



**Ergon Energy Corporation Limited**

# **Technical Specification for Pole Mounted Controllable Automatic Circuit Reclosers for Single Wire Earth Return (SWER) Distribution Systems**

**ETS06-07-02**

# Technical Specification for Pole Mounted Remotely Controllable Automatic Circuit Reclosers for Single Wire Earth Return (SWER) Distribution Systems

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## 1. Purpose and Scope

This specification covers requirements for outdoor pole-mounted single phase auto-reclosers that have programmable protection features and integrated remote operation capability, which are intended for use on the SWER (Single Wire Earth Return) distribution networks at nominal A.C. voltages of 11, 12.7 and 19.1 kV.

## 2. References

### 2.1 Applicable Standards

Unless otherwise specified herein, all equipment shall be designed and manufactured in accordance with the relevant current Australian and overseas Standards including all amendments at the time of calling quotations, in particular:

Standard	Title
ANSI/IEEE C37.60	Requirements for Overhead, Padmounted, Dry Vault and Submersible Automatic Circuit Reclosers and Fault Interrupters for A.C. Systems
AS 1767	Insulating Oil for Transformers and Switchgear
AS 60044.1	Current Transformers for Measurement and Protection
AS 1265	Bushings for Alternating Voltages above 1000 V
AS 2067	Switchgear assemblies and ancillary equipment for alternating voltages above 1 kV
AS 2395	Terminals for Switchgear Assemblies for Alternating Voltages above 1 kV
AS 2650	High Voltage A.C. Switchgear and Controlgear Common Requirements
AS 62271.100	High voltage switchgear and control gear
IEC 60255	Electrical Relays - Parts 5 and 6
IEC 376	Specification and Acceptance of New Sulphur Hexafluoride (plus supplements)

## 3. Drawings

### 3.1 Drawings by the Purchaser

### 3.2 Specification Drawings

The following drawing form part of this specification:

- 06-07-02 - SWER Remotely Controllable A.C.R. General Arrangement

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## 4. Service Conditions

### 4.1 System Conditions

The Auto Recloser shall be suitable for use on SWER distribution networks and under the system conditions as specified in **Attachment 1**.

### 4.2 Environmental Conditions

The Auto Recloser shall be suitable for use under the following environmental conditions:

(a)	<b>Altitude</b>		up to 1000 m;
(b)	<b>Ambient Temperature</b>	Minimum	- 10 °C;
		Maximum	+ 45 °C;
(c)	<b>Maximum Daily Variation</b>		35 °C;
(d)	<b>Rainfall</b>		Tropical storms with rainfall in excess of 2000mm pa
(e)	<b>Lightning Activity</b>		extremely high, Isokeraunic level of 40 thunder days per year
(f)	Pollution - Areas of coastal salt spray and / or industrial pollution with equivalent salt deposit densities in the range 2.0 to 3.0 g/m <sup>2</sup>		
(g)	Wind velocity 210 km per hour		
(h)	Solar radiation does not exceed 1100 /m <sup>2</sup> (which related to a maximum black body temperature of 80) but has a very high ultra violet content		
(i)	Vibrations due to external causes are negligible		
(j)	Extended periods of high relative humidity; in excess of 90%;		

## 5. Design and Construction

### 5.1 General

The Recloser shall have rated characteristics as detailed in the **Attachment 1**. If there are any conflicts between **Attachment 1** and the rest of this document, **Attachment 1** has precedence.

### 5.2 Interrupting Medium

The interrupting medium shall be vacuum.

### 5.3 Insulation Medium

Either oil, SF<sub>6</sub> or epoxy may be used as the phase/earth insulation. Where SF<sub>6</sub> is used the recloser shall be fitted with a pressure indicating/ alarming device which shall:

- (a) Indicate the actual pressure of SF<sub>6</sub> in the tank, or indicate when an alarm condition is reached

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Automatically trip and lock out the recloser if the SF6 pressure falls to a value where any further loss of pressure results in a reduction of insulation levels, below the system maximum voltage.

## 5.4 Housing Materials

The tank shall be manufactured from hot dipped galvanized steel, 316 stainless steel or cast aluminum. Control cubicles shall be manufactured from 316 stainless steel. All support structures and associated bolts and nuts with these parts, shall be hot-dip galvanized.

Suitable precautions shall be implemented to prevent corrosion due to the use of dissimilar materials and gases.

## 5.5 Mounting

The Automatic Recloser shall be suitable for single pole mounting, on concrete or timber poles. All recloser tanks are to be supplied with standard pole mounting brackets fixed to the rear of the tank. The bracket shall be designed to ensure that the recloser live parts have statutory clearances from the pole and the earthed metal equipment. It shall be possible to easily pass a body belt between the pole and the tank.

The brackets and tank wall are to be of adequate strength to limit distortion, when mounted. Both the top and bottom bracket shall be suitable to carry the total weight of the tank on their own.

Mounting brackets shall accommodate M20 pole bolts, and shall be in accordance with **Drawing 06-07-02**.

Adequately rated lifting eyes shall be provided and they shall be designed to allow the completely assembled Automatic Recloser (surge arresters fitted) to be lifted without recourse to a sling spreader. The diameter of the eyes shall be a minimum of 30mm. The Automatic Recloser shall be fitted with feet if necessary, to prevent overturning when placed on a level surface.

The Automatic Recloser shall be fitted with an external M12 earth stud, complete with a nut, lock nut and serrated washer.

A detailed drawing of the single pole Automatic Recloser mounting arrangement with surge arresters fitted should be provided. The minimum phase-to-earth clearance (including clearance to the structure) shall be indicated on the drawing.

Cabinets that house equipment for protection and control shall be mounted independently of the tank.

## 5.6 Pressure Relief

Tank design shall incorporate a pressure relief/rupture mechanism, that is of a non fragmenting design, and designed to vent the pressure away from the operator.

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## 5.7 Control Cabinet

The cabinet shall be designed for the service conditions specified, adequately ventilated and fitted with substantial door securing devices capable of being padlocked by a padlock with a shank of 8mm with the door in the closed position.

It shall be possible to disconnect the cable at the tank while the Automatic Recloser is connected to the power system, without causing damage or maloperation: care shall be taken that CTs are not open circuited. A robust, multipin weatherproof connector shall be supplied. Preference will be given to products supplying connectors at both the tank and the control cabinet.

The equipment housed in the control cabinet shall withstand the heating effect of direct solar radiation without causing failure and/or mal-operation.

The control cabinet shall be mounted below the switchgear tank and shall be connected to the switchgear by a minimum seven metre long multi-core control cable. The multi-core cable shall be ultra violet stabilised and adequately screened against electrostatic and electromagnetic interference, which can cause malfunctioning of the protection or control equipment. This cable shall connect into both the Recloser and the control cabinet by means of plug and socket arrangements. Entry of the control cable into the Control Cubicle shall be from the bottom.

The control cabinet shall have adequate space provisions to mount the Purchasers communications equipment (mobile phone/SAT phone and modem or radio, plus power supplies if need, ref Clause 5.15. (Note: SAT phone type currently used in Ergon Energy is NEC S2).

The cabinet shall make provision for bottom entry of at least two additional cables. The cabinet shall be pre-punched with at least one 21mm and one 32mm hole. The holes shall be suitably blanked off.

The cabinet shall be fitted with an external M12 earthing stud, with a nut, lock nut, and a serrated washer.

