



**Solid insulated vacuum recloser  
for power distribution system  
thru 15kV, 27kV, 38kV**

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## General features

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We, ENTEC introduce a Solid Insulated Vacuum Recloser encapsulated with cycloaliphatic epoxy materials.

The Solid Insulated Vacuum Recloser is designed for the inherently reliable, intelligent automation and environmentally friendly, completely oil free and gas free.

The mechanism is enclosed in a powder coated stainless steel and cycloaliphatic epoxy resin bushing is bolted on to the stainless steel enclosure.

The cycloaliphatic epoxy advantages show permanent flexibility, superior surface arc tracking resistance, hydrophobicity preventing continuous water film from forming leakage current paths, ultraviolet resistance and high tensile strength.

The control cubicle is heat insulated with polyurethane to minimize temperature variation and protected from solar heating as adopting sunshine cover to the outside and heat insulation inside of control cubicle.

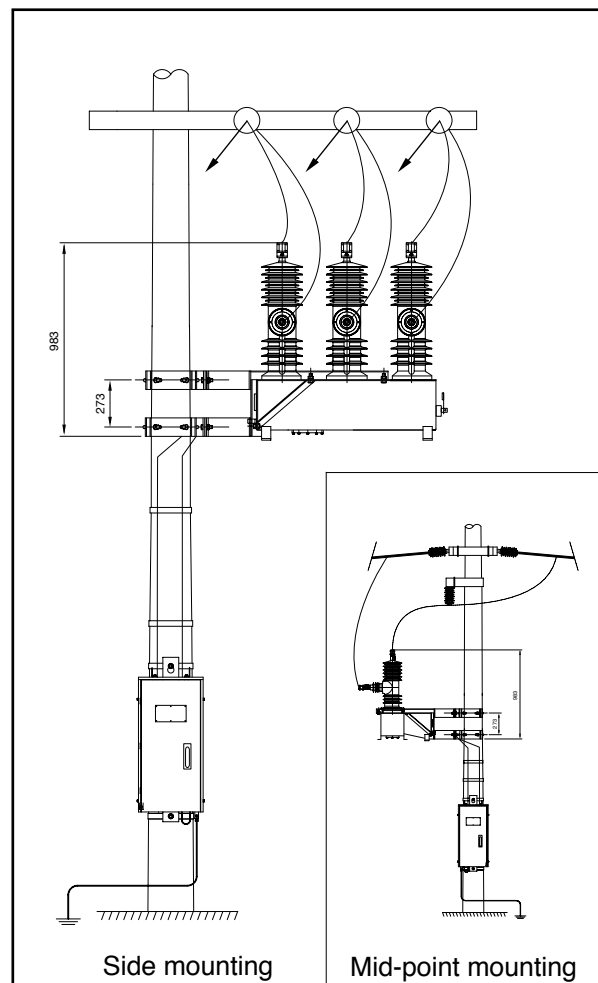
Vents of the control cubicle are screened against vermin's entry and door is sealed with a rubber gasket.

Especially all electronic parts built in microprocessor control are fully protected from entry of moisture and condensation able to use any places where tropical, moderate and severe humidity area is located on.

The mechanism is operated by a magnetic actuator which the opening and closing solenoid is respectively equipped with. As the actuator uses magnetic latching, the mechanical parts are drastically reduced, resulting from high reliability and maintenance free operation during the life time.

The operation of recloser uses a low-voltage power source supplying from low voltage distribution line by utility or potential transformer and a fully charged battery and trip and close capacitors provide recloser operation over hundreds of open-close operations as back-up upon loss of control power.

This allows recloser operation independent of the high voltage supply, the low voltage supply and the battery and capacitor conditions with dead line operation capability required for SCADA and distribution automation.



A current transformer and a capacitive voltage transformer are moulded in the horizontally arranged epoxy bushing.

These sensors provide to incorporate the functions of an overcurrent protection relay, a ground fault relay, a sensitive earth fault relay and to measure line current, voltage, real and reactive power, power factor, demand watts and VARs, frequency and so on.

All the measured values and event records are stored in the microprocessor control for transmission or off-line analysis.

