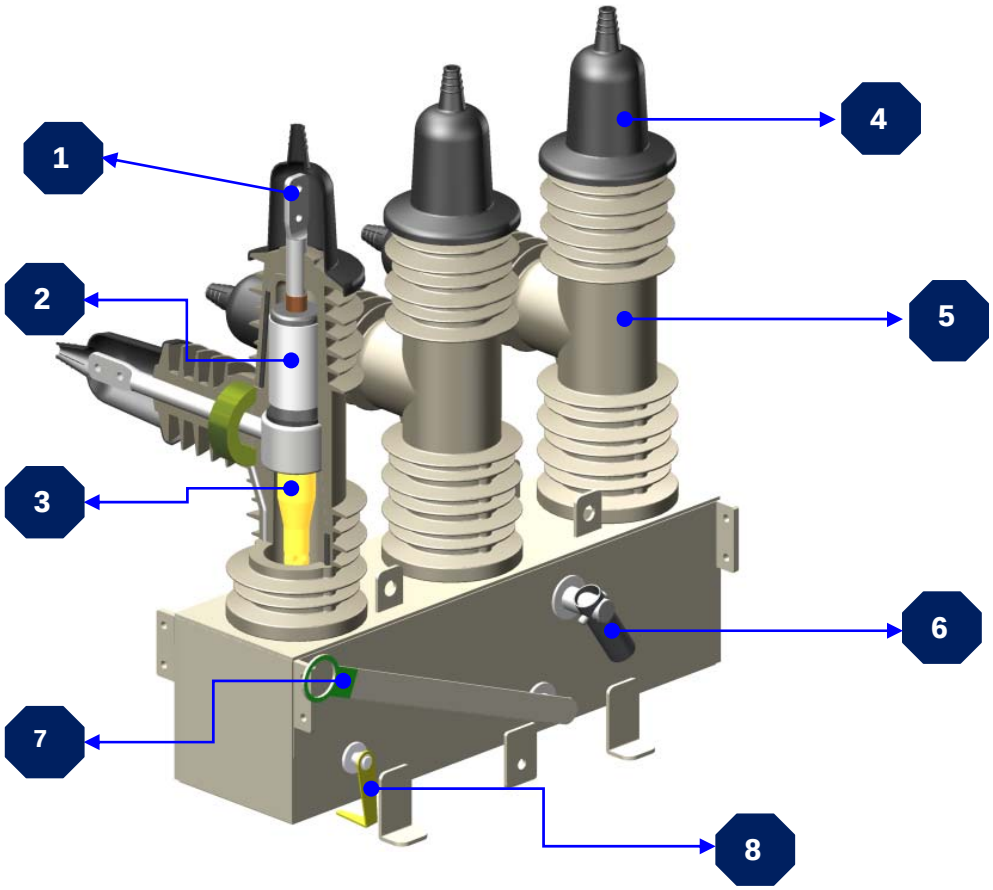
Introduction

SIREC(Solid Insulated Recloser) is designed for outdoor application with lightweight, longlife, maximum reliability and enviromental friendly products.
Controller with built-in RTU functions can perform the self restoration and feeder automation even without communication.

Features

- **HCEP (Hydrophobic Cycloaliphatic Epoxy)**
  - More Durability with Water-Resistance
  - Maintenance free, Oil free, SF6 gas free
- **PMA Application (Permanent Magnetic Actuator)**
  - More than 10,000 mechanical/electrical operations
- **Applied Standard**
  - IEC62271-111
- **Maintenance Free**
  - Cost-effective maintenance of labor and time etc by cycloaliphatic Solid Insulation, reliable operation with PMA application.
- **Advanced Self Healing Scheme (Option)**
  - Source side fault lockout feature
  - Reduced trip shots to lockout when the fault is at load side
  - Normal open recloser lockout feature when the fault is at adjacent section (No forced fault making)
  - Automatic setting group change from normal to reduced load
  - Maintain the normal setting group of source side recloser during increased load condition through load encroachment logic.
  - Sympathetic trip restraint feature during source side faults.
  - Adaptive protection and measurements according to the power direction:
    VIT recloser control uses the directional element and the polarity is automatically changed according to the power direction.