## 5.8 Earthing

Provision shall be made to ensure the electrical continuity of all exposed metal. Earthing terminals shall be fitted to all such equipment. An earthing strap shall be provided between the lid and the tank of the switchgear.

The control (umbilical) cable shall be adequately earthed to shield the control equipment against electrical interference.

## 5.9 Surge Arrester Brackets

Brackets shall be attached to the tank (not on the lid), one adjacent to each HV bushing to enable Ergon Energy to mount surge arresters. The surge arrester brackets shall be used as the connection point for the arrester earth. The brackets shall have an unpainted corrosion resistant metal connecting zone which has the capability to conduct surge arrester current. A 14mm diameter hole shall be drilled in the bracket for the arrester mounting.



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The brackets shall be constructed so as to accommodate the mounting of polymeric housed surge arresters. The arresters shall be mounted parallel to and in the same plane as the associated phase insulator. A minimum of 100mm clearance shall be provided between the sheds of the phase bushing and the arrester.

Clearances between the Recloser metalwork and surge arresters shall be as such that phase to ground clearances are achieved.

## 5.10 Markings and Nameplates

Phase identification markings shall be provided on each bushing of the Automatic Recloser in accordance with the table 6.1 of AS 2067. (ie markings U1 on the normal line side and U2 on the normal load side). These markings will be of a quality to remain viewable for the products working lifetime.

A Name plate shall be provided using a non ferrous material or stainless steel, with the following information engraved, indelibly stamped or etched:

- Manufacturers Name
- Manufacturers type or identification no
- Serial No
- Rated maximum voltage
- Rated Continuous current
- Rated interrupting current
- Rated impulse withstand voltage
- Purchaser's structured plant number

The structured plant number will be nominated in the purchase orders to the successful Tenderer, and will be an 8 digit number prefixed by 2 alphas (e.g. RE12345678 for reclosers)

The name plate shall be mounted clear of live parts in a position likely to be readable while the Automatic Recloser is in service without compromising safety of the operator.

## 5.11 Operating Mechanism

The reclosers may use a low voltage system supplied from a battery or voltage transformer to operate a closing mechanism. Tripping energy shall be supplied from a spring mechanism automatically tensioned when the recloser is closed.

Internal batteries used for the above purpose shall not have any dependence on recloser load current to maintain their state of charge.

The recloser shall incorporate provision for an operator to manually open the recloser using a standard operating stick in the event a failure of the electrical control system.

Clear and unambiguous indication shall be provided to an operator standing on the ground as to the status of the recloser main contacts. This shall be by an indicator mechanically linked to the recloser mechanism. which shall be clearly visible to an observer eight metres below the Recloser. Symbols and colours for the indicators shall be a Red "I" or "ON" for ON and Green "O" or "OFF" for OFF. The colours shall remain vivid for the products working life. Painted symbols are unacceptable.

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## 5.12 Maintenance Inspection and Test

The reclosers mechanism and vacuum interrupter shall be designed to be maintenance free.

The control system shall incorporate a system which provides an approximate indication of the life remaining in the vacuum interrupter. This system shall use the measured value of interrupted current and a formulae approved by the vacuum interrupter manufacturer to calculate the remaining life of the interrupter.

Facilities shall be available to allow secondary injection into the protection relay to prove the relay functions. This shall be able to be completed with the recloser in service and live without tripping the recloser.

## 5.13 High Voltage Bushings

Bushings shall be of outdoor type, manufactured and tested in accordance with AS1265. The HV bushings shall be of high quality glazed porcelain, or cyclo aliphatic epoxy resin having a creepage length of not less than that specified in **Attachment 1**. The bushing terminals shall allow for the attachment of copper or aluminum conductors of cross sectional area 10-95 mm<sup>2</sup>.

The source side bushing shall incorporate a measurement voltage transformer to provide indication of the source side voltage.

A dimensioned drawing of the bushing (and boot if applicable) shall be supplied with the tender.

## 5.14 Current Transformers

Suitable current transformers shall be incorporated in the Recloser to provide metering and protection functions as required by this specification.

They shall be of a class and ratio adequate to ensure they do not saturate under fault conditions up to the full rated interrupting current.

Current transformers shall be thermally rated to switchgear current rating regardless of the ratio selected.

All current transformers shall be in accordance with AS 60044.1 and shall preferably be of the bushing type.

## 5.15 Auxiliary Supply

Auxiliary supply for the control/operating system shall normally be from an internal sealed battery fitted with a charging system.

The charger shall operate from a HV voltage transformer, incorporated into the installation. The HV voltage transformer shall be designed, manufactured and tested in accordance with AS 60044.2. It shall be suitable for mounting on the recloser pole and supplied complete with a pole mounting bracket. The VTs shall have a primary winding suitable for connecting to the respective SWER systems and a secondary output voltage of 240V.

A name plate marked with the following information shall be provided on the auxiliary VT:

- Manufacturer's name

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- Serial number
- Rated impulse withstand level
- Primary and secondary voltages
- Rated current

A 2A HRC fuse or a circuit breaker shall be provided in the secondary terminal box of the VT to facilitate the isolation of the secondary wiring in the event of a fault.

The auxiliary supply system shall be protected against the temporary over-voltages arising from disturbances in the SWER distribution network.

Full details of the auxiliary VTs including its temporary over-voltage capability and the details of equipment incorporated in the auxiliary supply system for mitigating the effects of system disturbances on the protection, control and communication gear supplied by it shall be included in the tender documentation.

The battery system shall be capable of initiating correct operation of the recloser for not less than 36 hours after loss of ac auxiliary supply.

A 12V dc supply suitable for operation of a communications equipment shall be provided within the enclosure. This may be from the same battery as the control supply, or a separate battery. It shall not be provided from the tripping/ closing battery. A Radio shut down feature shall be incorporated into the battery management to ensure the radio does not drain the battery if supply is lost over an extended period. Protection functions are to be available after the communications supply has been shut down.

Required parameters for the Communications Supply is:

- A fuse or miniature circuit breaker shall be provided to protect and isolate the supply to the communications equipment.
- Voltage range 10.0V to 13.8V
- Discharge rate : 0.5A average, 5A Maximum
- Carry Over capacity in the absence of ac supply for 20 hrs at 0.5A discharge rate, over and above the recloser equipment requirement.
- Automatic reconnection of supply once the auxiliary supply is restored

The battery system shall incorporate a battery test facility. The following features shall be regarded as typical of the 'test' / 'monitoring' facilities required.

- (a) An inbuilt instrument / instruments which can be a switch or push button configured to display:
- Battery operating voltage.
  - Battery voltage under the effect of a dummy load.
  - Battery charge / discharge current.

The dummy load shall be built into the system and the manufacturer shall state in its manual.

- The normal steady state fully charged battery voltage.
- Charging currents.

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- Recommended minimum battery voltage.
  - Maximum battery voltage reduction when the dummy load is applied.
- (b) An alarm shall be raised in the event of loss of the battery system or poor battery condition.

Battery systems charged from current transformers are not acceptable.