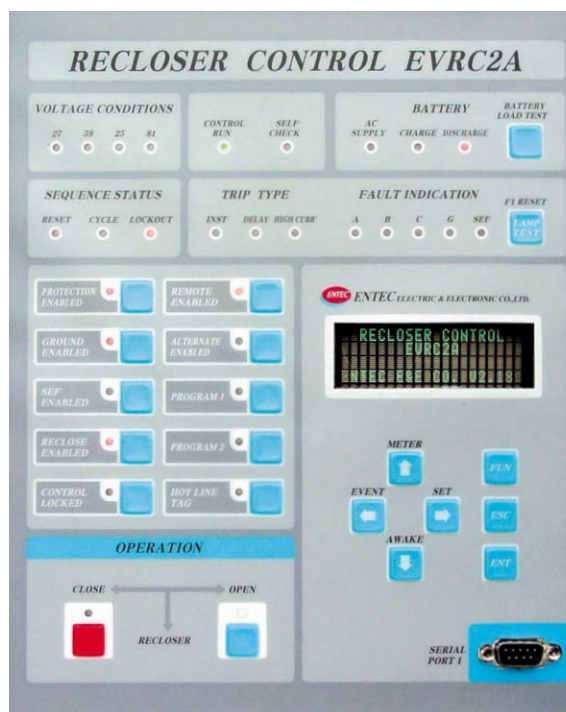
The recloser functions, settings and data records are programmable and readable with PC or remote communication.

Personal computer based on software package supports on-line and off-line programming, monitoring, measuring and control of recloser via RS232 port.

All telemetry communication can be supported with DNP3.0 protocols based on IEC870-5 and Modbus.

- The advantages of cycloaliphatic epoxy encapsulation
  - environmentally friendly, oil free and gas free
  - Proven performance in outdoor use
  - Compact, light weight, easy to transportation
  - Superior surface arc tracking resistance
  - Excellent hydrophobicity
  - Highly resistant to moisture absorption
  - Ultraviolet resistance
  - Outstanding tensile characteristics

- The advantages of magnetic actuator
  - Elimination of mechanical latches and associated associated linkage provide reliable, trouble free operation
  - Dramatic reduction in moving parts provide maintenance free, ten thousand operations without periodic maintenance.
  - Compact, light weight and minimum mounting space
  - High response time in instantaneous reclose
  - Reduced installation and operating cost.



User Interface Panel

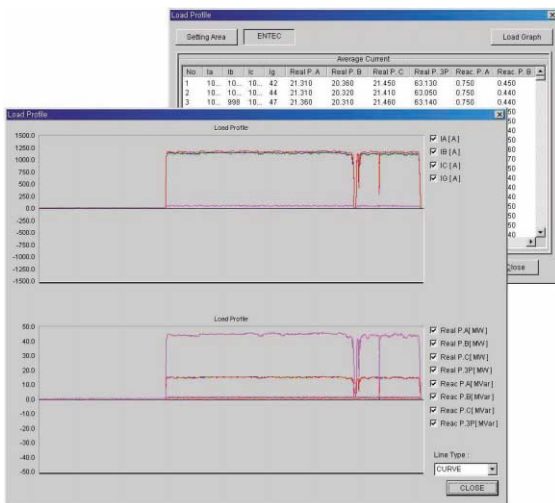
# Microprocessor Based Recloser Control EVRC2A

## Features

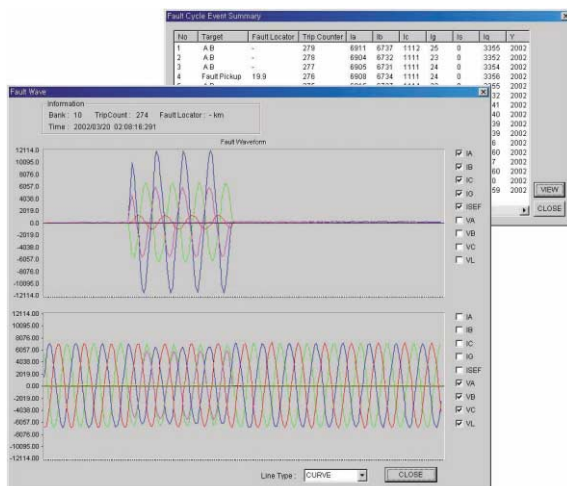
- Reduced distribution automation costs
- RTU and control mounted in one control cubicle with space for radio and modem
- DNP 3.0, Modbus communication protocols and SCADA capability
- 12Vdc ~ 24Vdc auxiliary power available for modem or radio
- Voltage, current and power metering
- Record of operation, fault and waveform data for line and load profile data
- Un-interruptable power supply with trip and close
- Inner heat insulation for polyurethane foaming
- Microsoft Windows-based EVRC2A interface software



