

U-Series Three-Phase Recloser / W-Series Single-Phase Recloser

Medium Voltage Distribution

Whitepaper

N00-805-01
01/2021



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About the Book

Document Scope

This document promotes or highlights the features of the U and W-Series recloser ranges with ADV C Controller range. It also describes a brief overview of the technical specifications of the U and W-Series recloser range, the ADV C Controller and the Software WSOS 5.

Validity Note

This document is valid for the U and W-Series remotely controlled and monitored automatic circuit recloser (ACR) which consists of the U and W-Series automatic circuit recloser (ACR) combined with an ADV C Controller (ADV C).

Related Documents

Title of Documentation	Reference Number
U-Series Installation Manual	N00-809
W-Series Installation Manual	N00-810
ADV C Controller Operational Manual	N00-812

You can download these technical publications and other technical information from our website at www.se.com/ww/en/download/.

Introduction

Executive Summary

In the past, distribution equipment such as reclosers have been purchased only to support load growth. Today your customers and the electricity consumers, are demanding reduced outages and lower tariffs. At Schneider Electric, we are continually working to provide the advanced equipment needed for tomorrow's competitive electricity distribution system.

By using our technologically advanced equipment, operating costs are reduced and capital works can be deferred through better management of existing plant. In addition, outages causing lost revenue is reduced.

In addition to automatic circuit reclosers, the Schneider Electric family of switchgear includes remotely controlled and monitored pole-mounted load break switches and sectionalisers, as well as remote control and monitoring software.

The Schneider Electric Switchgear and controller product family is a complete solution for Distribution System Automation.

Introduction and Benefits

Overview

The U-Series and W-Series solid dielectric Automatic Circuit Recloser (ACR) represents Schneider Electric's commitment to improved products and ongoing product development. Providing the features of a traditional recloser, plus the benefits of up-to-date design optimized for automation, remote control and monitoring, now or in the future.

The U-Series and W-Series development was driven by customer demand for improved return on capital investment in the distribution network. After careful evaluation of customers' needs, the U-Series was developed to achieve performance using technology in solid dielectrics, vacuum interruption and microelectronics.

Benefits

Reduced Purchase Costs

- No requirement for additional RTU, power supplies, batteries, or enclosures. The Remote Terminal Unit (RTU) and a range of communication ports are included in the standard equipment.

Reduced Installation Costs

- Simple Commissioning: Configuration of the unit is from the WSOS Software or the Operator Interface (O.I.).
- The key components required for installation are included.
- Pole mounting brackets are provided in the standard package. An optional Voltage Transformer (VT) for auxiliary supply is available.
- Schneider Electric ACRs are suitable for low-cost feeder circuit breakers in outdoor primary substations. In this application, connection into the substation control system is simple and low cost.

Reduced Operating Costs

- Reduce Equipment Damage: The integral protection relay provides fast isolation of any event.
- The recloser monitors line current and voltage without the need for additional measurement devices. This data can then be used for forward planning and optimization of existing feeders.
- Long lifetime, low maintenance equipment reduces lifetime cost.

DSA/SCADA Compatibility

When used with a compatible Distribution System Automation (DSA) or SCADA system, Schneider Electric ACRs support remote control and monitoring to provide the following advantages

- Reduced Travel Time for Line Crews: Information on events current and recloser status values transmitted to system control allows fast location of the by affected line section.
- This same information allows informed remote switching, reducing the affected area and quickly restoring supply.
- ACRs can be configured and settings managed from system control, without technicians having to visit each individual recloser in the field, with a consequent reduction in traveling time and improved system integrity.

Applications

Smart Grid Ready

With the increasing push for advanced monitoring, reduction of outages and the need to facilitate two-way communications between supply and the distribution network, the U-Series solid dielectric recloser is ready to be integrated into your Smart Grid solution.

Loop Automation

Restoring supply to your customers in time is the focus of Recloser Solutions' Loop Automation Scheme.

The Loop Automation Scheme reconfigures protection settings, sectionalises by events, minimizes affected areas, and restores network supply without the need for communications or operator intervention, using standard recloser features.

A network affected by an outage is automatically reconfigured to provide power to the unaffected area when an additional supply is available. Using a combination of Feeder, Mid-Point and Tie Reclosers to protect, sectionalise by events and minimize affected areas. Loop Automation is a Distribution System Automation Scheme designed to restore supply to customers in time.

Automatic Changeover (ACO)

The Automatic Changeover (ACO) system uses primary & alternative supplies, master & slave reclosers and fast communications so the supply is available for a load in the event of a power outage.

Using a number of different set-ups, including Break-Before-Make and Make-Before-Break, allows the system to be configured to the specifications required for the load. The system can even be set up for one-way or two-way switching so the power is available to your systems.

Operation as a Sectionalizer

Reclosers and sectionalizers work together to further improve feeder reliability. Using a separate RL-Series LBS/ Sectionalizer, as part of a feeder automation network, detects passage event and automatically isolates sections events of a network in conjunction with upstream recloser operation.

To accomplish this it senses the three-phase current and voltage to count the number of recloser trip operations. When the pre-programmed number of recloser operations is reached, the controller opens the sectionalizer during the recloser dead time to isolate the downstream event.

Automatic Circuit Recloser (ACR)

ACR Overview

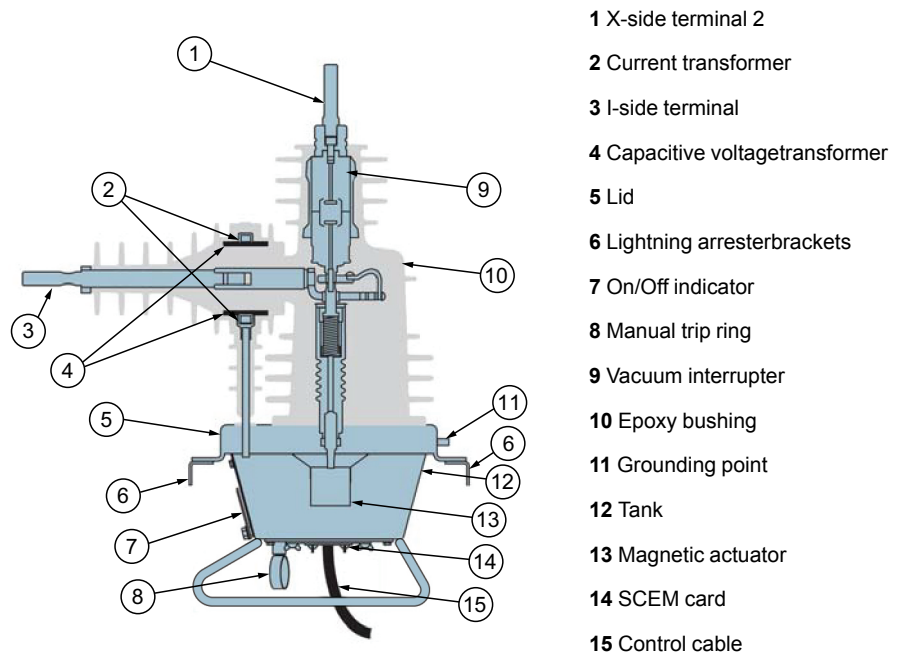
U-Series Overview

The U-Series circuit breaker is controlled and monitored by either the **COMPACT** or **ULTRA** or **LITE** ADVC Controller (ADVC).

Enclosed in a 304 (**COMPACT**) or 316 (**ULTRA**) grade stainless steel enclosure or enclosed in a mild steel enclosure coated with zinc rich epoxy and special powder paint system (**LITE**) the ADVC provides an electronic controller with Operator Interface (O.I.) that monitors the circuit breaker and provides protection, measurement, control, and communication functions. Connected via a control cable, the switchgear and ADVC can form a remotely controlled and monitored ACR.

NOTE: 1. Battery replacement interval is influenced by environmental temperature.

2. With optional 12 Ah battery, panel off and without communications devices operating.



Cross section of circuit breaker

U-Series Function

The switchgear is operated by a magnetic actuator which produces an opening and closing action. Switching occurs when a controlled pulse is sent through the open/ close actuator from storage capacitors in the ADVC. When closed, the switch is latched magnetically. Spring loaded push-rods provide contact loading on the interrupters.

A Current Transformer (CT) and a Capacitive Voltage Transformer (CVT) are moulded into the CT-housing.

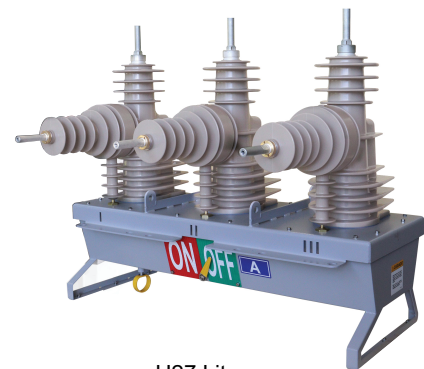
These are monitored by the ADVC for protection, remote monitoring, and display. An auxiliary voltage supply of 115/230 V AC is required to power the control unit. Where this is inconvenient, an additional voltage transformer can be provided. The recloser is supplied with copper stems or optional cable clamp connectors. Mounting brackets for lightning arresters are optionally available.

The switchgear contact position is shown by a large, clearly visible external pointer. The main tank is equipped with a manual trip lever that can be operated from ground level by a hook stick which performs open and lockout simultaneously. The mechanical lever electronically inhibits both local and remote closing. The position of the lever is indicated to the ADVC by an associated micro-switch. The manual trip ring remains in the down position until physically returned to the normal position by the operator. The ADVC interfaces to the switchgear via the control cable and connects to the Switch Cable Entry Module (SCEM) in the base of the tank via a covered plug/socket sealing arrangement on both the ADVC and the Switchgear.

