

KINGDOM OF CAMBODIA
NATION RELIGION KING



ELECTRICITE DU CAMBODGE

TECHNICAL SPECIFICATION

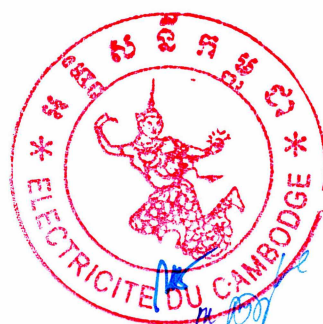
EDC-DTS-MV006

35 kV and 22 kV Pole Mounted

Auto Recloser


August 2019

Version 2.0





ELECTRICITE DU CAMBODGE

Version	Date	Technical Specification Name	Authorized by : (name and signature)
1.0	February, 2017	35 kV and 22 kV Pole Mounted Auto Recloser	
2.0	August, 2019	35 kV and 22 kV Pole Mounted Auto Recloser	 Dr. PRAING CHULASA



Version	Drafted/reviewed by	Verified by	Approved by	Date
Draft1	AD			
Draft 2	AD			
FINAL	AD			
Appro	EDC/AD			
Version 2	AD/EDC			August 2019

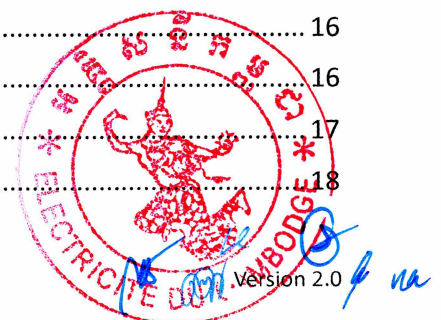
Version 2.0 : Main modifications from version 1.0 (February 2017) are below:

- The solid insulation of recloser is accepted
- Protection characteristics are reviewed
- Remote control function is modified
- Life expectancy is 25 years
- And Others minor correction



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35 kV and 22 kV Pole Mounted Auto Recloser

1 Scope

This specification covers the design, manufacturing, testing, supply, delivery and performance requirements of 22 KV and 35 kV Pole-mounted three phase GIS or solid insulation automatic reclosers used to auto-reclose feeders on Distribution networks of Electricité du Cambodge.

They shall be of SF6 or solid insulation /vacuum circuit breaker type, with electronic control and shall have the facility to detect over-current conditions on phase fault and earth fault, to time and interrupt such fault currents, and to re-energize the line by re-closing automatically after a predetermined time delay.

If a fault is persistent, the recloser shall lock open (lock out) after a pre-set number of operations and isolate the faulty section from the main part of the system. Control functions of the recloser are performed via the control cubicle in an integral part of the provided recloser. Remote control functions applications are capable of being inserted in the control cubicle at installation or later.

The pole mounted auto reclosers shall have a life expectancy of 25 years with low maintenance in normal operation conditions.

The recloser for single pole mounted application shall be complete with operating mechanism, control module programming facility and all other components necessary for installation and operation.

Oil and dry insulated type shall not be acceptable.

2 Standards

IEC : International Electro-technical Commission

IEC 60050 : International Electrical Vocabulary – IEV

IEC 60059 : IEC standard current ratings

IEC 60071.1 : Insulation coordination- Part 1 Definition, principles and rules

IEC 60255 : Electric relays

IEC 62271-1 : Common clauses for high voltage switchgear and control gear standards

IEC 62271-100 : High voltage alternating- current circuit breakers

IEC 62271-102 : Alternating current disconnectors (isolators) and earthing switches

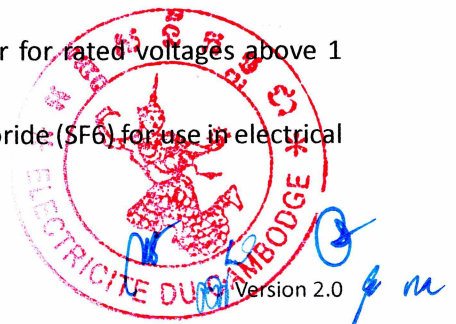
IEC 62271-103 : Switches for rated voltage above 1 kV and less than 52 kV