EVRC2A cubicle



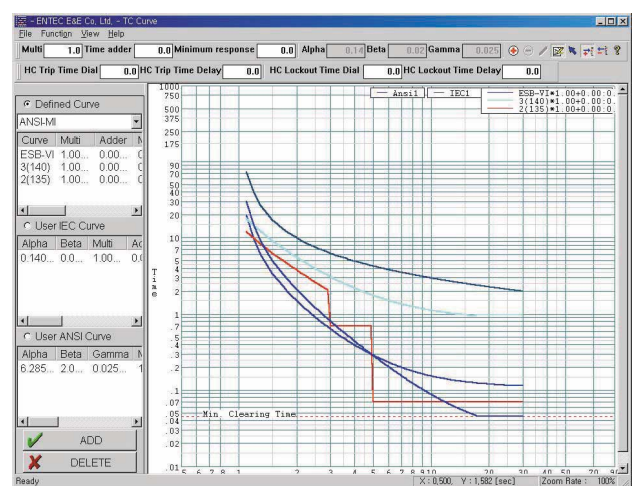
Average load profile & waveform



Fault events & 15 Cycles waveform

## Protections

- User TCC construction capability
- Three curve standards: IEEE, IEC and 37non-standard inverse time curves
- Protective settings in nonvolatile memory during power failure
- Delay time overcurrent protection(51P, 51G)
- Instantaneous overcurrent protection(50P, 50G)
- Negative sequence overcurrent protection(46)
- SEF protection
- Source and load side synchronism check
- Cold load pickup and sequence coordination
- Underfrequency and load shedding(81)
- Undervoltage, overvoltage detection and alarm(27,59)
- Directional controls(67)



Editor for TCC modification

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## Mutli-metering

- Current
- Voltage
- Measures KW and KWH, power factor, demand watts and VARs and frequency
- Load profile data & oscillogram

## Remote Communication

- RS-232 ports
- DNP3.0 protocol based on IEC870-5, Modbus
- Built in RTU
- Complete remotely access for recloser functions, settings metering and data records

## Technical EVRC2A Control Specifications

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### RATINGS

Rated frequency	50 or 60 Hz
Control voltage	110/220 AC

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### ENVIRONMENTAL

Ambient temperature range	Storage -40°C to +85°C Operation -25°C to +70°C
Degree of protection	IP65
Insulation test voltage	2kV 50/60Hz, One minute
Impulse voltage withstand	6kV Peak, 1.2/50 $\mu$ s 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

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### GENERAL PROTECTION (CT ratio 1000:1A)

Phase time overcurrent	CT ratio $\times$ (0.04~3.20), (40~3200A at CT 1000:1)
Phase instantaneous multiplier range	CT ratio $\times$ (1.00~20.00)
Ground time overcurrent	CT ratio $\times$ (0.02~1.60), (20~1600A at CT 1000:1)
Ground instantaneous multiplier range	CT ratio $\times$ (1.00~20.00)
Sensitive earth fault	CT ratio $\times$ (0.005~0.160), (5~160A at CT 1000:1)
Phase and ground time curves	IEEE C37.112, IEC255-3, User programmable curves 37 non standard inverse time curves

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### RECLOSE

Reclose times	Programmable from 1 to 4
Reclosing(Dead) times	1st reclose: 0.5-600 sec in 0.01sec steps 2nd reclose: 1.0-600 sec in 0.01sec steps 3rd reclose: 1.0-600 sec in 0.01sec steps 4th reclose: 1.0-600 sec in 0.01sec steps
Reset (Reclaim) times	1-600 sec in 1sec steps

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### METERING (At rated voltage and current)

Current	$\pm 1\%$	
Voltage	$\pm 1\%$	( $\pm 2.5\%$ : CVD)
Watt hours	$\pm 3\%$	( $\pm 5\%$ : CVD)
Vars hours	$\pm 3\%$	( $\pm 5\%$ : CVD)
Demands	$\pm 3\%$	( $\pm 5\%$ : CVD)
Power factor	$\pm 0.02$	( $\pm 0.05$ : CVD)
Frequency	$\pm 0.02\text{Hz}$	( $\pm 0.05\text{Hz}$ : CVD)