## 5.16 Controls

### 5.16.1 General

The control system shall allow for the following levels of control and indication:

- Operator Hook stick control & indication – to be used as a last resort manual control
- Local Control Panel control & indication – to be used at the recloser control and protection module
- SCADA operation and indication
- Engineering Access & Control

### 5.16.2 Operator Hook Stick Control - Refer Clause 5.11.3

### 5.16.3 Local Control Panel Control and Indication

The Reclosers shall be equipped with the following local operation features through switches/push buttons operable by a gloved hand:

- a) Trip (with no reclosing)
- b) Close (single shot)
- c) Auto Reclose ON/OFF
- d) Definite time protection ON/OFF
- e) Live Line Working Clearance ON/OFF
- f) Local / Remote Operation
- g) View Trip Sequences and Status Information

The following information shall be able to be viewed in full sunlight on a local Controller:

- a) Switch open status
- b) Switch closed status
- c) Remote control disable status (LOCAL)
- d) Automatic sequence enable status
- e) Definite time protection disable status
- f) Live Line Working Clearance Applied Status
- g) Equipment integrity alarm(s) (as applicable to the type of equipment)

The following information shall be able to be viewed in full sunlight on a local display screen incorporated into the controller, or on a local PC connected to the controller an on-demand interrogation facility to indicate up to ten previous trips:

- (a) Protective device and sequence which initiated the trip and
- (b) Date and time of occurrence.
- (c) Interrupted current

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## 5.16.4 SCADA Operation and Indication

The Recloser is required to be controlled and operated over a standard telephone line, a radio with V23 capabilities, digital phone and modem, via a satellite phone and modem or using a remote IBM compatible PC with phone modem and applicable software.

The recloser shall be capable of operation using the following communication protocol:

- DNP3.0

As a minimum the following controls and indications shall be provided to the Remote SCADA system using the above protocol.

### Controls:

- a) Tripping and closing
- b) Enable and disable automatic sequences (reclosing)
- c) Enable and disable Definite time protection
- d) Enable and disable Live line Working Clearance
- e) Change Protection Setting group
- f) Reset fault flags and currents

### Status:

- a) Switch open status
- b) Switch closed status
- c) Remote control disable status (LOCAL)
- d) Automatic sequence enable status
- e) Definite time protection disable status
- f) Live Line Working Clearance Applied Status
- g) Equipment integrity alarm(s) (as applicable to the type of equipment)
- h) Over Current Trip
- i) Definite time Trip
- j) Lockout
- k) Auxiliary supply healthy
- l) Active Protection setting group

### Analogues:

- a) Phase Current
- b) Phase voltage
- c) Operations Counter
- d) Battery Voltage
- e) MW and MVar desirable
- f) Fault current

When in LOCAL control it shall not be possible to reverse a local setting for the following by means of the REMOTE system:

- Recloser Status – TRIP / CLOSE
- Local setting to block the supervisory.

When in REMOTE control it shall be possible to reverse a local setting for all of the recloser features.

The DNP3.0 interface shall allow for 4 data classes, three of which are for event data objects. Data objects shall be user configurable into each event class. Event classes shall

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be individually user configurable for both the number of events and time for which exception reporting shall occur. The RTU shall incorporate a collision avoidance and retry scheme to provide maximum probability to successful transmission of the report on a busy network. Transmission will be either by V23 over Radio, or via a RS232 serial connection via a modem. The RTU shall support a modem dial up and auto answer capability.

A DNP3.0 device profile shall be included.

The purchaser reserves the right to use its own communication equipment. If the purchaser decides to exercise this right, the supplier will be requested to provide details of the communication system including the connection diagrams. The supplier shall supply the relevant information to the purchaser within two weeks of receiving such request.

## 5.16.5 Engineering Access and Control

The recloser is to be capable of being controlled and operated locally, over a standard telephone line, digital phone and modem or via a satellite phone and modem using a IBM compatible PC, serial cable or phone modem and the suppliers software.

The following features shall be able to be controlled/monitored using this facility:

- a) Tripping and closing
- b) Enable and disable automatic sequences (reclosing)
- c) Enable and disable definite time protection
- d) Enable and disable Live line Working Clearance  
Toggle between the main and alternative trip settings.
- e) Read and display metering data including a summary page.
- f) Reset the stored maximum demand.
- g) Read the operations counter.
- h) Read the event recorder and display at least the last 50 events in time sequence complete with feeder currents at the time of the event.
- i) Display a summary page which shows the number of fault trips since it was last reset.
- j) Examination of recloser/control system malfunction alarms.
- k) Read all existing recloser settings.
- l) Read & write recloser setting
- m) Down load revised recloser settings.
- n) Ability in programme to compare recloser settings to offline setting file.

## 5.17 Sequence of Operation

In the event of a fault on the section of the line controlled by a Recloser, the Recloser shall automatically open, and after a minimum dead time it shall reclose and remain closed should the line be no longer faulty. (Auto Reclose set to ON).

Should the fault persist, the Recloser shall again disconnect the section of line being controlled. The Recloser shall be capable of not less than three automatic reclose operations at rated short circuit current should the fault persist and then lock out in the open position until reset by hand or remote control.

If the fault is of a transient nature the equipment shall remain closed, and the operating mechanism shall automatically reset.

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The number of operations to lockout shall be adjustable in any combination of instantaneous and time-delayed trips up to a minimum of four with a minimum dead time of 0.5 seconds for the first operation.

## 5.18 Protection

All Reclosers shall be fitted with current transformers, for overcurrent protection.

The reclosers shall be supplied complete with an integrated microprocessor based control and protection system incorporating all the features stated in the following sub sections of this clause.

The equipment shall be capable of stand alone operation. Upon restoration of normal power supplies after prolonged failure all equipment will be restored to full operational capability. All user settings and parameters will be retained in nonvolatile memory. Additional desirable features are covered in Clause 5.19.

### 5.18.1 Overcurrent Fault Protection (OC)

The protection system shall provide overcurrent protection of the circuit supplied by the recloser. Each of up to four shots in a reclose sequence shall have independent curve, time (multiplier) and curve modifier settings and a common overcurrent fault pick up current setting.

The overcurrent trip pick up value shall be programmable between 5 and 400 amps in steps of not less than 1A.

The overcurrent protection shall provide the following facilities on each of the four trips.

- a) Choice of not less than the following Time/Current Characteristics:
  - Definite Time
  - IEC60255 Standard Inverse
  - IEC60255 Very Inverse
  - IEC60255 Extremely Inverse
- b) Time multiplier variable between 0.05 and 1.0 in steps not greater than 0.025
- c) Definite Time variable between 0.5 (lower preferred) to 5s in steps not greater than 0.1s
- d) Control system operational accuracy not greater than +/- 10% or 20 ms whichever is the greater.
- e) Provision to program a minimum operate time into the time / current characteristic. This shall be variable between 0 and 0.5 seconds in steps not greater than 0.05s.
- f) Provision to program an additional operate time curve modifier into the time / current characteristic. This shall be variable between 0 and 1.0 seconds in steps not greater than 0.05s.

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- g) High set overcurrent trip setting which can be set from 1 to 30 times the normal pick up level setting. Setting resolution shall be 0.1 times the normal pick up. A definite time delay to be able to be applied to the High set, setting values of 50ms to 2.0 sec in steps of 50ms.
- h) The trip sequence shall be able to be programmed to have one (1) to four (4) trips to lock-out.

## 5.18.2 Reclose Times

The dead time between a trip operation and its subsequent close operation shall be able to be independently programmed for each dead time. The required time range is from one half (0.5) to thirty (30) seconds in steps not greater than one half (0.5) second.

## 5.18.3 Auto Reclose Reset Time

The reset time between a successful recloser auto reclose operation and the time when the recloser's full sequence is restored shall be able to be programmed in the range from 5 to 180 seconds in steps not greater than 1 second.