The SCEM uses non-volatile memory to store the relevant calibration data, ratings, and number of operations. The SCEM also provides the first stage of electrical isolation and shorting electronics too short the CTs and CVTs in the event the control cable is disconnected while current is flowing through the switchgear.



U-Series



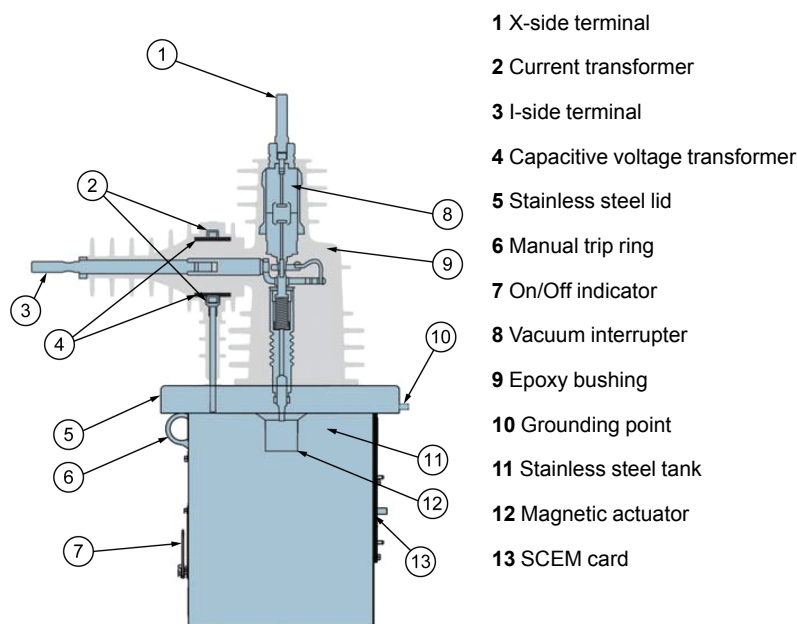
U27 Lite

*Solid dielectric bushing*

W-Series Overview

The W-Series ACR uses a vacuum interrupter, contained in an epoxy bushing, eliminating the need for insulants like oil and gas.

The mechanism is enclosed in a 316 stainless steel tank with a stainless steel lid.



Cross section of W-Series

W-Series Function

The W-Series circuit breaker is controlled and monitored by either the **COMPACT** or **ULTRA** ADVC Controller(ADVC).

Enclosed in a 304 (**COMPACT**) or 316 (**ULTRA**) grade stainless steel enclosure the ADVC provides an electronic controller with Operator Interface (O.I.) that monitors the circuit breaker and provides protection, measurement, control, and communication functions. Connected via a control cable, the switchgear and ADVC can form a remotely controlled and monitored ACR.

The switchgear is operated by a magnetic actuator which produces an opening and closing action. Switching occurs when a controlled pulse is sent through the open/ close actuator from storage capacitors in the ADVC. When closed, the switch is latched magnetically. A spring-loaded pushrod provides contact loading on the interrupter.

A Current Transformer (CT) and a Capacitive Voltage Transformer (CVT) are moulded into the CT-housing. These are monitored by the ADVC for protection, remote monitoring, and display.

An auxiliary voltage supply of 115/230 Vac is required to power the control unit. Where this is inconvenient, an additional voltage transformer can be provided.

The recloser is supplied with copper stems or optional cable clamp connectors. Mounting brackets for lightning arresters are optionally available.

The switchgear contact position is shown by a large, clearly visible external pointer. A hookstick can be used to engage the manual trip ring to trip and lockout the recloser from the ground. The mechanical trip ring has two positions: UP position allows for normal operation, and in the DOWN position the recloser is tripped and both mechanically and electronically locked open.

The ADVC interfaces to the switchgear via the control cable and connects to the Switch Cable Entry Module (SCEM) in the tank via a covered plug/socket sealing arrangement on both the ADVC and the Switchgear. The SCEM uses non-volatile memory to store the relevant calibration data, ratings, and number of operations. The SCEM also provides the first stage of electrical isolation and shorting

electronics to short the CT and CVT in the event the control cable is disconnected while current is flowing through the switchgear.



Recloser Specifications

U-Series

Description	Specification	
U-Series Range	15 kV	27 kV
	12.5 kA	12.5 kA
RATINGS		
Rated Maximum Voltage	15.5 kV	27 kV
Rated Continuous Current	630 A	630 A
Fault Make Capacity (rms)	12.5 kA	12.5 kA
Fault Make Capacity (Peak)	31.5 kA	31.5 kA
Power Operating Time (Close/Open)	0.1/0.05 s	0.1/0.05 s
Mechanical Operations	10,000	10,000
Rated Full Load Operations	10,000	10,000
Short Time Current	12.5 kA	12.5 kA
BREAKING CAPACITY		
Mainly Active (0.7pf)	630 A	630 A
Fault Break Capacity	12.5 kA	12.5 kA
Cable Charging	25 A	22 A
Transformer Magnetizing	22 A	22 A
LIGHTNING IMPULSE WITHSTAND LEVEL		
Phase to Earth	110 kV	125 kV
Across Interrupter	110 kV	125 kV
POWER FREQUENCY WITHSTAND VOLTAGE		
Phase to Earth	50 kV	60 kV
Across Interrupter	50 kV	60 kV
SERVICE CONDITIONS		
Ambient Temperature ^a (°C)	-40–50	-40–50
Ambient Temperature ^a (°F)	-40–122	-40–122
Radiation (max)	1.1 kW/m ²	1.1 kW/m ²
Humidity	0–100%	0–100%
Altitude meters (max) ^b	3000	3000
Altitude feet (max) ^b	9840	9840
NET WEIGHTS		
Circuit breaker with pole mount bracket (kg/lbs)	118/261	118/261
Control cubicle with control cable (kg/lbs)	41/90	41/90
Gross Weight of crate (kg/lbs)	263/580	263/580
CRATE DIMENSIONS		
Width (mm/in.)	960/37.8	960/37.8
Depth (mm/in.)	1020/40.2	1020/40.2
Height (mm/in.)	1160/45.7	1160/45.7

W-Series

Description	Specification
RATINGS	
Rated Maximum Voltage	24 kV
Rated Nominal Voltage (phase to ground)	21 kV
Rated Continuous Current	400 A
Fault Make Capacity (rms)	6 kA
Fault Make Capacity (Peak)	15 kA
Power Operating Time (Close/Open)	0.1/0.05 s
Mechanical Operations	10,000
Rated full load operations	10,000
Short time current	6 kA
BREAKING CAPACITY	
Mainly Active (0.7pf)	400 A
Fault Break Capacity	6 kA
Cable Charging	25 A
Line Charging	5 A
Transformer magnetizing	22 A
LIGHTNING IMPULSE WITHSTAND LEVEL	
Phase to Earth	125 kV
Across Interrupter	125 kV
POWER FREQUENCY WITHSTAND VOLTAGE	
Phase to Earth	60 kV
Across Interrupter	60 kV
SERVICE CONDITIONS	
Ambient Temperature ^a (°C)	-30 to 50
Ambient Temperature ^a (°F)	-22 to 122
Radiation (Max)	1.1 kW/m ²
Humidity	0 to 100%
Altitude meters (Max) ^b	3000
Altitude feet (Max) ^b	9840
NET WEIGHTS	
Circuit breaker with pole mount bracket (kg/lbs)	75/165
Control cubicle with control cable (kg/lbs)	41/90
Gross Weight of crate (kg/lbs)	196/432
CRATE DIMENSIONS	
Width (mm/in.)	1150/45.3
Depth (mm/in.)	1150/45.3
Height (m/in.)	57/22.4

ADVC Controller Series

ADVC Controller Overview

Overview

Advanced protection, data logging, and communications capabilities are made possible by the technology housed in the ADVC Controller.

It has been designed especially for outdoor pole mounted operation and is typically mounted low on the pole for ease of access by operation personnel.



ADVC ULTRA (with flexVUE)



ADVC COMPACT (with setVUE)

Function

With a cubicle designed to minimise temperature rise from solar heating, the 304 (**COMPACT**) or 316 (**ULTRA**) grade stainless steel enclosure or enclosed in a mild steel enclosure coated with zinc rich epoxy and special powder paint system (**LITE**) is used to mount the Control and Protection Enclosure (CAPE), Power Supply Unit (PSU), customer accessories and Operator Interface.

The ADVC Controller Series incorporates the functions of a multi-function protection relay, a circuit breaker controller, a metering unit, and a remote terminal unit.

Batteries are carefully located underneath these modules to help avoid overheating so that a battery life of up to 5 years ⁽¹⁾ can be achieved. A vandal resistant lockable stainless steel door, sealed with a rubber gasket, provides access to the Operator Interface. Vents are screened against vermin entry and the electronic parts are enclosed in a sealed die-cast enclosure which help protect them from entry of moisture and condensation for a long lifetime.

The **COMPACT** cubicle is suitable for temperatures from -10 to 50 °C, while the option of a battery heater in the **ULTRA** and **LITE** cubicle extends its operating temperature range from -40 to 50 °C.

A built-in microprocessor controlled power supply provides uninterrupted operation of not only the circuit breaker and controller, but also the communications radio or modem. These accessories are connected to a built-in user programmable radio power supply. Therefore no other power supplies are required for connection into your SCADA or Distribution Automation System.

Due to careful design the efficiency of the parts is high, allowing a battery hold up time of up to 48 hours (2). The architecture used has the advantage that the circuit breaker operation is independent of the high voltage supply, relying on a set of capacitors charged by the auxiliary supply.

Due to sophisticated power supply management techniques, a circuit breaker operation will operate when attempted and alarms are raised over the telemetry when auxiliary power is lost.