Construction



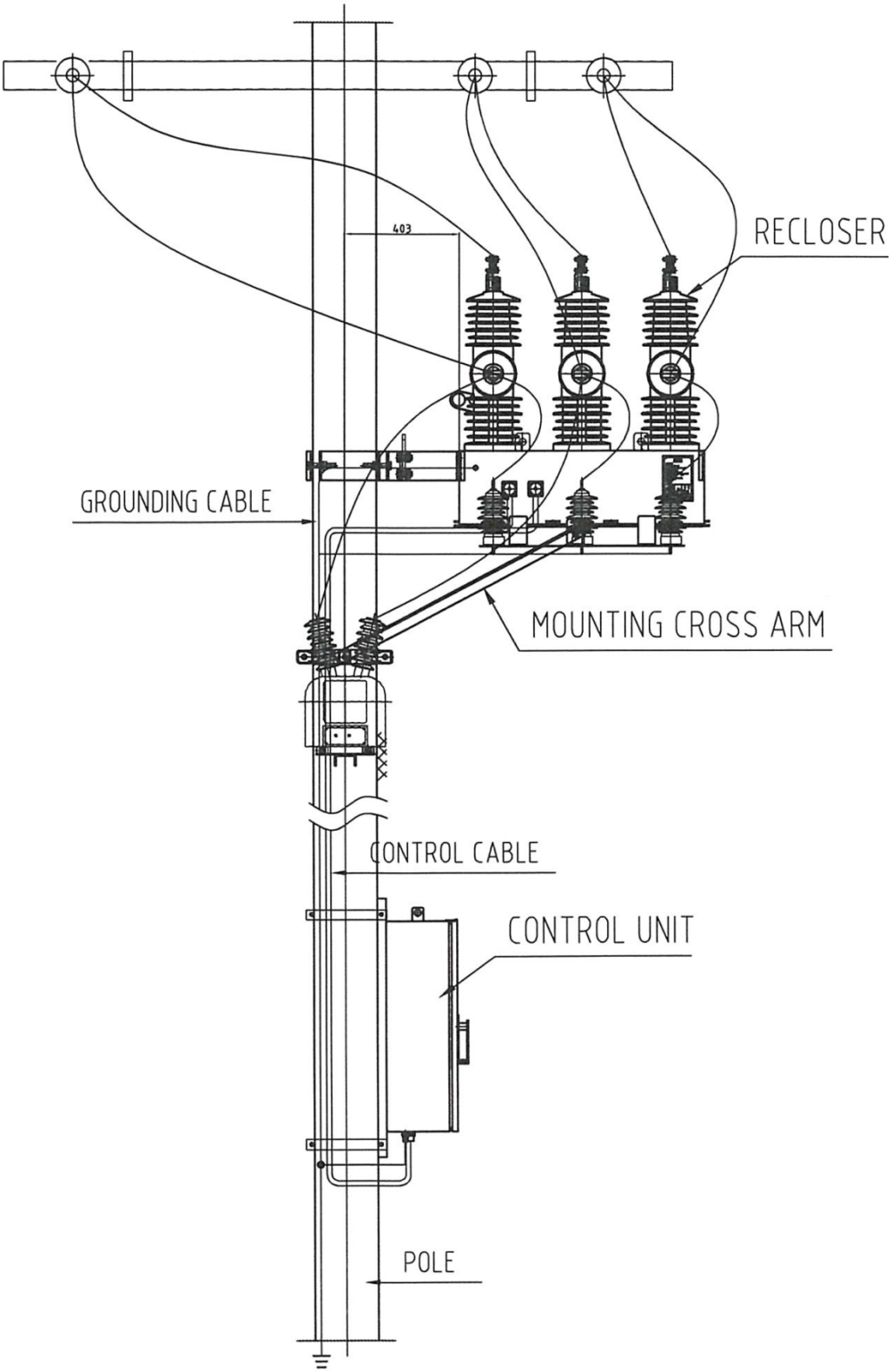
1	Bushing Terminal
2	Vacuum Interrupter
3	Insulation Rod
4	Bird Guard Cap
5	Epoxy(Polymeric) Bushing
6	Manual closing port
7	Manual open handle
8	On/Off position indicator

