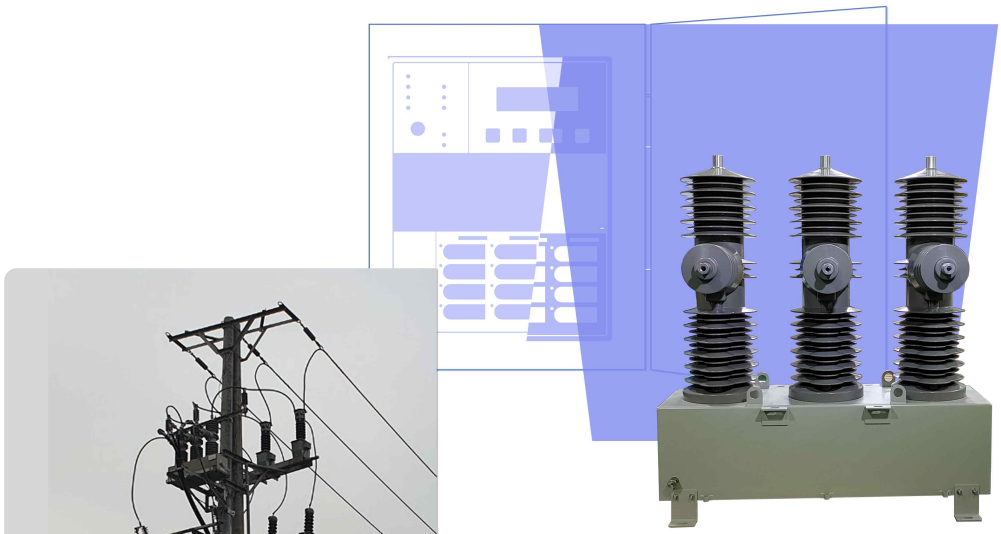
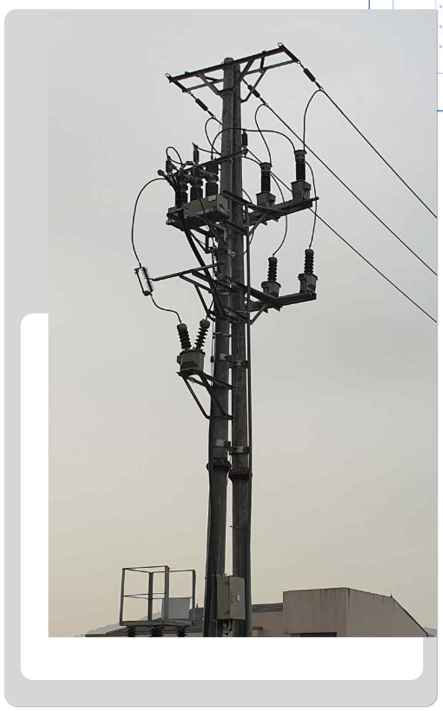
Solid Insulated Vacuum Recloser

for power distribution sysytem (Overhead line)





TAEYONG ENC

1. Index

2. General features

Taeyong ENC Solid Insulated Recloser designed for using on overhead lines as 27kV and 38kV. Main mechanism of solid recloser is magnetic actuator One-Coil Type, and bushing material is made of Epoary. Recloser is protected with Stainless-Steel Material Enclosure. Recloser control consists of RTU(Remote Terminal Unit)in one control with space for modem.