## 5.18.4 Manual / Supervisory Close & Reset Time

An auto reclose blocking feature shall be provided to prevent auto reclosing of the recloser if it trips for any reason within the reset time following a local manual or supervisory initiated close operation. This may be accomplished by means of the auto reclose reset timer or a separately programmable timer. The time setting range shall be the same as for the Auto Reclose Reset Time above.

All operator closes shall set the recloser protection curves to a Manual Close setting, or the CLP setting if selected. This curve shall remain active for the duration of the auto recloser reset timer.

## 5.18.5 Cold Load Pick up (CLP)

The recloser shall incorporate a 'cold load' pick up feature to increase the probability of a successful close operation following a period of supply interruption to the feeder being supplied by the recloser. The CLP feature shall modify the OC and DT curves.

The CLP feature shall be able to be programmed IN or OUT of service.

When Programmed IN service, this feature shall automatically apply to all supervisory initiated close operations and by operator selection, be available for local manually initiated close operations.

The facility shall operate by one or a combination of the following methods:

- Specification of a separate curve for CLP
- Specification of one of the specified OC curves for CLP
- Specification of a increase in the minimum trip threshold multiple to be applied to a specified curve. (Not an increase to the Pick Up value of the curve) Grading margins to up stream devices should not be compromised by the CLP scheme.

The recloser should automatically detect loss of supply, and apply the CLP feature to the first shot curves, regardless of whether the recloser is Open or Closed. This is to prevent



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the recloser tripping due to a reclose by a upstream device. The application may use time based formula to determine the extend of the increase in tripping value.

Alternative methods of providing this facility will be considered provided grading margins to upstream devices are not compromised.

## **5.18.6 Manual Trip**

Any operator trip, Local or supervisory shall not initiate a reclose operation.

## **5.18.7 Live Line Working Clearance (LLWC)**

The control system shall incorporate a LLWC feature that when set ON blocks all close commands, both operator and automatic protection (reclose) initiated. The selected state of the LLWC shall be maintained through out loss of supply of the auxiliary supplies, HV supplies, and throughout fault transients.

The LLWC feature shall be capable of being placed and removed both locally and remotely, provided the appropriate location of control has been locally selected.

This feature when enabled shall have the ability to modify the operating characteristics. The setting range shall be similar to the OC setting ranges.

## **5.18.8 Sequence Coordination**

Sequence coordination facilities shall be provided to allow the recloser to coordinate with downstream reclosers.

The system shall operate by the recloser advancing to the next trip in the sequence if it measures a current pulse above its trip setting which is interrupted by another device before the set time elapses for this recloser to operate.

The sequence coordination shall reset in the same manner as a normal successful auto reclose operation.

The facility shall be able to be programmed either 'in' or 'out' of service.

## **5.18.9 Stored Main and Alternative Settings**

The recloser shall be capable of storing both main and alternative sets of protection trip level settings, curves and modifiers. These shall allow the recloser to be reset to an alternative set of settings to allow for changes to the power system configuration during switching operations etc.

## **5.18.10 Operations Counter**

The control system shall incorporate an operations counter which cumulatively records the number trip operations.

## **5.18.11 Local Recloser Programming & Setting Entry**

Keyboard facilities shall be provided to program the recloser and its control system. These shall also provide a means for local interrogation of the recloser, its settings, metering and event data. The keyboard data entry system shall be arranged to have at least two levels of

# Technical Specification for Pole Mounted Remotely Controllable Automatic Circuit Reclosers for Single Wire Earth Return (SWER) Distribution Systems

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use. The first or lower level shall allow an operator to 'read' all stored values but not alter any settings etc. The second or higher level shall be password protected and shall allow a suitably empowered person to both 'read' data and 'write' new settings etc to the control system memory.

Facilities shall also be provided to interrogate and program the complete control system using a 'laptop' computer and purpose written software. The software shall be provided with the recloser and its use by the purchaser shall not be restricted in any way other than the purchaser agreeing not to pass it on to a third party.

## **5.18.12 Metering**

The recloser shall have integral metering facilities which shall record at least the following data:

- Present instantaneous rms phase current and voltage.
- 15 minute integrated maximum demand rms phase current.
- The recloser shall also store the 15 minute integrated maximum demand current for at least the previous 24 hour period.
- The maximum demand value shall be capable of being reset from the operator keyboard.
- 

## **5.18.13 Event Recorder**

The recloser shall have an integral event recorder which shall store at least the last 150 events in time sequence. It shall include a real time clock and all events shall be time tagged with the date and time the event took place. Time resolution shall be to the nearest milli-second. All events shall also list the measured value of the phase current at the time of the event.

At least the following shall be classed as events and recorded accordingly:

- Overcurrent initiated trips.
- DT protection initiated trips.
- Sequence coordination operations.
- Local close and trip operations.
- Supervisory close and trip operations.
- Recloser resetting after operation.
- Loss and restoration of ac auxiliary supply.
- Battery low/fail
- Recloser failed operations
- Changes to recloser controls- ie manual blocking etc

## **5.18.14 Software**

Any software upgrades made during the course of the contract should be supplied to the purchaser free of charge.

## **5.18.15 Desirable Optional Features**

The following features are considered as desirable and would be considered an advantage to the Tenderer if available.

# Technical Specification for Pole Mounted Remotely Controllable Automatic Circuit Reclosers for Single Wire Earth Return (SWER) Distribution Systems

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Provision of an optional definite time (DT) protection system for the circuit supplied by the recloser. The definite time setting shall be applicable to all shots in the sequence, alternatively four settings shall be available to specify the DT setting at each shot.

The DT protection shall be independent of all other protection elements specified herein in that none of its settings shall be restricted by, or conditional upon the settings of other types of protection.

The trip pick up value shall be programmable between 5 and 100 amps in not less than 1A steps.

The DT shall have definite time operation with the time to trip adjustable between 2 and 600 seconds in steps not greater than 0.5 second.

The number of trips to lock-out shall be programmable between one (1) and four (4) independent of other protection settings.

The control system operational accuracy shall be not greater than +/- 10%.

The DT protection shall be able to be programmed either 'in' or 'out' of service.

Provision of optional over voltage protection, with auto reclose, providing the following:

- a) Trip setting from 1.0 to 1.2 pu voltage in steps of 0.01pu min, Definite time delay 0.2 to 1.0 sec in steps of 0.1 sec, 1.0 sec to 10 seconds in steps of 0.5 seconds
- b) Reclose single shot delayed after voltage comes into normal range (normal reclaim time to apply)
- c) Reclose time 2 to 180 seconds after good volts.
- d) Additional Voltage OK setting may be required.

Provision of an inrush restraint scheme to lift the threshold of operation for OC curves for a definite time following energisation, either from the recloser itself, or a upstream device.

Provision of an optional isolated 4 wire multi-drop interface to allow communication to multiple reclosers in a substation environment.

Maintenance of switchgear wear information continuously applicable regardless of swapping of the control and protection cubicle.

## 6. Performance and Testing

### 6.1 Type Tests

Copies of certificates of all type tests shall be submitted with the tender. These tests shall be in accordance with the Design Tests set out in Section 6 of ANSI/IEEE C37.60, Section 5 of ANSI/IEEE C37.63. In addition the electronic protection/control unit shall have been subject to the relevant impulse, and high frequency noise immunity tests specified in IEC 60255 or equivalent national standards. Also, the reclosers with their control/protection equipment (including earths) as a composite unit shall have been tested for the rated impulse withstand level and for immunity against the effects of EMI and RFI.