Technical Specification

Description	Guaranteed Value
Applied Standard	**IEC62271-111**
Type	**SIREC-38**
Ratings	
Maximum Voltage	38kV
Rated Continuous Current	800A
Rated Frequency	50Hz
Mechanical Operations	10,000times
Breaking Capacity	
Rated Symmetrical Interrupting Current	16kA
Making Current (Peak)	40.8kA
Short-Time Withstand Current	16kA/1sec
Cable Charging Current	40A
Line Charging Current	5A
Lightning Impulse Withstand Voltage (1.2x50μs)	
Phase to Earth	170kV
Across Interrupter	170kV
Power Frequency Withstand Voltage (Dry for 60sec)	
Phase to Earth	70kV
Across Interrupter	70kV
Others	
Recloser body/tank weight	≒208kg
Recloser control weight	≒63kg
Degree of Protection for control box	IP66
Degree of Protection for control box	IP55

* Other ratings are available upon request

Typical Pole-Mounting Installation



Note: Voltage transformers, surge arresters are out of supply scope

Recloser Control

◆ Overview

Two types are recloser controls available; one is that R6 is μ-processor control with built-in RTU as a conventional protection functions that has capabilities of sending the status, voltage/current, fault information etc to SCADA centre through the communication module like modem for SCADA system, and the other is that VIT R6 as an optional function is designed for the advanced protective application including conventional functions to fulfill the feeder automation without using communication in a radial and loop network as well.

It has many advanced features compared with conventional current controlled recloser and as powerful self-restoration system it is best matched with VIT LBS. When the VIT Recloser is used with VIT LBS, it can identify and isolate the faulted section without limitation of sectionalizing points, and can restore the service by itself without any communication-assisted computer system.

Main Features of VIT Recloser control

Conventional recloser functions

- Directional ground fault protection
- Fast, delay curve combination
- Sequence coordination
- Cold load pick up
- Directional negative sequence current protection
- Sympathetic trip restraint feature
- Event reports / Measurements
- Load profile
- CB wear monitoring function / DNP3.0

Protection Functions

- Phase instantaneous overcurrent protection (50)
- Phase time overcurrent protection (51)
- Ground instantaneous overcurrent protection (50N)
- Ground overcurrent protection (51N)
- Negative sequence overcurrent protection (46)
- Directional overcurrent protection (67)
- Under voltage protection (27)
- Over voltage protection (59)
- Negative phase-sequence overvoltage (47)
- Under/Over frequency protection (81)
- Up to four reclose cycles (79) : close four times / trip five
- Directional SEF (Sensitive Earth Fault) protection
- Fuse blown Protection
- 32 traditional curves, 5 IEC curves, 5 US curves, 4 KEPCO curves, 4 user programmable curves

Additional functions (Option)

- Source side fault lockout feature
- Reduced trip shots to lockout when the fault is at load side
- Normal open recloser lockout feature when the fault is at adjacent section (No forced fault making)

- Automatic setting group change from normal to reduced load
- Maintain the normal setting group of source side recloser during increased load condition through load encroachment logic.
- Sympathetic trip restraint feature during source side faults.
- Adaptive protection and measurements according to the power direction:

VIT recloser control uses the directional element and the polarity is automatically changed according to the power direction.

◆ Hybrid Feeder Automation System using VIT Recloser

Even in communication-assisted feeder automation system, the CB-Recloser coordination scheme can reduce the outage area during temporary and permanent fault.
So the large section is protected first by conventional CB-recloser scheme and the small section can be isolated through the FTU of the load break switch. After deciding and isolating the faulted section, it send close command to the normal open switch to restore the service.

Automatic setting group change

During loop operation the recloser of the unfaulted feeder (source side recloser) should supply more current and the recloser of faulted feeder (load side recloser) may supply reduced current.
If the correct setting group cannot change automatically, then the computer system has to change the source side, load side recloser settings before sending close command to the normal open switch.
The VIT recloser control uses the load encroachment logics for source side recloser and changes the setting group of load side recloser according to the power direction. The load encroachment logics qualify not only current amplitude, but also the power factor, so even the load current exceeds the pickup level, still it can supply the power but if there is actual fault, it trips and protects the distribution line.
From the normal load pickup current (1^{st} level) to the increased load pickup current (2^{nd} level) the load encroachment logic qualifies the fault and after increased load pickup current, the fault current amplitude qualifies the fault.

◆ Self Restoration System using VIT Recloser and VIT LBS

The self restoration system can achieve the same or better result than the communication assisted hybrid feeder automation system in the aspect of speed, reliability, expandability, cost, etc.

The large section is protected by substation circuit breaker and distribution line recloser and if the fault is permanent after one or two trip of CB, recloser, the VIT LBS open simultaneously and close one by one to identify and to isolate the fault.
It can isolate the faulted and can restore the service by itself without communication.