2.1. Recloser Housing

Advanced Outdoor solid dielectric Material(Epoary)

2.2. Mechanism

One Coil PMA

2.3. Installation Environment

Pole Mounting/Substation Available
All accessories included such as Control
Power cable, Mounting bracket etc
Operating Temperature: -40°C to 80°C
Altitude : up to 3000M
Remarks: Altitude above 1000m should be corrected in accordance with ANSI C37.60 - 2012

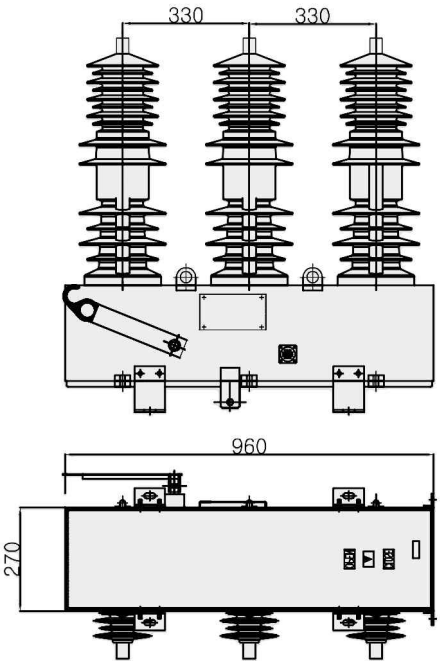
2.4. Other Technical Features

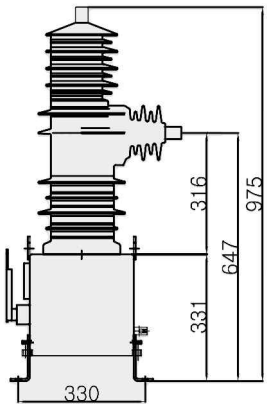
Voltage measurment : RVD Type
Manual Trip Operation Available
In case of loss of control power, over
hundreds of open/close operations with fully charged battery(18AH/30HOURS)
Various CT Ratio available

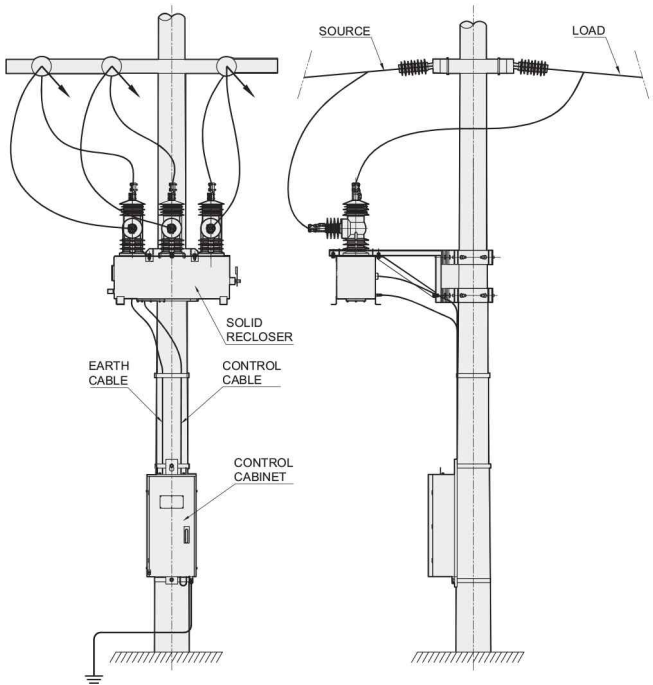
2.5. OPTION (Diagnostic)

-Partial discharge Detection
-Alarm Indicationg for remote

3. Installation Drawing







4. Microprocessor Based Recloser Control R200i(PNC TECH)

4.1. Intorduction

Summary

Distribution lines have their own equipment in outdoor, the types of loads are various, and the configurations of the networks are flexible and complicated. There are many kinds of fault causes such as direct contact of trees or birds, natural phenomenon of lightning or heavy snow, and fault spread-out due to customer's facilities. Among these faults, most of faults are temporary and the dominant fault type is ground-fault. For rapid fault detection and fault section isolation, blackout area minimization, many protection devices such as Recloser, Sectionalizer, and Line Fuse are adopted. Among these devices, Automatic Circuit Recloser is the most important protection device, whose main functions are fault current trip and autoreclosing. Advanced automatic recloser controller FTU-R200i is used with circuit breaker in overhead distribution line and provides fault protection, measurements, status monitoring, control and communication for distribution automation. FTU-R200i can be used also in the distribution line with dispersed power sources as well as radial network and at the substation feeder.