# Technical Specification for Pole Mounted Remotely Controllable Automatic Circuit Reclosers for Single Wire Earth Return (SWER) Distribution Systems

Copies of the test certificates for the auxiliary transformers carried out in accordance with AS 60044.2 Clause 8 shall be submitted with the tender

## 6.2 Routine Tests

Routine tests shall be carried out on all equipment supplied and shall be according to the Production Test set out in Section 7 of ANSI/IEEE C37.60. One copy of the test results shall accompany each unit of switchgear delivered. A second copy shall be forwarded to the Supervising Officer for the contract via electronic mail to: [inventory.nameplatedata@ergon.com.au](mailto:inventory.nameplatedata@ergon.com.au)

All test certificates shall include the manufacturer's serial number, the Purchaser's structured plant number, the order number, contract/item number and specification number. The test certificates shall also be accompanied with a completed **Attachment 5** returned electronically as a MS Excel document.

The Contractor shall give the Purchaser reasonable notice of when the routine tests are to be carried out. The Purchaser reserves the right to appoint representatives to witness the tests as well as conduct design reviews, and periodic inspection of the reclosers during manufacture.

Routine tests on the VTs shall be conducted in accordance with AS 60044.2 Clause 9. One copy of the test results shall accompany each unit delivered. A second copy shall be forwarded to the Supervising Officer of the contract as per the schedules. An electronic copy of the routine test certificates shall be forwarded to the Supervising Officer for the contract via electronic mail to: [inventory.nameplatedata@ergon.com.au](mailto:inventory.nameplatedata@ergon.com.au)

All test certificates shall include the manufacturer's serial number, the Purchaser's structured plant number, the order number, contract/item number and specification number. The test certificates shall also be accompanied with **Attachment 6** returned electronically as a MS Excel document.

## 6.3 Additional Tests

### 6.3.1 Millivolt Drop Test

Millivolt Drop Test or equivalent resistance measurement to the manufacturer's standards shall be taken across the main contacts, recloser terminals, and the primary terminals of every self-contained portion of the switch unit. Results obtained for the type tested unit shall serve as a datum for the purpose of comparison. These tests shall be in accordance with manufacturers standards, details of which shall be supplied with the tender submission.

## 6.4 Tests on Delivery

Subsequent to delivery and before approval is given for final payment, the equipment will be tested by the Purchaser to prove that it conforms with the requirements of this specification.

These tests may include the tests carried out at the maker's works and all such tests as may be considered necessary by the Purchaser to prove that the equipment as delivered meets with the requirements of this specification.

# Technical Specification for Pole Mounted Remotely Controllable Automatic Circuit Reclosers for Single Wire Earth Return (SWER) Distribution Systems

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Any equipment showing evidence of failure to comply with the requirements of this specification shall be liable to rejection.

## 7. Risk Assessment

### 7.1 Compliance

The Tenderer warrants (without limiting any other warranties or conditions implied by law) that all Goods have been produced, sold and delivered to the Principal in compliance with all applicable laws (including all workplace health and safety and electrical safety legislation, codes of conduct and the Principal's Workplace Health & Safety and Electrical Safety Conditions).

All risk assessments must meet the requirements of AS/NZS 4360:1995 Risk Management as a minimum standard. It is preferred that the risk assessment methodology uses an energy model to identify hazards.

### 7.2 Hazards

The risk assessment/s must identify hazards to the corporation personnel, public and property associated with:

- The installation of the equipment
- The operation and maintenance of the equipment during life expectancy
- Dismantling/disposal of equipment at end of life
- The "Risk Assessment" schedule included with this specification is to be completed by the Supplier. Note the schedule contains a generic set of questions designed to cover all the purchaser's plant and materials and the supplier is only required to complete those items applicable to the product offered.

## 8. Quality Assurance

### 8.1 Purchasers Policy

It is the Purchaser's policy to procure goods, equipment and services from sources that demonstrate the ability to supply quality products.

### 8.2 Documentary Evidence

Documentary evidence shall be provided concerning the level of quality system certification associated with the supplier and/or manufacturer. This documentation shall include the Capability Statement associated with the Quality System Certification.

## 9. Samples

### 9.1 Production Samples

Tenderers shall state if they are prepared to make a sample unit as offered against this specification available to the purchaser for testing and evaluation. All costs for delivery and return of this sample unit shall be the responsibility of the tenderer.

# Technical Specification for Pole Mounted Remotely Controllable Automatic Circuit Reclosers for Single Wire Earth Return (SWER) Distribution Systems

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## 10. Packaging and Marking

### 10.1 General

Individual crates shall contain one recloser unit, VT, control cubicle and all accessories. The equipment must be securely fastened to prevent movement during transport and handling.

The crates must be sufficiently sturdy to allow for the removal of the equipment for testing purposes at the Purchasers testing facility, and the repacking of the equipment in the same package for transportation to the work sites.

A copy of instruction manual for the equipment shall be provided in a weather proof bag inside each package.

### 10.2 Marking

The following information shall be legibly and indelibly marked on **TWO** sides of the crate:

- a) Manufacturer's name and catalogue number
- b) Rated Voltage and Current
- c) Purchase Order Number
- d) Purchasers Item Identification Number
- e) Description of contents and gross mass
- f) Handling or lifting instructions.

### 10.3 Quarantine

Should any timber packaging be supplied from overseas manufactures, then it is mandatory that all conditions and inspections required by the Australian Quarantine Act be met and that all these costs be included in the offered price.

## 11. Service Performance

Potential first time Suppliers to the Purchaser shall state:

- The period of service achieved by the items offered within Australian service conditions;
- Australian electricity supply authorities who have a service history of the items offered;
- Contact names and phone numbers of relevant employees of those supply authorities who can verify the service performance claimed.

## 12. Reliability

### 12.1 Service Life

When the supplier is unable to provide reliability data for 1000 plant years of service, an extended warranty for the control and communication components will be an acceptable alternative. The duration of the extended warrantee shall be five years from the date of commissioning.

# Technical Specification for Pole Mounted Remotely Controllable Automatic Circuit Reclosers for Single Wire Earth Return (SWER) Distribution Systems

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## 13. Training

The supplier shall provide training material in the form of drawings, instructions and/or audio visuals for the items accepted under the offer.

This material shall include but is not limited to the following topics:-

- Handling
- Storage
- Application
- Installation
- Maintenance
- Environmental performance
- Electrical performance
- Mechanical performance
- Disposal

In addition training sessions shall be conducted for the benefit of the purchasers technical staff addressing no less than the following topics:

- Basic recloser features
- Basic recloser operation
- Field and remote control operation
- Interrogation for access of event data, recloser status, fault and metering data
- Fault finding
- Application of protection and control settings

These training sessions shall be conducted in the purchaser's premises in Townsville, Rockhampton and Toowoomba.

## 14. Environmental Considerations

### 14.1 Assessment of Chemical Substances

The Queensland Government Occupational Health and Safety Act requires the Purchaser to assess the possible effects on health, safety and environment of chemical substances which are used in the manufacture of plant and materials.

### 14.2 Safety Data Sheet

Safety Data Sheet to be supplied for every chemical substance used for electrical and thermal insulation, impregnation, paint finish or for any other purpose.