Communications equipment can be mounted within the ADVC Controller cubicle. RS-232 and Ethernet TCP/IP are provided as standard to support the of your communications needs.

The ADVC Controller series is available in three models:

- **ULTRA**
- **COMPACT**
- **LITE**

The following table outlines some of the differences between the two models:

	ULTRA	COMPACT	LITE
Enclosure	316 stainless steel	304 stainless steel	Mild steel coated with zinc rich epoxy and special powder paint system
Door locking	Three-point	Two-point	Three-point
Customer accessory tray	Side tray Upper tray	Side tray only	Side tray Upper tray
Input/Output modules	8 inputs, 8 outputs Optional	N/A	8 inputs, 8 outputs Optional
Battery heater	Optional	N/A	Optional
Battery	7 Ah or 12 Ah	7 Ah	7 Ah or 12 Ah
Temperature range	-40–50 °C With battery heater option	-10–50 °C	-40–50 °C With battery heater option
Auxiliary power supply	115/230 Vac	115/230 Vac	115/230 Vac
Dual AC power supply	Optional	N/A	Optional
VT power via switchgear	Optional	Optional	Optional
DC power supply	Optional	N/A	Optional

NOTE: 1. Battery replacement interval is influenced by environmental temperature.

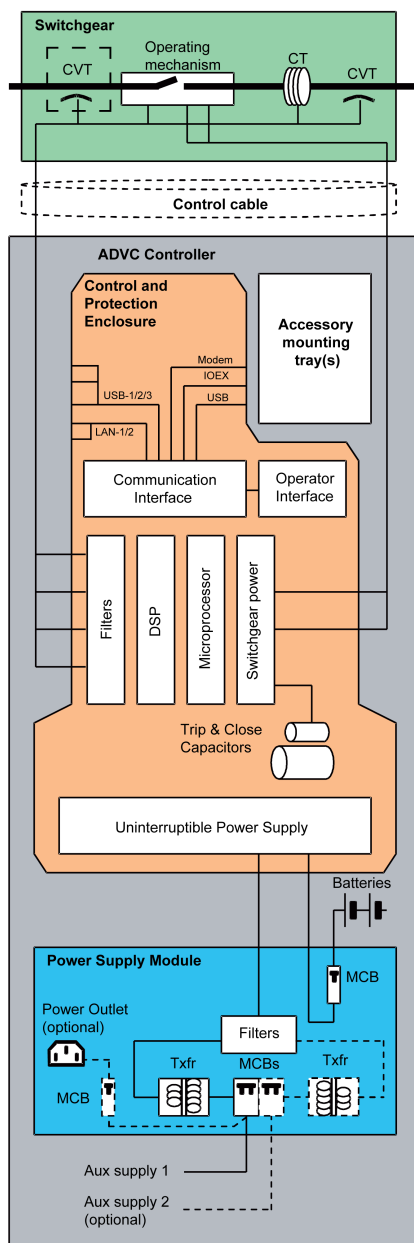
2. With optional 12 Ah battery, panel off and without communications devices operating.

ADVC Features

ADVC Block Diagram

Schneider Electric automatic circuit reclosers provide many outstanding advantages to the user.

New and innovative features have been made possible by the intimate way the pole-mounted circuit breaker and control cubicle work together. The ADVC block diagram shows how the two items are interfaced.



ADVC Controller block diagram

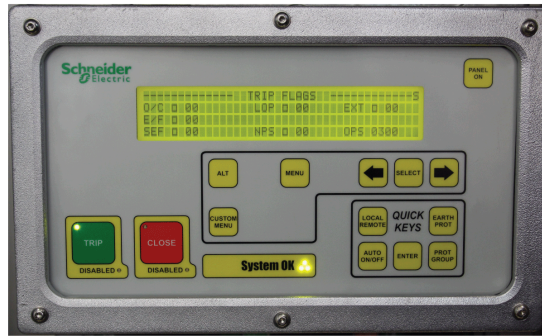
ADVC Features

Special extended range current transformers provide a range from 1 A –12,500 A for measurement and protection. Embedded voltage screens accurately image the primary voltage value and phase relationship at the analog front end, allowing measurement of voltage, current, power factor and frequency in the electronic module.

Two different Operator Interfaces are available, these are:

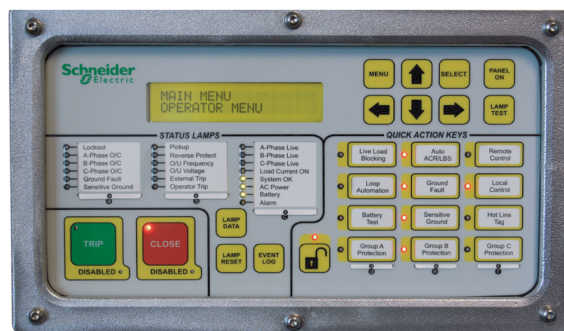
- **serVUE** Operator Interface

- Based on the field-proven operator panels in the previous controllers, this menu-driven interface with large LCD display offers a familiar look and feel.



setVUE Operator Interface

- **flexVUE Operator Interface**
 - 20 Status Lamps provide a quick snapshot of the protection and controller status.
 - 12 Quick Action Keys are available to execute frequently used actions such as “Remote control” ON/OFF, “RECLOSE” ON/OFF, and so on. Each key has its own status lamp to indicate the ON/OFF state.
 - The Status Lamps and Quick Action Keys are customizable.
 - It is possible to access Event and Measurement data and modify settings.



flexVUE Operator Interface

Telemetry Interface

The Schneider Electric ACR can be interfaced to your SCADA system through its RS-232 ports and a modem of your choice. Ethernet TCP/IP are also available. A variable voltage uninterrupted power supply is included for the radio or modem, which can be mounted inside the communications cubicle. Many telemetry protocols can be supported such as DNP3 and IEC 60870-5-101/104.

Computer Interface

WSOS is an advanced personal computer-based software package to allow off-line and on-line programming, monitoring, and control of a recloser via a USB port, RS232 port, or Ethernet.

Remote Control

The ADVC offers an impressive list of communication ports for use in remote control applications:

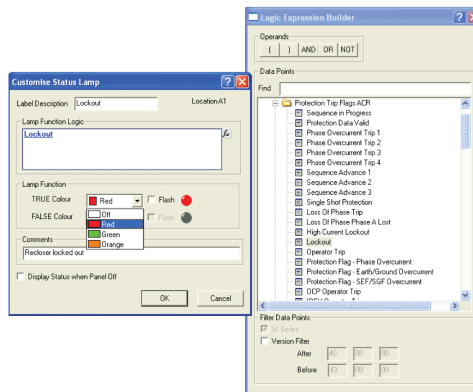
- 2 x RS-232
- 2 x 100Base-T Ethernet port
- 3 x USB (Type A)
- 1 x USB (Type B)

flexVUE Operator Interface

Overview

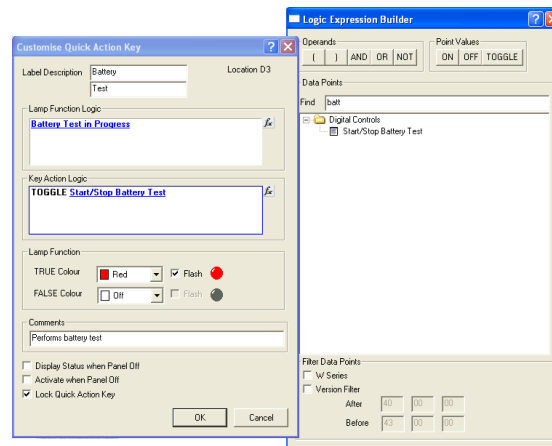
The **flexVUE** Operator Interface uses Light Emitting Diodes (Lamps) and an LCD display to communicate the system status to a local operator. Operator actions that are performed on a regular basis can be mapped to 12 dedicated buttons on the interface.

Each of these buttons also have a lamp to indicate the ON/OFF state of each action. Together with the 20 status lamps the panel provides no less than 32 three-color LEDs that display the state of the controller and overhead system. On the interface, the action buttons are grouped together and referred to as Quick Action Keys. The status LEDs are also grouped together and referred to as Status Lamps.



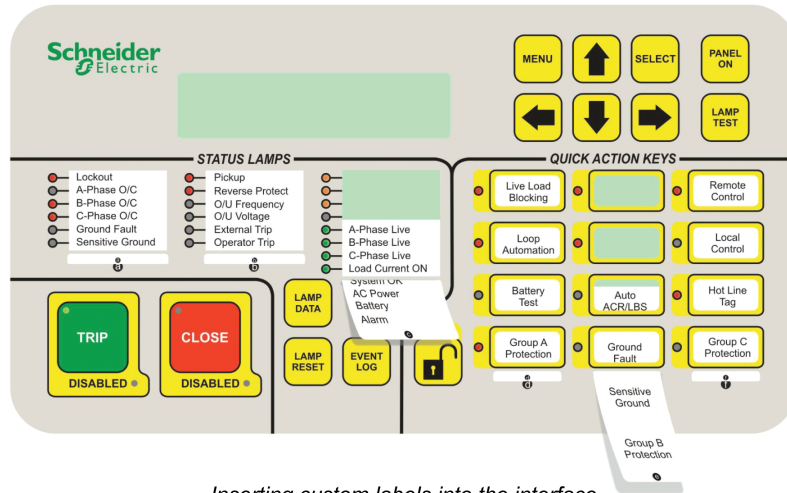
Example of building the logic function for a Status Lamp

Every controller is programmed with a standard configuration of Status Lamps and Quick Action Keys: text labels are used to mark the function of each. These labels are inserted into special pockets within the **flexVUE** Operator Interface and can be changed in the field if required.