4.2. Main feature

4.2.1. Protection

4 stages directional overcurrent elements for phase, ground and negative fault
- Inverse type OC (OC, GOC, NOC) -Fast/Delay
- 67 types of TOC curves including 6 customized curves
- Definite time (Instantaneous) overcurrent element: DTOC, IOC1, IOC2

SEF (Sensitive Earth Fault) Protection
Broken Conductor Protection (I2/I1)
Hot Line Fault Protection
Auto-Reclosing (up to 4 shots)
Cold Load Protection (Pickup Adjustment)
2nd harmonic based magnetizing Inrush Restraints
Sequence Coordination
Open Line Detection
Phase Synchronism Check
Over Voltage, Ground Over Voltage, Under Voltage Protection: 4 stages
Under Frequency, Over Frequency Protection: 4 stages
Loop Automation Scheme
Sectionalizer
Single-shot Operation
4 Setting Groups: Automatic Setting Group change depending on power flow or loop scheme change
Fault Location
Automatic Source Transfer Switch

4.2.2. Measurements

Magnitude and phase angle of voltages & currents
Sequence components of 3-phase voltages & currents
True RMS, harmonics up to 31st and THD of voltages & currents
Line-to-line voltages
Phase difference between source-side and load-side voltage
Active, reactive and apparent power for each phase and 3-phase total
Demand currents and power
Energy (4-quadrant metering): import, export, active, reactive
Power factor
Frequency of source and load-side voltage
Internal temperature
Two 4~20mA transducer signals
PQM, Fault, THD event counters for statistics
Interrupter duty

4.2.3. Control

Recloser open/close (Select-Before-Operate
Operator place: local (Button or through maintenance software) / remote
Interlocking: Gas low, Handle lock, Hot line tag, Sync Fail, Live Load
Battery Test
External trip and close by external input(configurable)
Function enable/disable: reclosing, protection, ground protection, fault indicator reset, PQM reset

4.2.4. Status Monitoring

Through 10 binary inputs

Recloser open/closed (double binary inputs
Mechanical locked
Gas pressure low
External AC power loss
Enclosure door open
Battery low or fail
Dummy switch can be configured
Spare

4.2.5. Event Recording

Event recording with 1ms time-stamp
: I/O changed events (1023), Functional operating events (20,000)
System related events (255), Communication events (255)
Fault current (1,023), PQM events (255)
Demand profile: current, voltage and power (6,143)
Daily maximum current, voltage and power (1,023)
Energy & Peak Demand Profile (63)

Waveform Recording
: 8 Fault waveforms
6 PQM waveforms
1 Manual trigger waveform
128 samples/cycle, 40 cycles
Saving COMTRADE File format

4.2.6. Counter

FTU Restart count
Switch open counts (total, fault trip, local control, remote control)
Fault counts (OC total/A/B/C, NOC, UF/OF, OV/UV/OVG)
PQM statistics
THD event counts

4.2.7. Communication

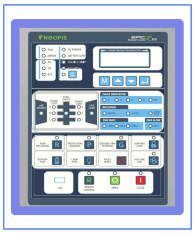
Maintenance Port (Front Panel)	RS232C or USB* (Female Plug Type A) FTUMan connection
RS232C port	SCADA protocol - DNP3.0 - IEC60870-5-101 (Unbalanced/Balanced) - Modbus-RTU - SMS (GSM)
RS232C/RS485 port	SCADA protocol - DNP3.0 - IEC60870-5-101 - Modbus-RTU - SMS (GSM) or Dedicated channel while ATS function is enabled.
Ethernet port	RJ45 or Fiber optic Two ports available for Redundancy** PRP/HSR scheme** : Parallel Redundancy Protocol)/(High Availability Seamless Redundancy) SCADA protocol -DNP3.0 over TCP/IP with Secure Authentication v2/v5 (up to 2 masters*) - IEC60870-5-104 - Modbus TCP - IEC61850 Edition2 with GOOSE** SNTP (Simple Network Time Protocol) TFTP (Trivial File Transfer Protocol) FTUMan connection using Modbus TCP (Maintenance Port: 19999)