## 15. Information to be Provided

### 15.1 Specific Technical Requirements

The following documentation shall be included with the tender submission:

- Detailed scaled drawings / sketches, diagrams and photographs as necessary to fully describe the equipment being tendered

# Technical Specification for Pole Mounted Remotely Controllable Automatic Circuit Reclosers for Single Wire Earth Return (SWER) Distribution Systems

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- At least one hard copy of the technical submission with technical manuals.
- Comments under each clause of this specification indicating compliance or non-compliance of the products offered with the specified requirements.
- Completed form **Attachment 2 – Technical Details of the Items Offered**
- Completed **Attachment 3 -Risk Assessment Schedule**
- Supporting technical documentation requested in the **Attachment 4 -**

## 15.2 Drawing Requirements

Within four (4) weeks of the placing of the order, the supplier shall supply three (3) copies of the following drawings.

- a) Schematic and wiring diagrams of component.
- b) Layout drawings.

The Purchaser will approve only drawings or sections thereof which relate directly to integration with the Purchaser's supplied equipment. The Purchaser will not approve schematic and wiring diagrams as this is considered the sole responsibility of the manufacturer.

The supplier shall amend the drawings as directed and resubmit them for approval within fourteen (14) days.

If the supplier is wishing to provide drawings in electronic format should consult with the Purchaser to obtain details of acceptable standards.

## 15.3 Manuals

Within eight (8) weeks of placing of the order, the successful tenderer shall supply fifteen (15) copies of a detailed operation and maintenance manual incorporating the following information.

- a) Schematic diagrams and component layouts of all printed circuit boards.
- b) A detailed list of all component parts including manufacturers part numbers.
- c) A detailed description of the circuit operation including block diagrams.
- d) A comprehensive trouble-shooting guide to assist in fault-finding by qualified personnel.

## 16. Warranty

The equipment shall be guaranteed against all defects, fair wear and tear accepted, for a period of not less than 36 months from date of delivery.



# Technical Specification for Pole Mounted Remotely Controllable Automatic Circuit Reclosers for Single Wire Earth Return (SWER) Distribution Systems

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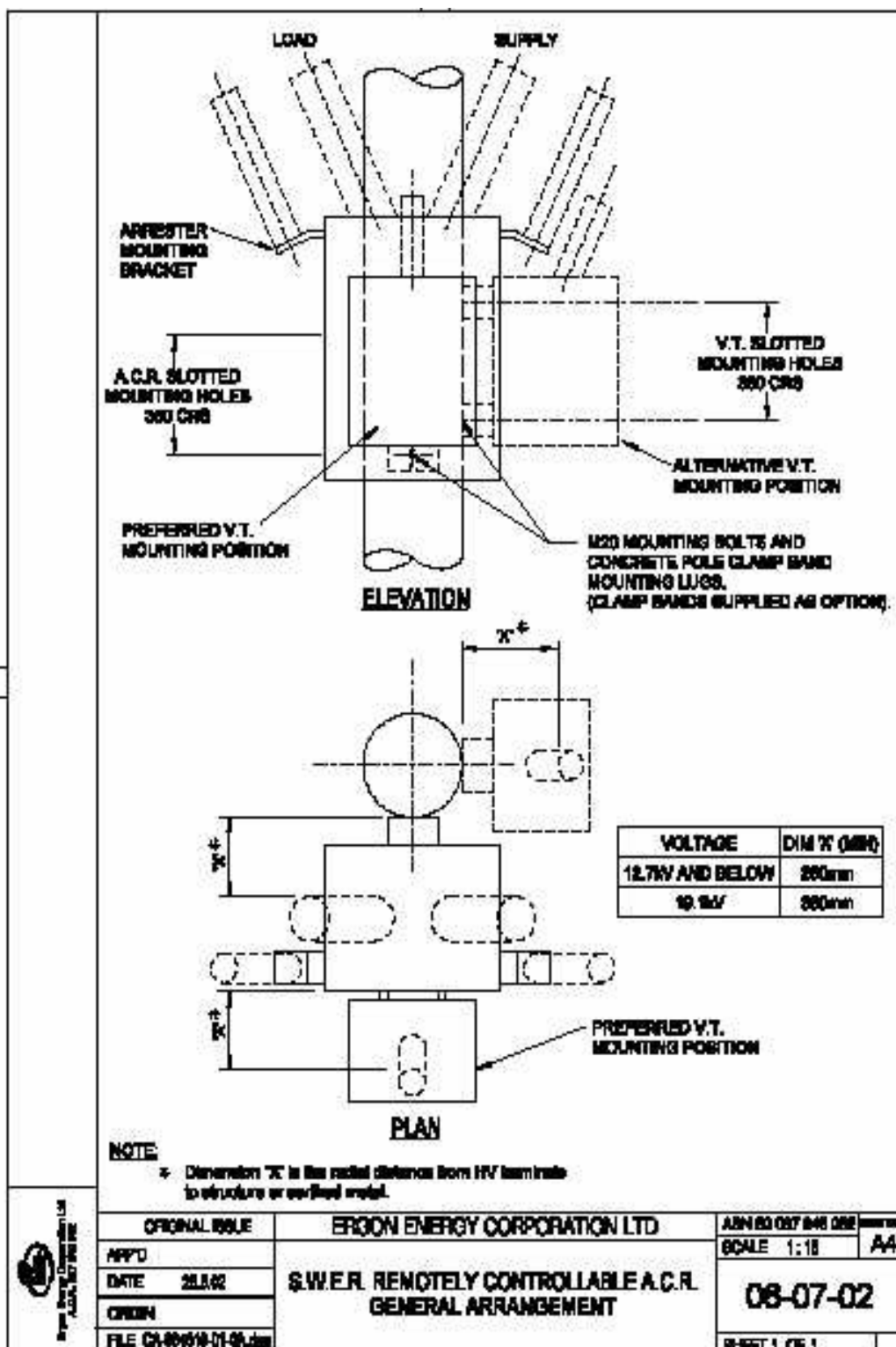
## 17. Spares

A table detailing spares and pricing is to be included. Include protection cards/boards, communications cards, cabinets, power supplies, VT's, control cables, batteries, mounting structures etc.

Tenderer shall also provide relevant information on the availability and delivery of spare parts.

# Technical Specification for Pole Mounted Remotely Controllable Automatic Circuit Reclosers for Single Wire Earth Return (SWER) Distribution Systems

## 18. Appendix A.1 – Drawing 06-07-02



# Technical Specification for Pole Mounted Remotely Controllable Automatic Circuit Reclosers for Single Wire Earth Return (SWER) Distribution Systems

## 19. Attachment 1 – Design and Performance Criteria for Equipment Required by the Purchaser

REF.	PARTICULARS	UNITS	ITEM 1	ITEM 2	ITEM 3
1.	Number of phases		1	1	1
2.1	Nominal rated voltage	kV	11	12.7	19.1
2.2	Maximum Operating Voltage	kV	12.1	14	21
3.	Rated frequency	Hz	50	50	50
4.	Rated normal current (Minimum)	A	280	280	280
5.	Rated symmetrical interrupting current at rated voltage	kA	4	4	4
6.1	Rated making current (RMS)	KA rms	4	4	4
6.2	Rated short time current for 3 sec.	KA	4	4	4
7.	Rated impulse withstand voltage (minimum)	kVp	95	125	150* (170 preferred)
8.	Rated 1 minute power frequency withstand between phase and earth (minimum)	kV	28	50	60* (70 preferred)
9.1	Minimum number of interruptions at rated short circuit current (up to X/R = 5) without requiring maintenance or inspection		100		
9.2	Minimum number of load break operations at rated current before maintenance required		3000		
10.	Required interrupting medium		vacuum		
11.	Rated transformer magnetising breaking current	A	10		
12.	Rated cable charging breaking current	A	10		
13.	Rated operating sequence (total number of trips/counts to lock out)		4		
14.	Maximum break time	s	0.05		
15.	Mechanical life - minimum number of close/open operations - without inspection		3000		
17.	Variation in nominal system voltage for guaranteed performance of pole mounted switchgear	%	-20 / +10		
18	HV bushing creepage length	mm	540		
19.	Minimum taut string metal to metal clearance in air Phase to ground	mm	280		
20	Minimum length of umbilical (multicore cable) between pole mounted switchgear tank and control unit	m	7		