Example of setting the action keys

A graphical panel configuration tool is provided as part of the WSOS 5 software package that allows full customization of the **flexVUE** Operator Interface, if required. With the tool, you can create your own logic functions driving the Status Lamps, as well as modify the actions linked to each Quick Action Key. New labels can be printed from the WSOS template using standard office stationery, cut to size and inserted into the controller.



Inserting custom labels into the interface

Switchgear Operating System software

WSOS

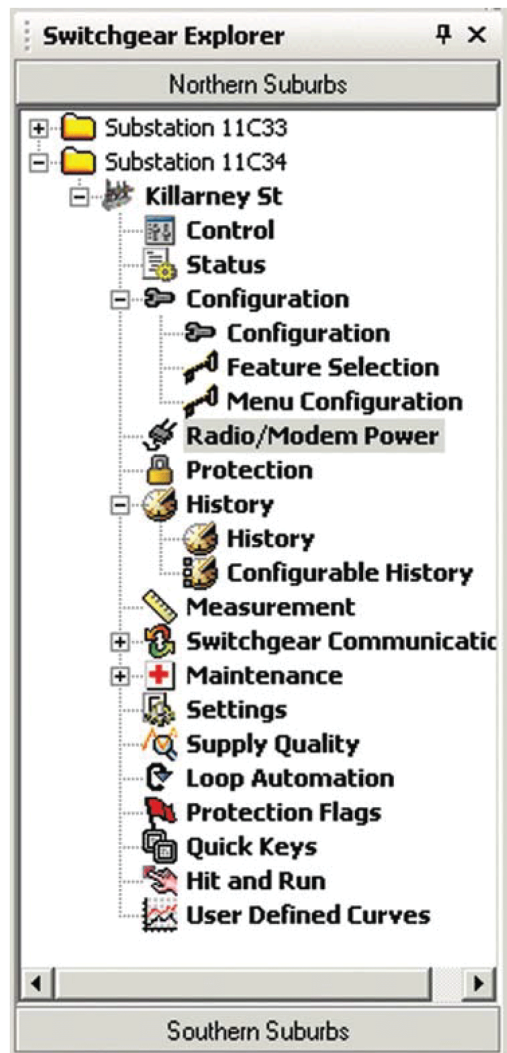
Overview

WSOS is the Schneider Electric Switchgear Operating System software. It provides easy access to the switchgear functions from opening/closing, through configuring protection and communication parameters to accessing measurement and analytical data.

By using a PC, engineers can manage many reclosers either remotely via a communications link or locally via a USB, serial port, or Ethernet connection.

Description

WSOS Version 5 integrates Schneider Electric's field proven Windows-based switchgear operating system and its powerful features and tools, developed over many years, into a modern desktop. The desktop includes the Switchgear Explorer to organise your switchgear the way you like it and the Launch Pad for handy links to online help, getting started, updates, and much more. Controlling, configuring, and accessing valuable switchgear data from a local or remote location is now even easier than before.



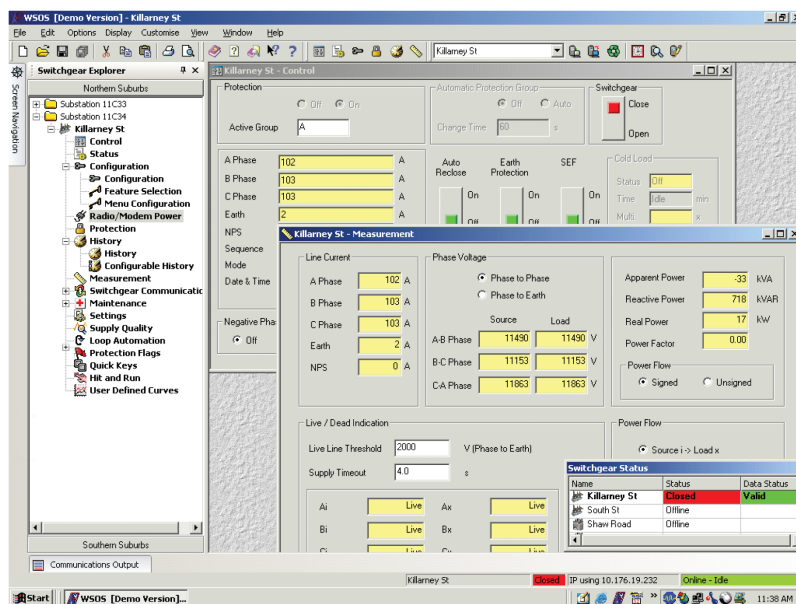
Switchgear Explorer window

Local and Remote Control

- Switchgear operation
- Protection group selection
- Protection group copy
- NPS on/off/alarm control
- Auto reclose, earth protection and SEF on/off control
- Work tag, low gas, and lockout on/off control
- Configurable Input/Output Expander (IOEX)
- Configurable quick keys
- Configurable delay for local Open and Close operations (Hit and Run)
- Configurable SCADA protocols:
 - DNP3.0 is included as standard

Communication Options

- Local USB port
- Local RS-232 port connection
- GSM
- DNP3
- TCP/IP
- Communications output capture



Example of the WSOS5 desktop

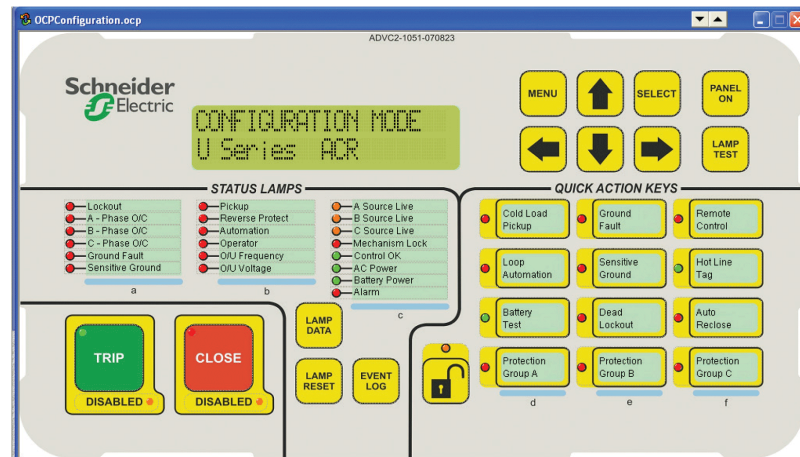
Measurement Screens

- Three-phase, earth, and sequence current
- Phase voltages:
 - Phase to phase
 - Phase to earth, and
 - Sequence voltages
- Sequence voltages
- Apparent, reactive, and real power
 - Total, and
 - Per phase

- Power factor
- Signed or unsigned power
- Frequency
- Power quality toolkit:
 - Waveform capture
 - Harmonics

Interface Configuration

- Status lamps:
 - Logic function to indicate; and
 - Separate true/false state color configuration
- Quick Action Keys:
 - Customize actions assigned to each key;
 - Custom logic functions for lamp indication; and
 - Separate true/false color configuration
- Print labels to insert into operator interface



Panel Configuration Tool

NOTE: U-series shown on the screen is for representation purposes only.

Other Features

General Protection Features

Operating Sequence

Reclose times are individually selectable. The operating sequence is defined by:

O - 1st rt - CO - 2nd rt - CO - 3rd rt - CO

Where rt = reclose time

Where O = open

where C = close

Reclose Times

1 st Reclose Time range	0.3–180 s
2 nd Reclose Time range	2.0–180 s
3 rd Reclose Time range	2.0–180 s
Timing resolution	0.1 s

Sequence Reset Time

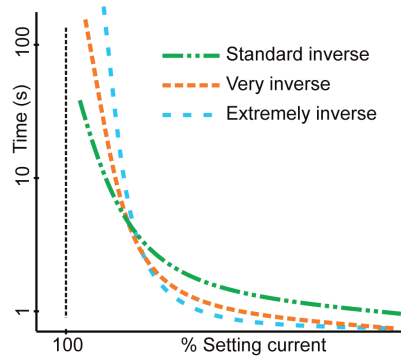
Sequence Reset Time	3–180 s
Timing resolution	1 s

Trips to Lockout

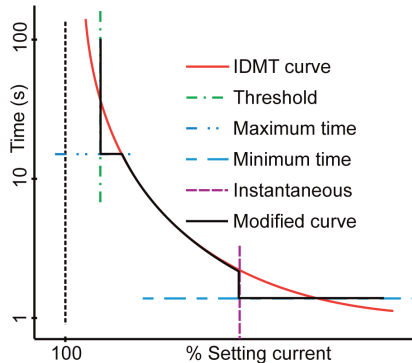
Overcurrent and fault trips to lockout are selectable from 1–4. A separate setting is available for Sensitive Earth Fault and Negative Phase Sequence.

Inverse time Curves

Three IEC60255 curves	Inverse Very Inverse and Extremely Inverse
Three IEEE C37.112 Inverse Time curves	Moderately Inverse Very Inverse and Extremely Inverse
4 2 Non-Standard Inverse Time Curves	Refer to the Operating Manual for a full listing.



Inverse time curves



Modified curve

Instantaneous Protection

Instantaneous protection works by tripping the recloser if the line current exceeds the Instantaneous Multiplier x Setting Current.

Multiplier range	1–30
Resolution of setting	0.1
Max. effective setting	12.5 kV

Definite Time Protection

Definite Time is an alternative to Inverse Time protection. It works by tripping the recloser at a fixed time after pick-up.

Setting current range	10–1260 A
Definite time resolution	0.1 s
Definite time range	0.01–100 s
Setting current resolution	1 A

Sensitive Earth Fault (SEF)

SEF causes the recloser to trip when the earth current rises above a set level for longer than the set time.