*Ordering option

**Ordering option for FTU-R200i

5. Microprocessor Based Recloser Control R300(NEOPIS)

5.1. Intorduction



Summary

Reclosers are used in distribution system. In case of line fault, due to temporarily overcurrent, Reclosers can break and make currents several times, thus avoiding longer network interruptions due to temporary faults. But, in case of permanent fault, because fault current is still detected after trip and reclosing actions of pre-set sequences, Recloser is locked out finally as opened.

The pre-set sequences are available to set five times, and for both phase and ground, the combined operations are possible within the range of 5 instantaneous or 5 times delayed operating. The first interruption of a fault regarding instantaneous operation, is done quickly and instantaneously, so that even the fuses in the system do not operate. After setting time, it recloses back on. And the next interruption has a definite or inverse time delay. Thus downstream fuses or other protection devices in the network have the chance to operate and isolate the affected network section, restoring normal operation in the remaining work. Therefore reclosers make the range of fault section to be limited.

Mainly Reclosers which are installed in overhead distribution line, provide the measurement of electric current flowing in the distribution line. In case of load current occurrence and fault detection, it opens and recloses repeatedly according to setting sequence, and at the sametime, it transmits the status/receives the command to/from HOST and remote controls of opening/reclosing to minimize the accident. Besides, it stores the whole events in distribution line, provides the fault causes, and it performs remote monitoring and controls by transmitting data through DNP3.0, IEC60870-5-101, IEC60870-5-104 protocols

5.2. Main features

5.2.1. Protection

Fault Detection about phase and ground fault
SEF(Sensitive Earth Fault) used on non-grounded network
Inrush current control function during fault detection
In case of Cold Load, Fault Pickup Level adjustment
Phase Loss Detection
Phase Sync Fail Detection about source and load voltage
Automatic breaking and reclosing by detecting phase and ground fault
Detecting fault and monitoring the status in distribution line
Built-in 50 types of recloser curves including IEC, ANSI/IEEE, McGraw Edison Recloser curve
Equiped with 4 types of curves(N1, N2, N3, N4) developed by Korea Electric Power Research Institute(KEPRI, under KEPCO)
Additionally user defined 4 types of curves available
3 steps protection characteristics implementable, established with definite time elements and high-current elements

5.2.2. Measuring

Current, voltage magnitude and phase angle
Symmetrical component about 3-phase voltage and current
Active, reactive, apparent power, and power factor
Active and reactive energy
Frequency
Power quality information : THD, sag/swell, harmonic 2~32th

5.2.3. Control

Recloser switch Open / Close control
Battery Test control
Preparatory control

5.2.4. State Monitoring

Recloser Open / Close status
Handle locked status
Gas pressure low status(option)
External AC low status
Battery overcharge status
Door Open
Spare status 1,2
Over dischager
Chager fail

5.2.5. Various Communication Interface

System Interface Port : RS232C
DNP3.0
IEC60870-5-101

System Interface Port(option) : Ethernet
DNP3.0 over TCP/IP
IEC60870-5-104

Maintenance Port : USB-A, Wi-Fi(option)
MODBUS RTU

5.2.6. Various Event Information

Operation Event

It stores and manages events occurred during operation such as control(On, Off, Trip)event and diagnosis event up to 30,000 cases in time sequence.

Fault Event

It stores and manages various fault information(occurred time, type of fault, operation relaying element) during distribution line accidents up to 1024 cases in time sequence.

Fault Wave Storage Function

It saves and manages the latest fault 160Cycle(16Sample standard) sample data up to 6 cases. The user can use save fault wave to analyze the cause of faults.