IEC 62271-104 : Switches for rated voltage of 52 kV and above

IEC 32271-111 : Automatic circuit reclosers and fault interrupters for alternating current systems up to 38 kV

IEC 62271-200 : AC metal-enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52 kV

IEC-60376 : Specification of technical grade sulphur hexafluoride (SF6) for use in electrical equipment



ANSI : American National Standards Institute

ANSI C 3760 or equivalence standard requirement for overhead, pad-mounted, dry-vault submersible automatic circuit reclosers and fault interrupters for AC systems

ISO : International Standard Organization

ISO 2063 : Metallic coating-protection of iron and steel against corrosion

ISO/IEC 17025 : General requirements for the competence of testing and calibration laboratories.

ISO 9001 : Quality management systems – Requirements

The Supplier may propose alternative standards, provided it is demonstrated that they give an equivalent degree of quality as the referenced standard. Acceptability of any alternative standard is at the discretion of EDC.

3 Definitions

The definitions of the relevant IEC/ANSI standards apply to this technical specification.

4 Testing and Inspection

4.1 General Notes for Test

Pole mounted auto reclosers may be inspected at the manufacturer's factory by EDC's representatives. The inspection and routine tests shall be carried out in accordance with the provisions of the relevant IEC/ANSI recommendations.

The Pole mounted Auto Reclosers shall be subjected to tests as specified below.

4.2 Type Tests

All type tests required by the relevant IEC and/or ANSI standards shall be carried out.

Type test reports shall be carried out by internationally recognized electrical testing laboratories.

Full copies of type test reports shall be submitted within the bid of the manufacturer/supplier. Type test reports older than 10 years will not be accepted.

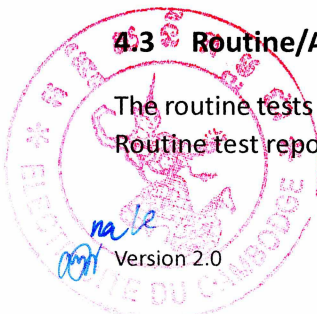
If the manufacturer is certified by EDC, it is not necessary to submit type test reports for the considered equipment.

Nevertheless, in case the testing laboratory is not internationally recognized, the testing laboratory shall be mandatorily accredited ISO/IEC 17025 by an international or national accreditation body specialized in testing laboratories accreditation/acceptance. In that case, the testing laboratory shall prove mandatorily its capability/capacity to carry out all type tests mentioned in the type tests reports by supplying: Full description of all tests the laboratory can carry out, list of testing equipment with full characteristics, drawing of testing rooms with location of testing equipment, ...etc., supported by pictures and copy of the ISO/IEC 17025 accreditation certificate.

Acceptability of any accredited testing laboratory is at the discretion of the EDC.

4.3 Routine/Acceptance tests

The routine tests requested by relevant Standard shall be carried out on all pole mounted auto recloser. Routine test reports shall be sent to EDC prior the shipment for EDC acceptance.



Nevertheless, the Supplier shall make necessary arrangements for inspection by an Engineer appointed by EDC to carry out in his presence necessary Routine/Acceptance tests of the equipment.

The supplier shall include details of all acceptance/routine tests to be carried out on reclosers and the routine test certificate shall be made available to Employer's inspector at the end of inspection.

5 Quality Management

Design, development and production of the proposed equipment shall be ISO 9001 certified. The ISO 9001 certificate shall be submitted within the bid.