SEF trip current range	1–80 A
SEF operating time range	0.1–999 s
SEF trip current setting resolution	1 A
SEF operating time resolution	0.1 s

Inrush Restraint

Inrush restraint raises the phase and earth threshold currents for a short period to allow for short duration inrush currents when closing onto a load.

Multiplier range	1–30
Multiplier resolution	0.1
Time range	0.05–30 s
Time resolution	0.05 s

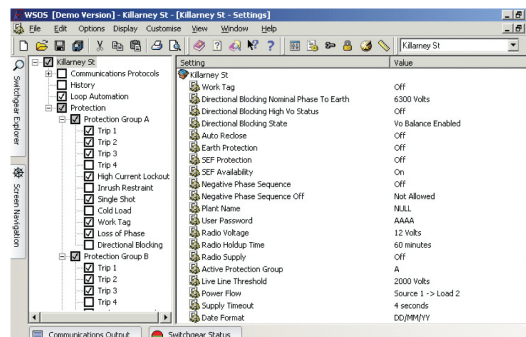
Cold Load Pick-up

Cold load pick-up allows for a loss of diversity when a load has been without supply for a period of time.

Multiplier range	1–5
Multiplier resolution	0.1
Time Constant range	1–480 min
Time Constant resolution	1 min

Multiple Protection Groups

The ADVC supports up to 10 Protection Groups, each of which can be configured with separate protection characteristics with different inverse time curves and setting currents. The number of protection groups available to the operator can be configured using WSOS, thereby restricting or enabling access to protection settings as required.



WSOS offers a quick, easy way to configure the protection groups.

Automatic Protection Group Selection

Automatic Protection Group Selection is used to modify the protection group depending on the direction of power flow. This allows the recloser to be correctly graded with devices downstream regardless of the power flow direction.

Loss of Phase

Loss of phase protection trips the recloser if phase-ground voltage on one or two phases falls below a set voltage threshold for a set length of time.

Threshold voltage range	2–15 kV
Voltage resolution	1 V
Time range	0.1–100 s
Time resolution	0.1 s

Live Load Blocking

Live load blocking prevents a recloser from closing if any of the load side terminals are live.

The Live Load threshold voltage range is 2–15 kV.

Lockout

Lockout prevents a reclose unless one or more of the source side or load side terminals are live. If all terminals are dead, then the controller goes to lockout.

Advanced Protection Features

Directional Blocking

Directional blocking is a protection feature that restricts tripping on event to a designated side of the recloser. It prevents nuisance tripping if particular network conditions are causing “false” ground event. In radial systems, Directional Blocking prevents nuisance tripping by blocking event in the source direction and only responding to event in the load direction.

Directional Protection

Distinct protection for event in the forward and reverse direction. A forward event may use a different time-current curve and settings to a reverse event (that is, these are individually selectable). Both the forward protection and reverse protection are operating at the same time. This is an additional protection feature.

Sequence Components

Negative, positive and zero-phase sequence currents and voltages can be monitored and logged.

In addition, the negative phase sequence current protection can be used for detection of low-level phase-to-phase event in the presence of high-level three-phase loads. Inverse Time, Definite Time, and Instantaneous operation is available.

The setting current range is 10–1260 A.

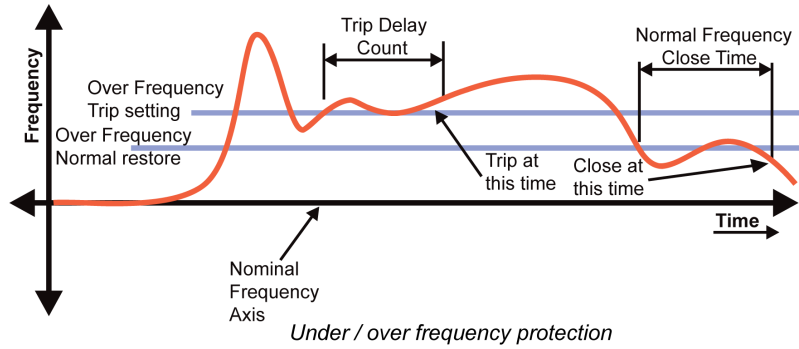
Sequence Coordination

Sequence coordination allows a recloser to coordinate its trip sequence with another recloser downstream.

Under/Over Frequency Protection

This feature trips the recloser when the system frequency exceeds the under and over frequency trip threshold values. Frequency tripping range: 45–65 Hz.

Frequency calculation	Once / cycle over a two cycle period
Number of under/over frequency cycles before tripping	2–1000
Accuracy	±0.05 Hz



Under / Over Voltage Protection

When selected, and a nominal Phase to Ground System operating voltage is set, the UOV Protection works within a defined threshold above and below the specified voltage.

Under / Over Voltage Protection, Group A (Active)			
Under Voltage Trip	<input type="checkbox"/> Off	Over Voltage Trip	<input type="checkbox"/> Off
Under Voltage Trip At	<input type="text" value="80"/> %	Over Voltage Trip At	<input type="text" value="120"/> %
Under Voltage Trip After	<input type="text" value="20.0"/> s	Over Voltage Trip After	<input type="text" value="10.0"/> s
Under Voltage Phase Logic	<input type="text" value="Average"/>	Over Voltage Phase Logic	<input type="text" value="Average"/>
Normal At	<input type="text" value="90"/> %	Normal At	<input type="text" value="110"/> %
Nominal Phase To Earth	<input type="text" value="6300"/> Volts	Recovery Time Out	<input type="text" value="OFF"/> s
Normal Voltage Close	<input type="checkbox"/> Off	Excess Sequences At	<input type="text" value="0"/>
Normal Voltage Close After	<input type="text" value="10"/> s	Excess Sequences Within Last	<input type="text" value="0"/> Mins

Under Voltage Lower Threshold Range	50–80%
Over Voltage Upper Threshold Range	112–150%
Trip After X secs Range	0–60 s
Phase Logic	<ul style="list-style-type: none"> • AND: When ALL phases deviate beyond thresholds • OR: When ANY phase voltage deviates beyond the thresholds • AVERAGE: When the numerical AVERAGE of all phase Voltages deviates beyond the threshold.

Measurement Features

Voltage and Current

True RMS voltage is measured on the three I-Side terminals. A user configured threshold indicates live terminal. RMS current is measured on three phases (reading 2–630 A).

Optional external Capacitive Voltage Transformers (CVTs) can be fitted to measure the voltage on the other three (X-Side) terminals. External CVTs can be purchased at the time of your order or can be added to an existing installation when required. The external CVTs are mounted onto a cross-arm adjacent to the recloser and the secondaries are connected to the SCEM card located in the base of the recloser.

Real Power (Signed or Unsigned)

Real power is determined by multiplying the line voltage and line current in real time and averaging over 2 seconds (accuracy ±5% of reading, within limits of V and I above).

Power and Power Factor

The ADVC Controller measures kW, kVA, kVAR, and power factor on a per-phase basis.

The power factor of the line is determined from the line voltage and the line current phase relationship and the previously calculated real power (accuracy $\pm 5\%$ of reading, within limits of V and I above).

Default Historical Measurements

Power flow is integrated over 5, 15, 30, or 60 minute intervals (kWh) and recorded for a period of two months from the date of the event. This can be viewed on the operator control panel, computer, or compatible SCADA system. Additionally, data can be uploaded into a portable computer or a compatible SCADA system.

Configurable Historical Measurements

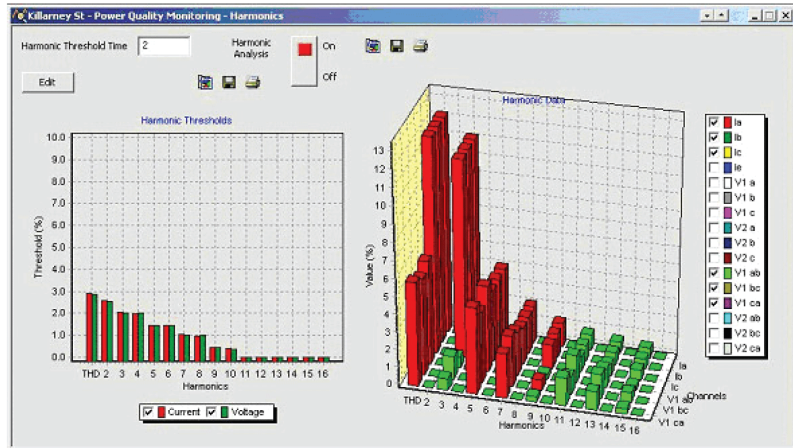
Average demand profiles may be configured using WSOS. Customised configuration enables the user to specify only the parameters that are required, negating unnecessary information capture. Parameters such as line voltages and currents, power, kWh, battery voltage, THDi, THDv, and cubicle temperature can be recorded in intervals selectable 1–1,440 min.

Event History

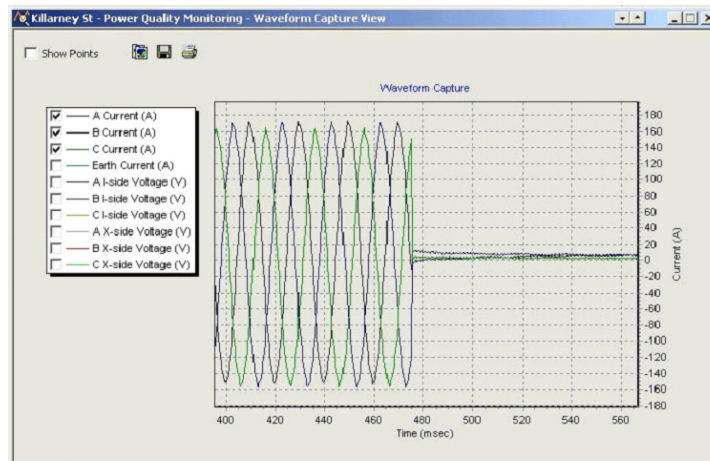
Maximum number of typical events stored in the event history is 100,000 events.