The additional functions of VIT recloser are designed to achieve the best performance of the self restoration system matched with VIT LBS but even without the VIT LBS it solve the problem of conventional loop system using recloser likes forced fault making and lockout, non automatic setting group change, difficulty of directional protection during reverse power flow etc.

◆ Operation Mode

Normal Recloser Mode

- In normal recloser mode, the operation is exactly the same with conventional recloser.
- If the load side of recloser just has sectionalizers, the recloser should operate according to normal recloser mode.

Radial Line Mode

- Basic functions are the same with normal recloser mode
- If the recloser is coordinated with 2 or 3 sectionalizers, then the radial line mode is not

necessary

- If the down-stream of recloser uses more than 2 or 3 sectionalizers, the VIT LBS is recommended
- The radial line mode will be best matched with VIT LBS self restoration scheme
- Unlike conventional recloser, if the adjacent load side of recloser is a faulted section, then the recloser goes to lockout with one reduced trips.

Loop Line Mode

- Basic functions are the same with normal recloser mode
- Source side fault lockout feature
- Load side fault lockout feature with reduced number of trips
- Loss of voltage lockout feature
- Normal open (Tie) recloser adjacent fault lockout feature
- Tie recloser close function during one side voltage lost
- Automatic setting group change from normal setting group to load side setting group and vice versa according to power direction
- The normal setting group can supply more current without tripping, without scarifying the sensitivity during loop operation.

The load encroachment logics current amplitude and also power factor together. So even the current increased more than min pick up current during loop operation, the control will not start the trip timer until the power factor is out of load zone.

Application for SCADA System

❑ Overview

R6 control embedded with RTU(Remote Terminal Unit) is the device installed on the distribution line with an automatic recloser to monitor and meter current, voltage and support communicating the signal , status, sequential and fault event to central (SCADA) with DNP3.0 TCP/IP, IEC60870-5-101 or IEC60870-5-104, Modbus TCP/IP.
It is the apparatus to minimize troubled sites by manipulating switch-on/off on distribution line according to control order from central control system after indentifying troubled point by the information transmitted to central control system at the Distribution Control Center when trouble of distribution line occurs.

❑ Functions

- Communication with central control system (IEC60870-5-101 or IEC60870-5-104)
- Measurement of voltage and current
- Maximization of state input
- Remote control
- Fault indication

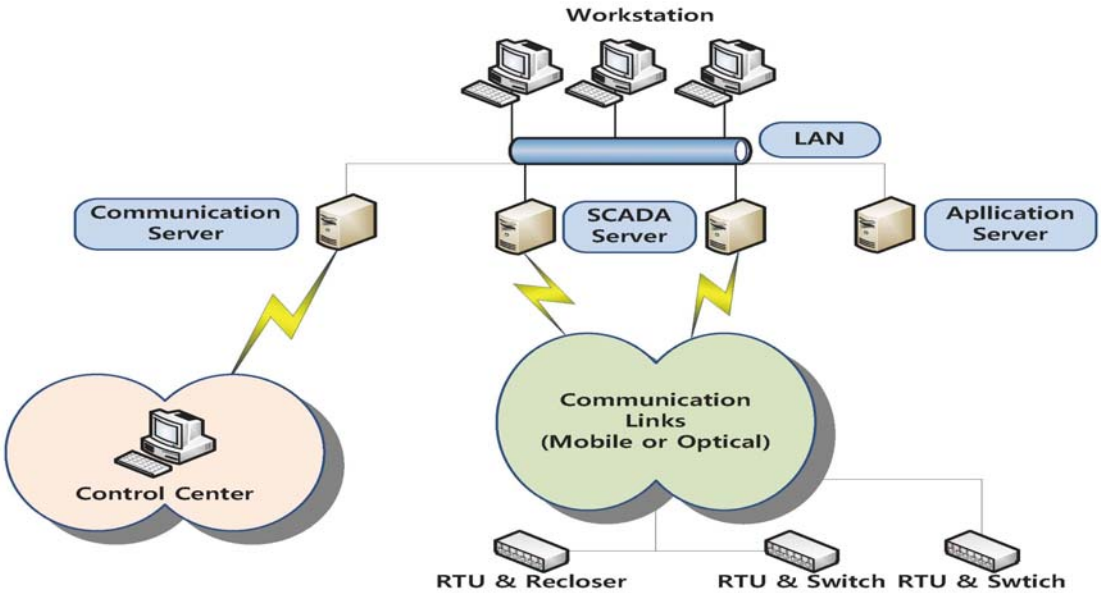
❑ Effects

- Economical and efficient operation of distribution system with distribution automation.
- Minimization of power losses through optical operation of distribution system
- Minimization of the public inconvenience and providing the various information related to electricity business