Convenient interface for users

hrough RS232 communication port, it is convenient to manage various set values and
stored measuring information search on PC.(using company supplied S/W)

Self-diagnosis and Backup functions during power-off

EPIC-R300 operates self-diagnosis such as CPU check, memory error diagnosis, I/O diagnosis, and control power diagnosis. It saves warning output and diagnosis event on
occasion of failure. Therefore the user can have a speedy response.

5.3. Control Technical Specifications

RATINGS		
	Rated frequency	50/60 Hz
	Control voltage	110-240VAC/24V(DC)
ENVIRONMENTAL		
	Operating temperature	-40℃ to +80℃
	Humidity	99%
	Degree of protection	Box (IP55), Electronic elements (IP65)
	Insulation test voltage	2kV 50/60Hz, One minute
	Impulse voltage withstand	6kV Peak, 1.2/50㎲ ANSI C62.45, IEC 61000-4-5
	Interference test withstand	SWC ANSI C37.90.1, IEC 61000-4-4
	Radio frequency interference	IEC 255-22-3 Class III, ANSI C37.90.2
GENERAL PROTECTION (CT ratio 1000:1A)		
	Phase time overcurrent	10 to 1,600 Amps in steps of 1A
	Phase instantaneous overcurrent	10 to 20,000 Amps in steps of 1A
	Ground time overcurrent	10 to 1,600 Amps in steps of 1A
	Ground instantaneous overcurrent	10 to 20,000 Amps in steps of 1A
	Sensitive earth fault(SEF)	1 to 160 Amps in steps of 1A
RECLOSE		
		Programmable from 1 to 3
	Reclose times	1st reclose : 0.5-600 sec in 0.01sec steps
	Reclosing(Dead) times	2nd reclose: 1.0-600 sec in 0.01sec steps
		3rd reclose : 1.0-600 sec in 0.01sec steps
	Control voltage	1 to 600 sec in 0.01 sec steps

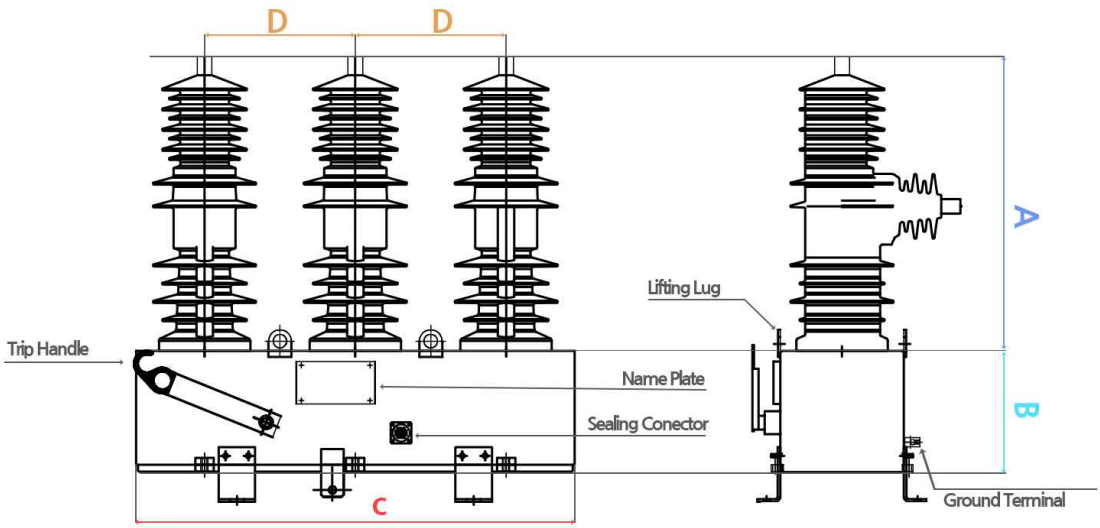
METERING (At rated volta5ge and current)	**RVD**
Current	+-1%
Voltage	+-1%
Watt hours	+-2%
Vars hours	+-2%
Demands	+-2.5%
Power factor	+-0.02
Frequency	+-0.02Hz