Power Quality Toolkit

- **Supply Outage Measurement**
 - The Supply Outage Measurement feature utilises built-in recloser features to record the number and duration of outages. These statistics are recorded in the controller and are available to the Utility to help calculate system outage customer minutes.
 - The controller records the cumulative total number of outages, cumulative total outage duration, and the time and duration of each outage event in the Event Log.
 - These records are accessible to the user and can be retrieved using the operator control panel, WSOS, or a SCADA System.
- **Harmonic Analysis**
 - Harmonics 2 to 16 and the Total Harmonic Distortion (THD) are calculated over a 80 ms period for four currents, six line-line voltages, and six line-earth voltages. These harmonics are available via WSOS
- **Waveform Capture**
 - Based on a user defined trigger, the ADVC captures and stores in non-volatile memory scaled raw data (10 x 3200 samples per second) of the six line-earth voltages and four currents for a predefined time window either side of a user-defined trigger.
 - The user can configure a pre and post trigger time ratio for data to be stored. This event to 50% pre-trigger and 50% post-trigger.
 - The captured data can be uploaded at anytime in COMTRADE (IEEE Std C37.111-1999) format via WSOS.



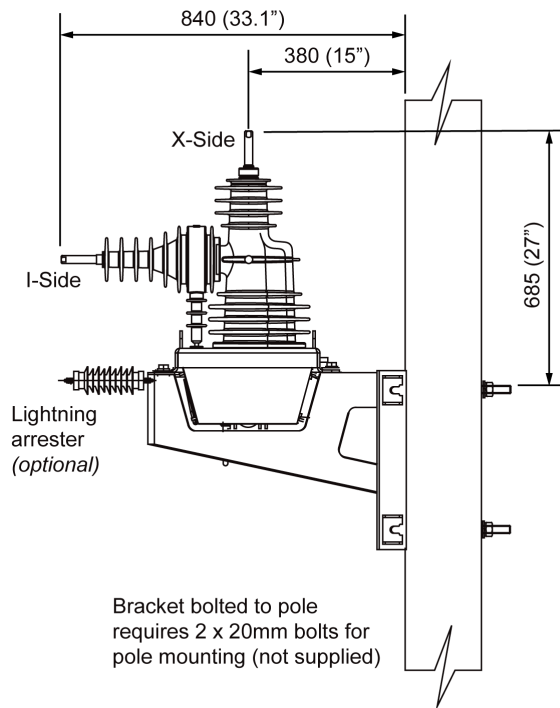
Harmonic analysis



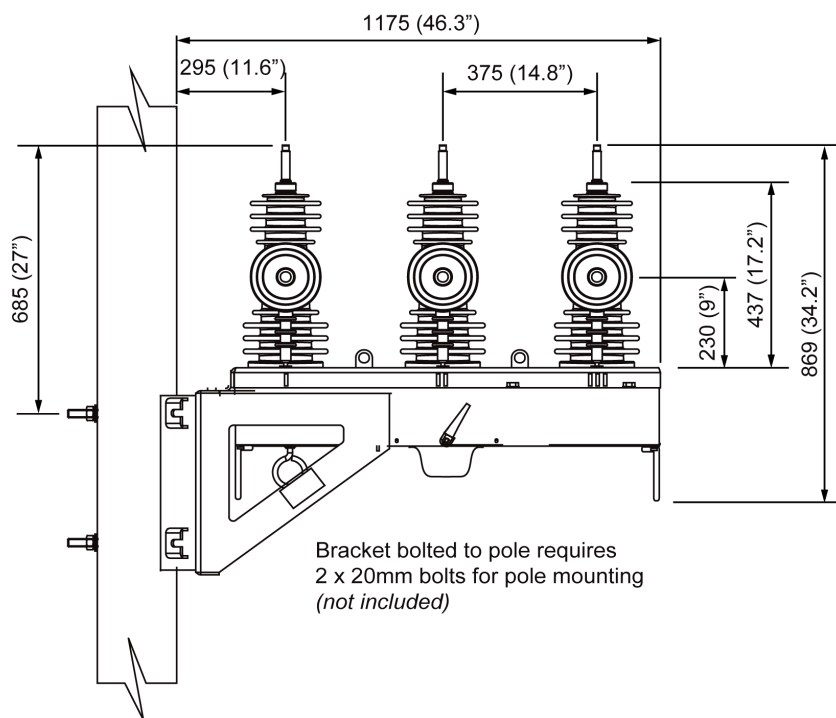
Waveform capture

Pole Mounting Details

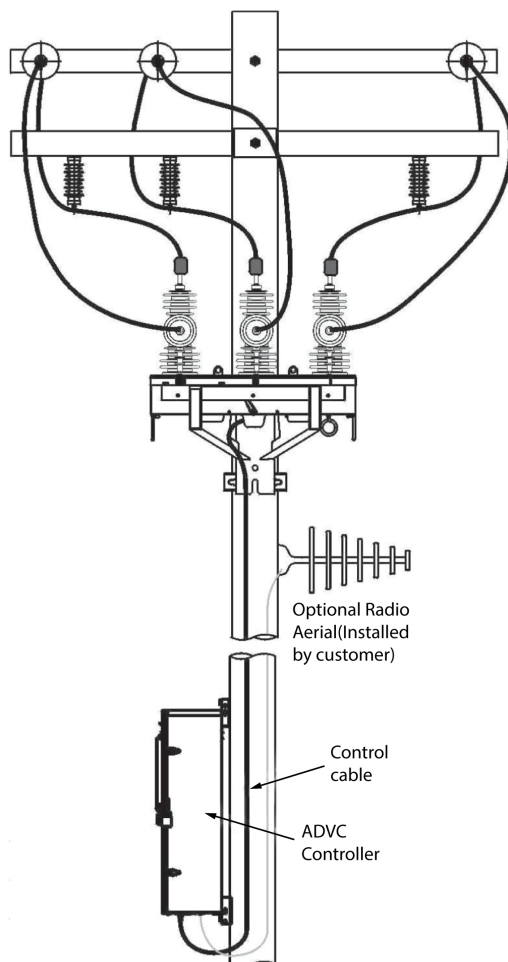
U-Series Recloser



Side view of Mid-point mounting arrangement



Side view of End mounting arrangement



Pole mounted U-Series recloser with ADVC Controller

NOTE:

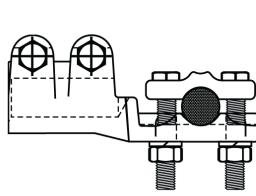
- Details given in this illustration are subject to change without notice. For full details, refer the Installation Manual.
- Grounding connections are not shown and are to be in accordance with the Installation Manual.
- Recloser can be mounted closer to pole if lightning arresters are pole mounted.
- Optional substation mounting frame available on request.

Accessories

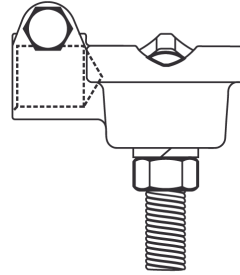
Below are the various accessories available:

- **Cable Connectors:**

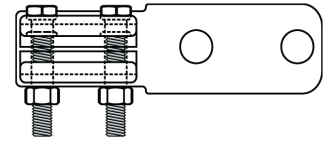
Connections are made to the bare recloser terminals using crimp lugs, parallel groove clamps, or stud connectors. This arrangement is suitable for connection into an insulated or bare conductor system, as appropriate