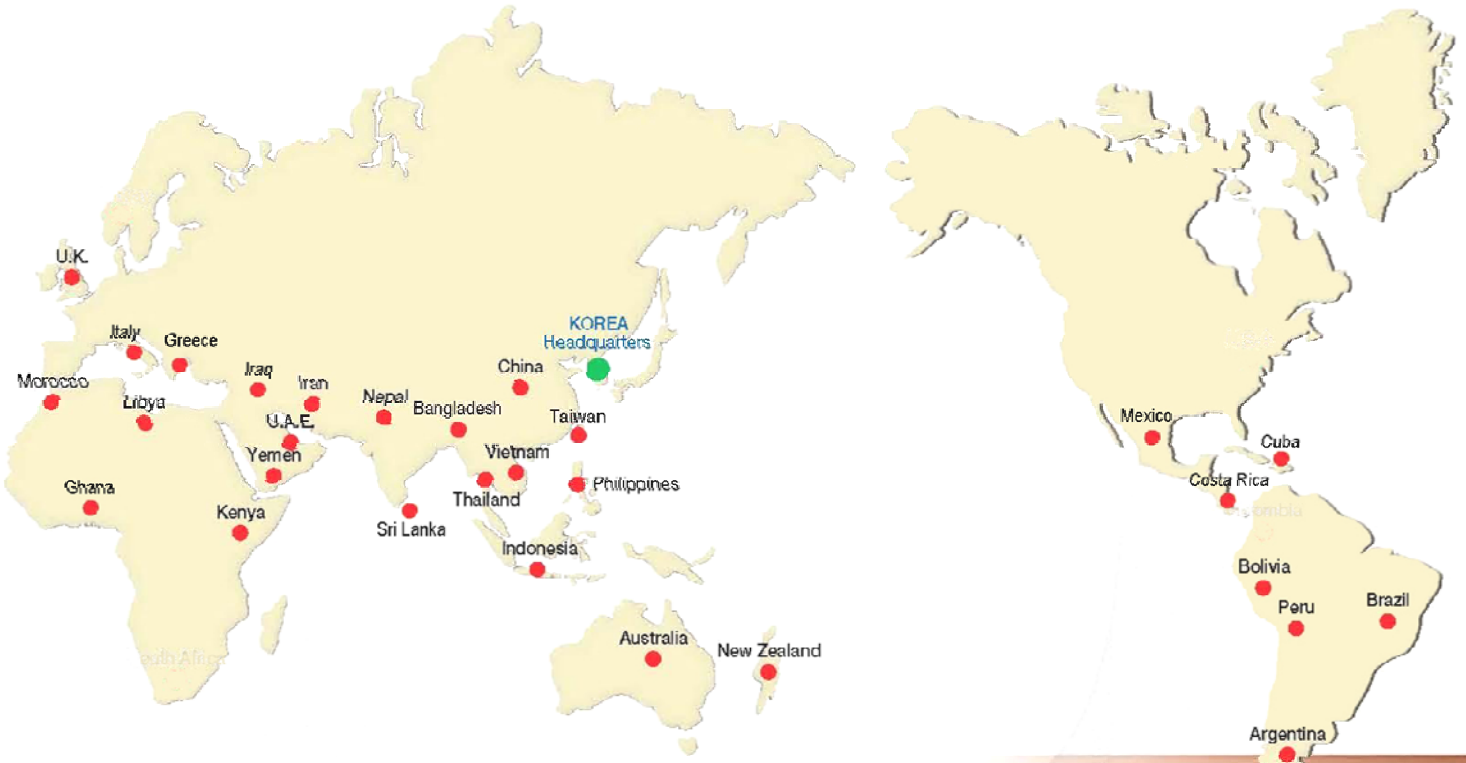
❑ Communication Interface

- 2 x RS232C port for local/remote setting and maintenance and SCADA communication
  1 x RS485 port
  1 x Ethernet TCP/IP(RJ45)
  1 x USB Port
  1 x Spare Port

❑ System Structure



Worldwide Sales Location



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