# Technical Specification for Pole Mounted Remotely Controllable Automatic Circuit Reclosers for Single Wire Earth Return (SWER) Distribution Systems

## DESIGN AND PERFORMANCE CRITERIA (Cont'd)

REF.	PARTICULARS	UNITS	ITEM 1	ITEM 2	ITEM 3
21.	<b>Time delayed overcurrent</b>				
21.1	Phase Current setting range	A		5 to 400	
21.2	Current setting step size	A		1	
21.3	Time multiplier range			0.05 to 1.0	
21.4	Time multiplier step size			0.025	
21.5	Minimum Operate time	s		0 – 0.5	
21.6	Minimum Operate time – step size	s		0.05	
21.7	Additional delay time	s		0 to 1.0	
21.8	Additional delay time – step size	s		0.05	
21.9	Time current characteristic			Selectable between a definite time, standard inverse curve (type A, IEC 60255-4) and a very inverse curve (type B, IEC 60255-4) and Extreme Inverse Curve	
22.	<b>Hi set over current</b>				
22.1	Current setting range			1 to 30 times over current setting	
22.2	Current setting step size			0.1 times over current setting	
22.3	Time delay range			(0s (ie. min. op time) - 2000 msec	
22.4	Time delay step size			50 ms	
23.	Auto Reclose Reset time			5-180 sec	
24.	Number of trips to lockout			Up to 4	
25	<b>Definite time (desirable feature)</b>				
25.1	Current setting range			5 A to 100 A	
25.2	Current setting step size			1 A	
25.3	Time Delay range			2.0 sec - 600 sec	
25.4	Time delay step size			0.5 sec	
26.	Rated duty cycle (dead times of recloser)			O - 0.5 s CO - 2 s – CO –2s -CO	
27.	Degree of protection of control unit in accordance with AS 1939. Where a supplier can demonstrate a lower IP rating will not affect the long term operation of the equipment, a lower IP rating may be accepted.			IP56D	
28.	Partial discharge at 8 kV rms of complete pole mounted switchgear if epoxy resin insulation is used	pC		40	

**SIGNATURE OF TENDERER:** \_\_\_\_\_

# Technical Specification for Pole Mounted Remotely Controllable Automatic Circuit Reclosers for Single Wire Earth Return (SWER) Distribution Systems

## 20. Attachment 2 – Technical Details of the Items Offered

This schedule shall be completed and submitted with the tender.

REF.	PARTICULARS	UNITS	ITEM 1	ITEM 2	ITEM 3
Name of Manufacturer:					
Address of Manufacturer:					
Place of Manufacture:					
Manufacturer's Catalogue Number and Drawing Numbers (2 copies to be supplied):					
1	Nominal rated voltage	kV			
2	Rated maximum voltage	kV			
3.	Rated frequency	Hz			
4.	Rated normal current (Minimum)	A			
5.	Rated symmetrical interrupting current at rated voltage	kA			
6.1	Rated making current (RMS)	kA rms			
6.2	Rated short time current for 3 sec.	KA			
7.	Rated impulse withstand voltage	kVp			
8.	Rated 1 minute power frequency withstand (dry)	kV			
9.1	Minimum number of interruptions at rated short circuit current (up to X/R = 5) without requiring maintenance or inspection				
9.2	Minimum number of load break operations at rated current before maintenance required				
10.	Interrupting medium				
10.1	Insulation medium				
11.	Rated transformer magnetising breaking current	A			
12.	Rated cable charging breaking current	A			
13.	Rated operating sequence (total number of trips/counts to lock out)				
14.	Maximum contact break time	s			
15.	Mechanical life - minimum number of close/open operations - without inspection				
16.	Nominal system voltage (for HV closing solenoid operation - if applicable)	kV			
17.	Variation in nominal system voltage for guaranteed performance of pole mounted switchgear	%			

# Technical Specification for Pole Mounted Remotely Controllable Automatic Circuit Reclosers for Single Wire Earth Return (SWER) Distribution Systems

## SCHEDULE B--TECHNICAL DETAILS OF THE ITEMS OFFERED (Cont'd)

REF.	PARTICULARS	UNITS	ITEM 1	ITEM 2	ITEM 3
18	HV Bushing creepage length	mm			
19	Minimum taut string metal to metal clearance in air Phase to ground	mm			
20	Minimum length of umbilical (multicore cable) between pole mounted switchgear tank and control unit	m			
21.1	Phase Current setting range	A			
21.2	Current setting step size	A			
21.3	Time multiplier range				
21.4	Time multiplier step size				
21.5	Minimum Operate time	s			
21.6	Minimum Operate time – step size	s			
21.7	Additional delay time	s			
21.8	Additional delay time – step size	s			
21.9	Time current characteristic				
22.	<b>Hi set over current</b>				
22.1	Current setting range	A			
22.2	Current setting step size	A			
22.3	Time delay range				
22.4	Time delay step size				
23.	Auto Reclose Reset time	s			
24.	Number of trips to lockout				
25	<b>Definite time</b>				
25.1	Current setting range	A			
25.2	Current setting step size	A			
25.3	Time Delay range				
25.4	Time delay step size				
26.	Rated duty cycle (dead times of recloser)				
27.	Degree of protection of control unit in accordance with AS 1939. Where a supplier can demonstrate a lower IP rating will not affect the long term operation of the equipment, a lower IP rating may be accepted.				
28.	Partial discharge at 8 kV rms of complete pole mounted switchgear if epoxy resin insulation is used	PC			
29	Recloser housing material				
30	Control box material				

# Technical Specification for Pole Mounted Remotely Controllable Automatic Circuit Reclosers for Single Wire Earth Return (SWER) Distribution Systems

## SCHEDULE B--TECHNICAL DETAILS OF THE ITEMS OFFERED (Cont'd)

REF.	PARTICULARS	UNITS	ITEM 1	ITEM 2	ITEM 3
31	Auxiliary VT <ul style="list-style-type: none"> <li>- Insulation withstand</li> <li>- Voltage ratio</li> <li>- Housing type</li> <li>- Construction (oil filled/epoxy etc)</li> </ul> Include drawings showing the mounting details, dimensions, connections etc	KVp			
32	DC Supply (Control & Protection) <ul style="list-style-type: none"> <li>- Voltage</li> <li>- Make of batteries</li> <li>- Type</li> <li>- Capacity</li> <li>- Life</li> <li>- No of reclose sequences possible within 36 hours after the loss of ac supply</li> </ul>	Volts  Amp-Hr Years			
33	DC Supply ( Communication) <ul style="list-style-type: none"> <li>- Is this taken off 32 above</li> <li>- Voltage</li> <li>- Discharge rate (average)</li> <li>- Discharge rate (maximum)</li> <li>- Carryover capacity at average discharge rate after loss of ac supply</li> </ul>	Yes/No Volts A A Hours			

**SIGNATURE OF TENDERER:** \_\_\_\_\_

# Technical Specification for Pole Mounted Remotely Controllable Automatic Circuit Reclosers for Single Wire Earth Return (SWER) Distribution Systems

## 21. Attachment 3 – Risk Assessment Schedule

This schedule details the risk assessment parameters to be provided by the Tenderer for items covered by this specification. This schedule shall be completed and submitted with the offer.