630-30TP stud connector

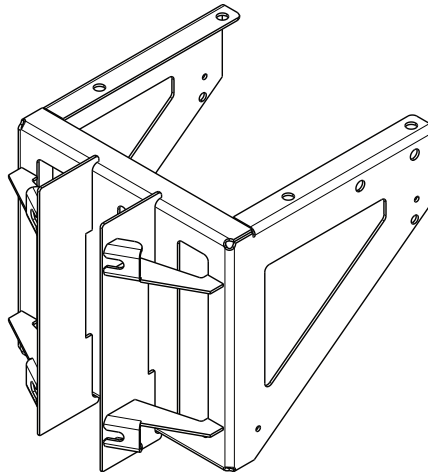


400-15TP stud connector

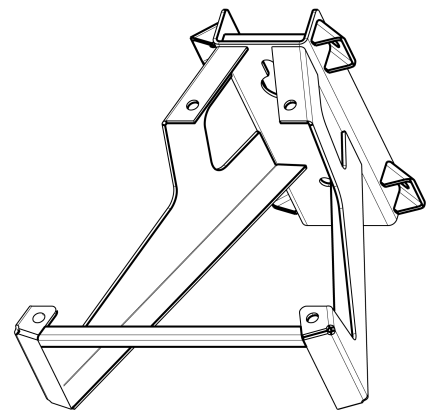


HJ connector

- **Mounting Brackets:**

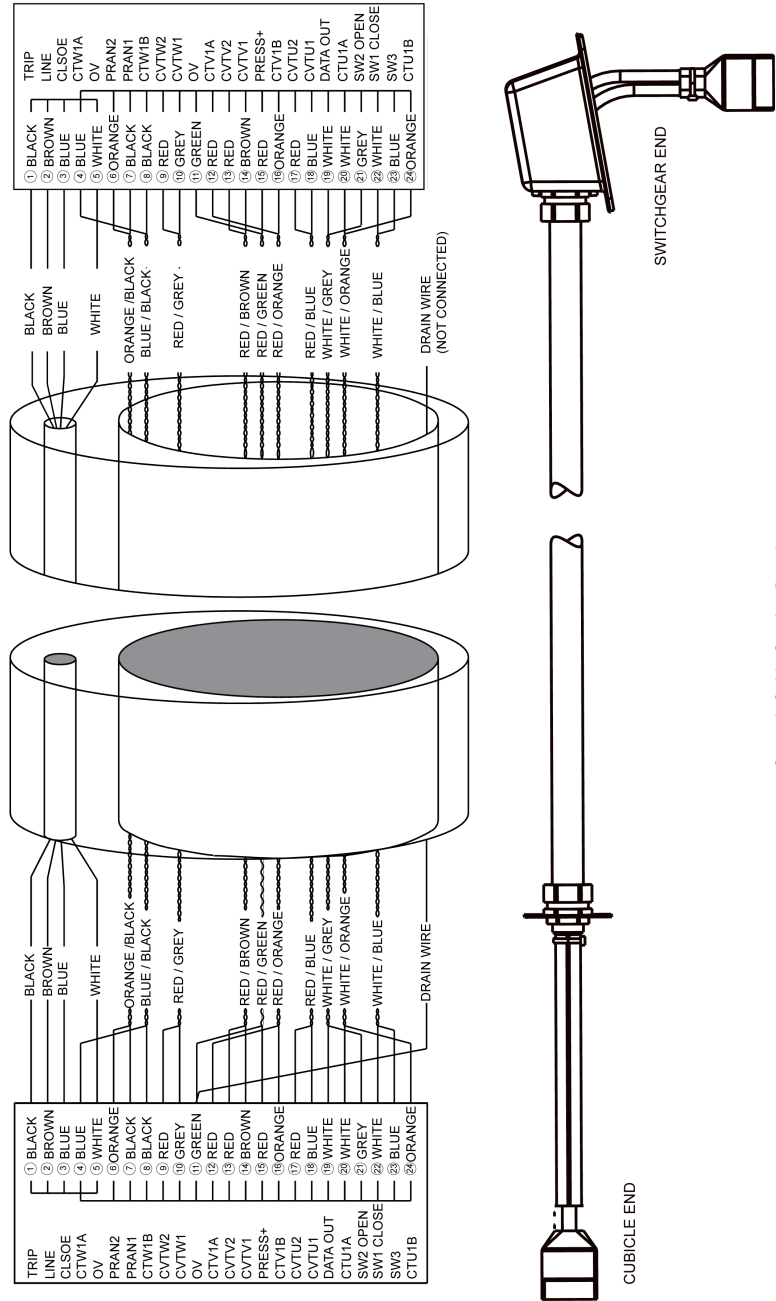


End mounting



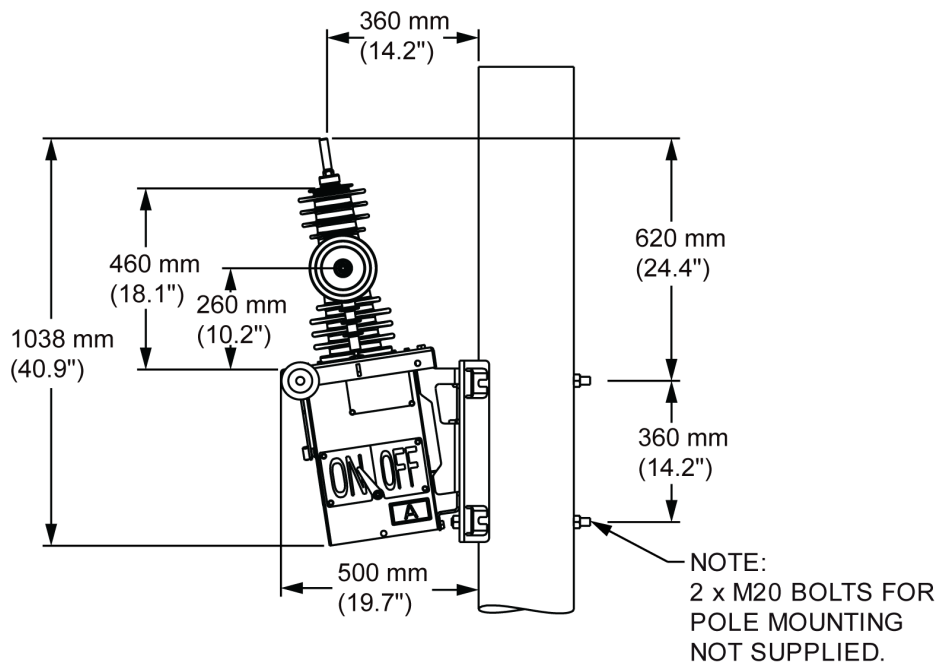
Center mounting

• **Control Cable:**

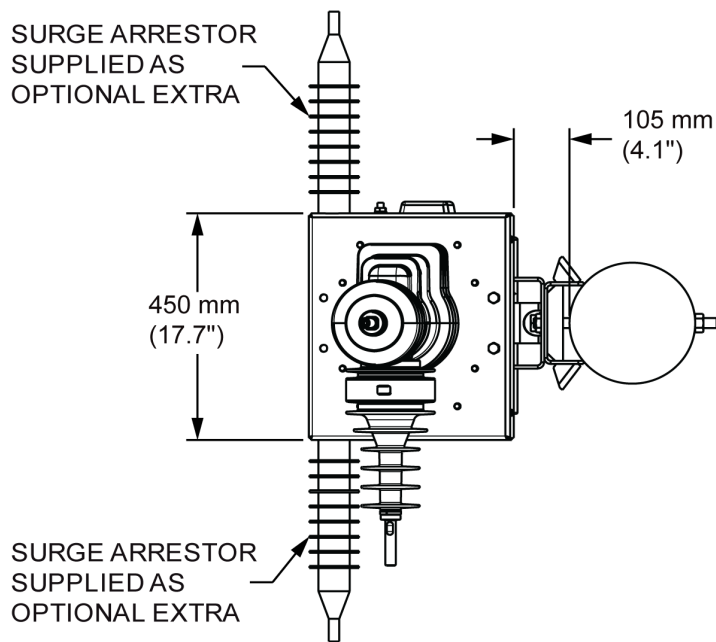


Control Cable Service Drawing

W-Series Recloser



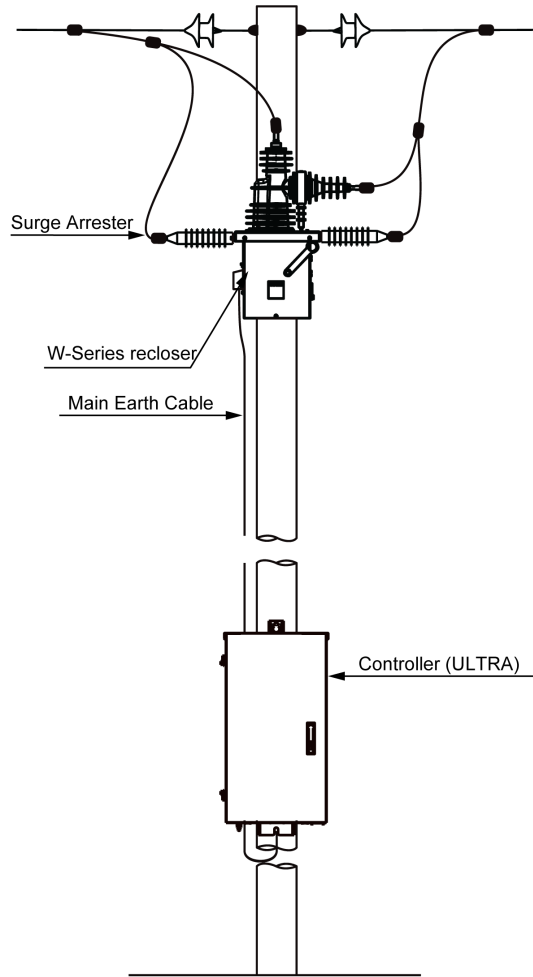
Side view of W-Series mounting arrangement



Overhead view of W-Series mounting arrangement

NOTE:

- Details given in this illustration are subject to change without notice. For full details, see the Installation Manual.
- Grounding connections are not shown and are to be in accordance with the Installation Manual.



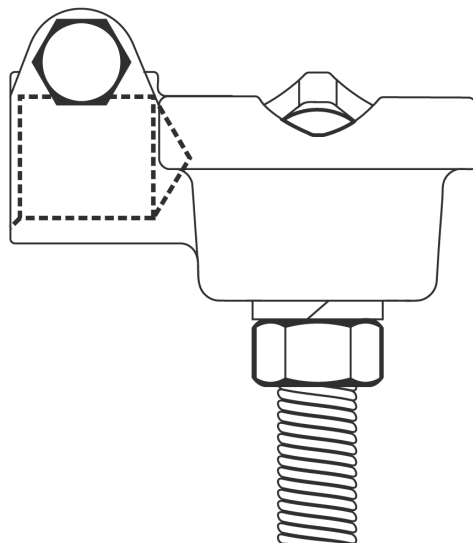
Pole mounted W-Series recloser with ADVC Controller

Accessories

Below are the various accessories available:

- **Cable Connectors:**

Connections are made to the bare recloser terminals using crimp lugs, parallel groove clamps, or stud connectors. This arrangement is suitable for connection into an insulated or bare conductor system, as appropriate.