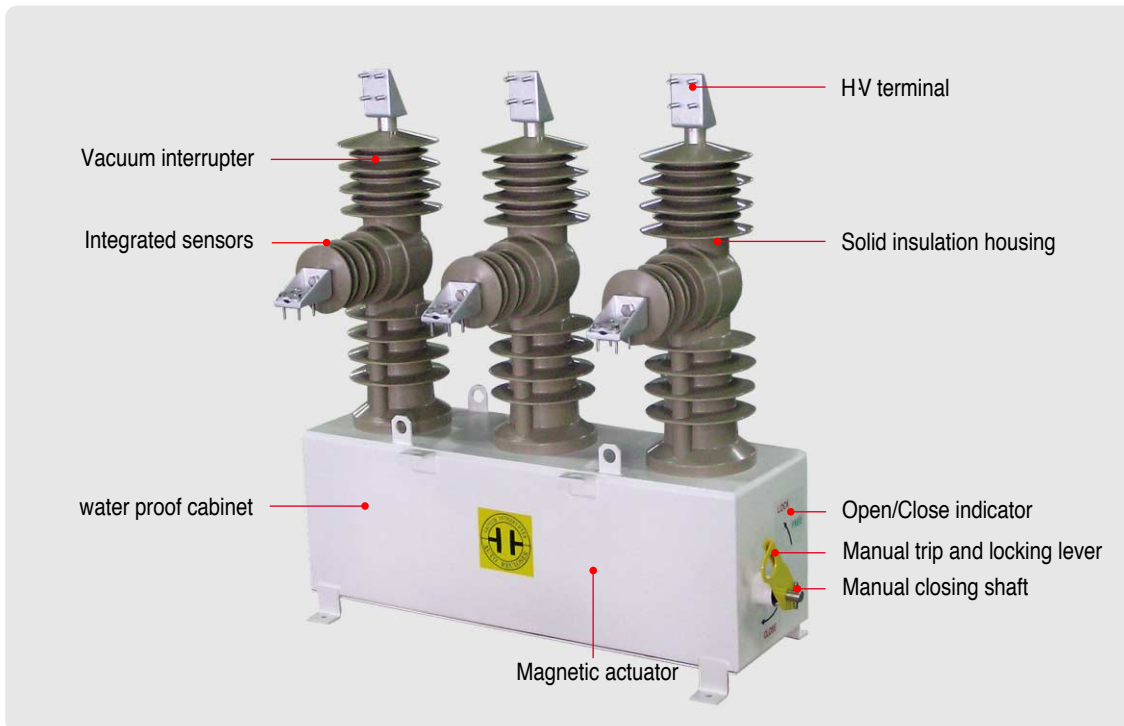
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### RECORDING

Waveform capture	: 16 events with 15 cycle
System event	: Last 500 events
Diagnostic event	: Last 100 events
Load profile	: Last 1024 events, 42 days/ 60Min.(5,10,15,20,30,60, min interval)
Counter	: Trip, fault, system restart
Recloser wear	: phase A,B,C

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## Construction



## Electrical ratings

Description	Unit	EPR-1	EPR-2	EPR-3
Rated maximum voltage	kV rms	15	27	38
Continuous current	A rms	400/630	400/630	630/800
Frequency	Hz	50/60	50/60	50/60
Short circuit interrupting current	kA rms	12.5/20	12.5	12.5/16
Short time withstand current. 3sec	kA rms	12.5/20	12.5	12.5/16
Making current	kA peak	32.5	32.5	32.5
Cable charging interrupting current	A rms	5	5	5
Transformer magnetizing interrupting current	A rms	22	22	22/28
Basic impulse withstand voltage(1.2×50μs)	kV crest	110	125(150)	170
Power frequency withstand voltage, dry	kV	50	60	70
Power frequency withstand voltage, wet	kV	45	50(60)	60
- Operating control voltage		AC 110V, 220V external sources		
- Ambient temperature	°C	-25 to 70		
- Degree of protection		IP65		
- Maximum mechanical and electrical operations(c-o)	No	10,000		

- Other ratings is available upon request.
- ENTEC reserves the right to change the design and specification without notice.