RECORDING

	R200i(PNC)	**R300(Neopis)**
Waveform capture	Last 32 events with 15 cycles &	Last 32 events with
System event	Last 2048 events	Last 2048 events
Diagnostic event	Last 512 event	Last 512 events
Fault event	Last 512 events	Last 256 events
Load profile	Last 5120 events, 213 days/60Min. (5, 10, 15, 20, 30, 60, min interval)	Last 6144 events, 256 days / 60Min. (5, 10, 15, 20, 30, 60min interval)
PQM	Last 512 events	Last 512 events
Fault events	Last 512 events	Last 256 events
Operation events		Last 256 events
Set Change		Last 100 events

events		
Alarm Current event		Last 512 events
Counter	Trip, fault, system restart, PQM	Trip, fault, system restart, PQM
Recloser wear	Phase A,B,C	Phase A,B,C

6. Recloser Lay-Out

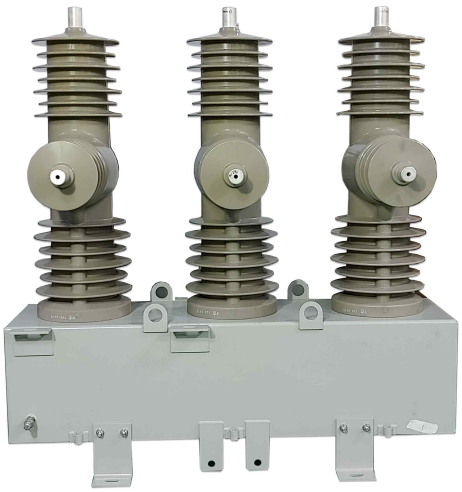


Dimension

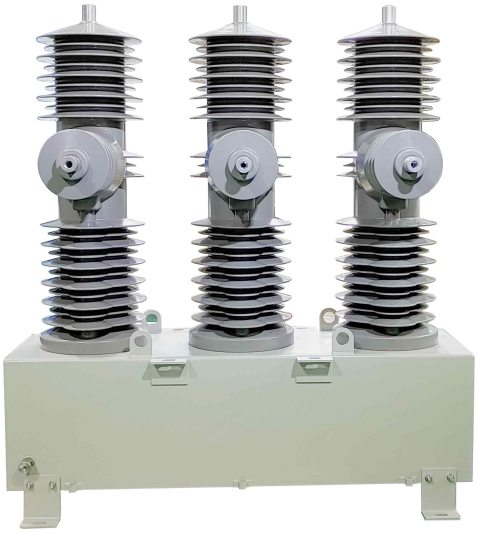
kV	A	B	C	D
27(12.5kA/16kA)	644	331	960	330
38	799	354	1060	350

7. Electirical ratings

Descrinption	Unit	TYR21	TYR31
		Three Phase	
Rated maximum voltage	kV rms	27	38
Continuous current	A rms	630/800	800
Frequency	Hz	50/60	50/60
Short circuit interrupting current	kA rms	16	16
Short time withstand current. 1sec	kA rms	16	16
Making current	kA peak	41.6	41.6
Cable charging interrupting current	A rms	25	40
Line charging interrupting current	A rms	5	5
Basic impulse withstand voltage	kV crest	150	170
Power frequency withstand voltage, dry	kV	60	70
Power frequency withstand voltage, wet	kV	50	60
-Operating control voltage	110-240VAC/125VDC(Option)		
-Operating temperature	˚C	-40 to + 80	
-Degree of protection	IP65		
-Maximum mechanical and electrical operations (c-o)	Number	10000	



[TY21 - 27kV]



[TY31-38kV]

[R200i]

[R300]

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