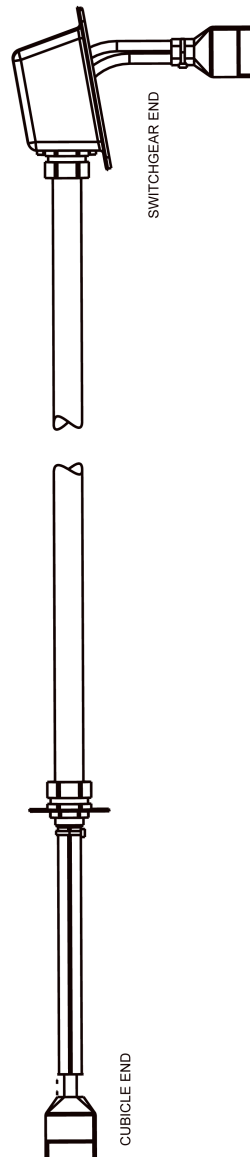
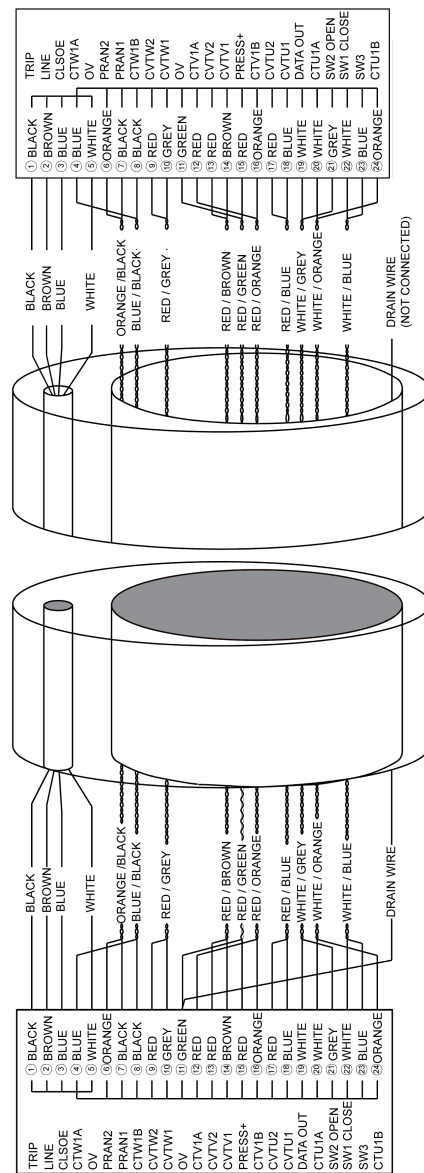


400-15TP stud connector

• **Mounting Brackets:**



• **Control Cable:**



Control Cable Service Drawing

Appendices

What's in This Part

Required details for order.....	40
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




Required details for order

What's in This Chapter

ADVC Controller 40
 Required details for order 41

ADVC Controller

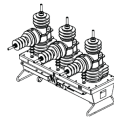
Only one of the boxes (ticked or filled) with the required value) have to be considered between each horizontal line.
 Red Circle lead-time should be requested from your distributor.

ADVC Controller		Quantity <input type="text"/>	
Model <i>(Features Highlighted are only available on ULTRA)</i>		COMPACT <input type="checkbox"/>	ULTRA <input type="checkbox"/>
Operator Interface (O.I.)		setVUE  <input type="checkbox"/>	flexVUE  <input type="checkbox"/>
Ambient Temperature (°C)		Standard -10°C to 50°C <input type="checkbox"/>	Extended With Battery Heater -40°C to 50°C <input type="checkbox"/>
Auxiliary Supply Type		Single AC Supply: 115 Vac <input type="checkbox"/> 230 Vac <input type="checkbox"/>	add 27.8 Vac Integrated Supply to above <input type="checkbox"/>
		Dual AC <input type="checkbox"/>	DC Supply <input checked="" type="checkbox"/>
Maximum Battery Hold Up Time		28 Hours <input type="checkbox"/>	48 Hours <input type="checkbox"/>
Language		English <input type="checkbox"/> US English <input type="checkbox"/>	Spanish <input checked="" type="checkbox"/> Portugese <input checked="" type="checkbox"/>
Standard Protocol		MODBUS <input type="checkbox"/> IEC <input type="checkbox"/>	DNP3 <input type="checkbox"/>
Accessories <i>(Additional Costs May Apply)</i>			
FTIM <i>(Ultra FTIM cable only)</i>		Not Applicable <input type="checkbox"/>	Yes <input checked="" type="checkbox"/>
IOEX		Not Applicable <input type="checkbox"/>	Yes <input checked="" type="checkbox"/>
General Purpose IEC Socket		Not Applicable <input type="checkbox"/> Yes <input type="checkbox"/>	
GPO 10A max. <i>Only with IEC Socket</i>			
None <input type="checkbox"/>	AUS  <input type="checkbox"/>	EU-A  <input checked="" type="checkbox"/>	EU-B  <input checked="" type="checkbox"/>
Other <input type="checkbox"/>	UK  <input checked="" type="checkbox"/>	USA  <input checked="" type="checkbox"/>	Sth Afric  <input checked="" type="checkbox"/>

Special notes *(For other available Accessories, contact local suppliers)*

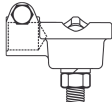
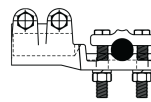
Required details for order

U-Series Recloser (U15 and U27)



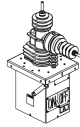
Only one of the boxes (ticked or filled with the required value) have to be considered between each horizontal line. Red Circle lead-time should be requested from your distributor.

Certain configurations may attract additional cost. To clarify these details, please consult your local distributor.

Circuit Breaker Unit		Quantity <input type="text"/>	
Rating (System Voltage / Interrupt / BIL)		15.5 kV / 12.5 kA / 110 kV <input type="checkbox"/> 27 kV / 12.5 kA / 125 kV <input type="checkbox"/>	
Rated Current (A)		630 A <input type="checkbox"/>	
Frequency		50 Hz Standard <input type="checkbox"/> 60 Hz Standard <input type="checkbox"/>	
Sensitive Earth Fault Rating		4 - 20 A <input type="checkbox"/>	
Language		English <input type="checkbox"/> Spanish <input checked="" type="radio"/> Portugese <input type="checkbox"/>	
Accessories			
Mounting Arrangement		Pole Mount: Centre Mount <input type="checkbox"/> End Mount <input type="checkbox"/> Substation Frame: Adjustable <input checked="" type="radio"/> Fixed <input type="checkbox"/>	
Concrete Pole Clamps		Not Applicable <input type="checkbox"/> 230 - 270 mm <input type="checkbox"/> 270 - 310 mm <input type="checkbox"/> 310 - 360 mm <input type="checkbox"/>	
Control Cable Length		4 Metres <input type="checkbox"/> 7 Metres (Default) <input type="checkbox"/> 11 Metres <input type="checkbox"/> 20 Metres <input type="checkbox"/> Other <input checked="" type="radio"/> <input type="text"/>	
Options			
Medium Voltage Terminal Options (Set of 6)		Bare Terminal 630 A <input type="checkbox"/> 15TP Connector 400 A <input type="checkbox"/> 30TP Connector 630A <input type="checkbox"/>	
		 	
External Capacitive Voltage Transformers		Not Applicable <input type="checkbox"/> CVTs <input type="checkbox"/>	
<i>Three external CVTs can be added when voltage measurement is required on all six bushings.</i>			
Surge Arrester Brackets		Standard Inclusion <input type="checkbox"/>	
<i>Set of 2 brackets with End Mount option. Only one Centre mount and Substation Options.</i>			
Surge Arresters		Not Applicable <input type="checkbox"/> Surge Arresters <input checked="" type="radio"/>	
VT Mounting		Not Applicable <input type="checkbox"/> Pole Mounted <input type="checkbox"/>	
Dressing (Australia Only)		Not Applicable <input type="checkbox"/> Dressed <input checked="" type="radio"/>	

Special notes

W-Series SWER Recloser (W27)



Only one of the boxes (ticked or filled by the required value) have to be considered between each horizontal line. Red Circle lead-time should be requested from your distributor.

Certain configurations may attract additional cost. To clarify these details, please consult your local distributor.

Circuit Breaker Unit		Quantity <input type="text"/>
Rating (System Voltage / Interrupt / BIL)	24 kV / 6 kA / 125 kV <input type="checkbox"/>	
Rated Current (A)	400 A <input type="checkbox"/>	
Frequency	50 Hz Standard <input type="checkbox"/>	60 Hz Standard <input type="checkbox"/>
Language	English <input type="checkbox"/>	Spanish <input checked="" type="radio"/> Portuguese <input checked="" type="radio"/>
Circuit Breaker Indication	I / O <input type="checkbox"/>	On / Off <input type="checkbox"/>
Accessories		
Mounting Arrangement	Not Applicable <input type="checkbox"/>	Pole Mount <input type="checkbox"/>
Concrete Pole Clamps	Not Applicable <input type="checkbox"/>	230 - 270 mm <input type="checkbox"/> 270 - 310 mm <input type="checkbox"/> 310 - 360 mm <input type="checkbox"/>
Control Cable Length	4 Metres <input type="checkbox"/>	7 Metres (Default) <input type="checkbox"/> 11 Metres <input type="checkbox"/> 20 Metres <input type="checkbox"/> Other <input checked="" type="radio"/> <input type="text"/>
Options		
Medium Voltage Terminal Options (Set of 2)	15TP Connector 400 A <input type="checkbox"/>	Bare Terminal 400A <input type="checkbox"/>
Surge Arresters	Not Applicable <input type="checkbox"/>	Surge Arresters <input checked="" type="radio"/>
Voltage transformers (VTs) 27.8 Vac secondary	Not Applicable <input type="checkbox"/>	SWER 12.7 kV <input type="checkbox"/> SWER 19.1 kV <input type="checkbox"/>
VT Mounting	Not Applicable <input type="checkbox"/>	Pole Mounted <input type="checkbox"/>
Dressing (Australia Only)	Not Applicable <input type="checkbox"/>	Dressed <input checked="" type="radio"/>

Special notes

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As standards, specifications, and design change from time to time,
please ask for confirmation of the information given in this publication.

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N00-805-01