The Tenderer shall complete the relevant items (as applicable):

REF.	PARTICULARS	RESPONSE
1.	Have Risk Assessments been carried out on equipment tendered which meet the requirements of AS 4360 (Yes/No)	
2.	Have copies of such risk assessments been included with the tender (Yes/No)	
3.	What is the weight of the components to be moved (for example – cable box covers/drawout circuit breaker trucks)?	
4.	How often do the components have to be moved ?	
5.	Are space restrictions associated with:	
5.1	Manual/materials handling tasks	
5.2	Installation/maintenance	
5.3	Operating procedures ?	
6.	Is there provision for the use of mechanical lifting devices?	
7.	Is the load stable?	
8.	What is the level of coupling? (poor/fair/good) (eg. Are operating handles fitted with grips)	
9.	What are the push/pull/rotational forces required to operate the equipment:	
9.1	When new?	
9.2	During life expectancy?	
10.	Do “above “ground” work surface have adequate fall protection (eg. Slip resistant surface, hand rails)?	
11.	Do the work positions require undesirable postures such as:	
11.1	Bending	
11.2	Stretching	
11.3	Twisting	
12.	What postures are required to be sustained over what period of time?	
13.	What movements are repetitive and for what duration?	
14.	What are the sound pressure levels (expressed in dB(A))?	

**SIGNATURE OF TENDERER:**

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# Technical Specification for Pole Mounted Remotely Controllable Automatic Circuit Reclosers for Single Wire Earth Return (SWER) Distribution Systems

## ATTACHMENT “C” RISK ASSESSMENT (Cont’d)

REF.	PARTICULARS	RESPONSE
15.	What hazardous substances are used/produces (including after failure) such as:	
15.1	Dust	
15.2	Gas	
15.3	Fume	
15.4	Emissions	
15.5	Mist	
15.6	Liquid	
15.7	Solids	
16.	Are the hazardous substances controls compatible with normal operational requirements?	
17.	Is a Safety Data Sheet for all hazardous substances provided?	
18.	What are the expected hazardous changes/by-products associated with the deterioration of a substance?	
19.	Is there any possible contact with energised components?	
20.	What are the levels of radiation emitted?	
21.	When in service, are any normally accessible areas hot/cold enough to be a hazard?	
22.	Are there any biological hazards?	
23.	Are there any mechanical hazards (eg. Nip in points, exposed moving components)?	
24.	Are mechanical hazards appropriately controlled (eg. guarding, lockouts)?	
25.	Are load limits established and clearly identified?	
26.	Are gauges clearly visible and easily interpreted?	
27.	Are control movements consistent with established Australian conventions (eg switch “UP” position is “OFF”)?	
28.	What is the degree of whole body or hand/arm vibration (Hz)	
29.	Are projectiles generated?	
30.	Are special tools required/identified/supplied?	
31.	What are the hazards associated with equipment failure?	

**SIGNATURE OF TENDERER:** \_\_\_\_\_

# Technical Specification for Pole Mounted Remotely Controllable Automatic Circuit Reclosers for Single Wire Earth Return (SWER) Distribution Systems

## 22. Attachment 4 – Technical Document Checklist

This schedule details parameters referred to within the body of the specification for which a response by suppliers is requested. This schedule shall be completed and submitted with the offer.

Have the following information provided with the tender documentation?

PARTICULARS	CLAUSE	ANSWER (Yes/No)
Consequence of loss of vacuum in interrupting chamber	5.2	
Ability of equipment inside the control box to withstand heating due to direct solar radiation	5.7	
Dimensional drawings of HV bushings	5.13	
Full details of auxiliary VT including the arrangements for mitigating the effects of temporary over-voltages due to system disturbances on protection, control, and communication equipment.	5.15	
Comment on the ability of the recloser to retain the pre- failure status of the settings following a aux supply/battery failure	5.16.4	
Type test certificates	6.1	
Availability of Millivolt drop test	6.3.1	
Risk assessment documentation	7.	
QA Certification of Supplier and Manufacturer	8.2	
Availability of samples for evaluation	9	
Service history details and contact names and telephone numbers	11	
Reliability information	12	
Availability of training materials	13	
Comments on environmental soundness of equipment and MSDS for chemical substances	14	
Availability of drawings and Manuals as required	15.3/15.4	
Drawings and photographs describing the equipment offered	15.1	
Hard copies of the technical submission and manuals	15.1	
Comments under each clause if specified requirements are met by the products offered	15.1 and all clauses	
Completed <b>Attachment 2</b>	15.1	
Details on Warranty offered	16	
List of spare parts and pricing	17	

**SIGNATURE OF TENDERER:** \_\_\_\_\_

# Technical Specification for Pole Mounted Remotely Controllable Automatic Circuit Reclosers for Single Wire Earth Return (SWER) Distribution Systems

## 23. Attachment 5 – VT Nameplate Details

Ergon Energy Structured Plant Number (Available from Purchase Order):				
AMPS-RATED	RATED CURRENT (A)			
CONTRACT-NO	CONTRACT NO			
LIGHT-IMPULS	LIGHT IMPULSE WITHSTAND (KVP)			
MAKE-CB	MANUFACTURER OF THE CB			
MASS-TOTAL	TOTAL WEIGHT (KG)			
MODEL	MODEL NO			
SERIAL_NUMBER	SERIAL NUMBER			
SF6-QUANTITY	QUANTITY OF SF6 (KG)			
SHORT-TIME-C	SHORT TIME CURRENT (KA)			
VOLT-RATED	RATED VOLTAGE (KV)			
YOM	YEAR OF MANUFACTURE			

SIGNATURE OF TENDERER:

\_\_\_\_\_

# Technical Specification for Pole Mounted Remotely Controllable Automatic Circuit Reclosers for Single Wire Earth Return (SWER) Distribution Systems

## 24. Attachment 6 - VT Nameplate Details

Ergon Energy Structured Plant Number (Available from Purchase Order):					
CONTRACT-NO	CONTRACT NO				
INSUL-TECHNI	INSULATION TECHNIQUE USED				
IT-NO-CORES	INSTR TX NUMBER OF CORES				
IT-PURPOSE	INSTR TX PURPOSE				
IT-SEAL-TYPE	INSTR TX SEAL TYPE				
IT-TYPE	INSTR TX TYPE				
LIGHT-IMPULS	LIGHT IMPULSE WITHSTAND (KVP)				
MAKE-IT	MANUFACTURER OF INSTRUMENT TX				
MASS-TOTAL	TOTAL WEIGHT (KG)				
MODEL	MODEL NO				
PHASE-NO	NUMBER OF PHASES				
POWER-FREQ	POWER FREQ WITHSTAND (KVRMS)				
SERIAL_NUMBER	SERIAL NUMBER				

NAME OF TENDERER:

ADDRESS OF TENDERER: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_ FOR AND ON BEHALF OF TENDERER

DATE: \_\_\_\_\_