6 Technical Characteristics

6.1 Operating Conditions

The pole mounted auto reclosers shall be suitable to operate in the ambient conditions described here after:

Altitude	Sea level to 1,000 meters
Climate	Tropical
Annual Rainfall	1,300 mm.140 days
Monsoon Period	June to November
Ambient Air Temperatures:	
Average	27.5°C
Minimum	13.3°C
Maximum	40.5°C
Relative Air Humidity	65-100%
Soil Thermal Resistivity:	
Average	1.20 cm/W
Maximum	3.00 cm/W
Solar Emissivity	0.8
Solar absorption	0.8
Wind Velocity:	
Average	37 km/h (10.3 m/s)
Maximum	72 km/h (20 m/s)



6.2 Ratings

Electrical Characteristics

Operating Voltage	35 kV	22 kV
Rated voltage U_r	38 kV	24 kV
Rated Frequency	50 Hz	50 Hz
Power frequency insulation level phase to earth	70 kV	50 kV
Power frequency insulation level across insulating distance	70 kV	50 kV
Minimum Rated Continuous Current		
- 200 A type	200 A	200 A
- 400 A type	400 A	400 A
- 630 A type	630 A	630 A
Rated Impulse Withstand Voltage 1.2/50 μ s, peak	170 kV	125 kV
Rated Impulse Withstand Voltage Auxiliaries 1.2/50 μ s, peak	3 kV	3 kV
Rated short time withstand current, 1s (rms)	12.5 kA	12.5 kA
Rated Symmetrical Interrupting Current (rms)	12.5 kA	12.5 kA
Cable Charging interrupting current	40 A	25 A
Line Charging interrupting current	5 A	5 A
Transformer magnetizing breaking capacity	10 A	10 A
Fault making capacity (Rms)	12.5 kA	12.5 kA
Fault making capacity peak	31.5 kA	31.5 kA
Rated full load operation and mechanical endurance	10 000	10 000

6.3 Design Features

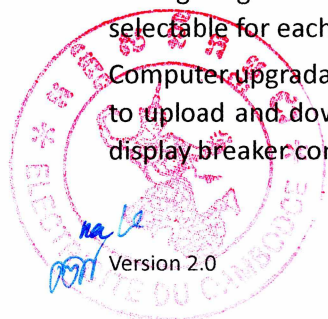
The Auto-recloser shall have its own self-contained operating mechanism, and self-supporting control unit, all housed in water and dust-proof stainless-steel cabinets having a degree of protection to at least IP54.

Suitable means shall be incorporated to eliminate the formation of moisture inside the Control unit cabinet.

The source side and the load side of the Auto-Recloser shall be interchangeable and protection setting shall automatically change to suit the change of direction of power flow and electricity network configuration.

Tripping shall be initiated by overvoltage, over-current, earth fault, loss of phase, instantaneous relays, etc. The type of over current, earth fault and sensitive earth relays and their operating current/time setting ranges shall conform to the Requirements. The Auto-recloser dead times shall be individually selectable for each auto recloser operation.

Computer upgradable software compatible with, Windows 7, Windows 8, Windows 10 or later versions to upload and download protection settings, to provide history information (stored information), to display breaker contact erosion data etc., shall be supplied. It shall be possible to download data stored



in control unit and configure the Auto-recloser using a portable PC in the field. Interfacing should be via RS-232 serial port and USB port.

As options, the recloser shall be remote controlled by SCADA, mini SCADA, GSM, by Smart phone etc. Tripping supplies shall be from a sealed, maintenance free rechargeable type battery having minimum of **5 years'** service life time.

An integrated PT or suitable separated transformer mounted at the same location shall be provided to supply the required power from the 22 or 35 kV line for the electronics and recharge the battery. A battery charging auxiliary supply shall be from an external supply to interface with the PT equipment provided. Calculations shall also be provided showing how many in and out operations a fully charged battery can handle without being recharged. A signal for Low Battery Voltage shall be incorporated. Battery hold up time shall be at least **48 hours**.

Three phase Current/Voltage Transformers or sensor shall be provided within the Auto-recloser for purpose of fault detection operation and storing event history as stipulated in the requirements.

All three poles of the Auto-recloser shall be operated simultaneously by a solenoid operating mechanism. The closing solenoids shall provide energy required for tripping operation and this energy shall be stored in the trip mechanism.

Auto-recloser lockout shall be clearly indicated. There shall be a mechanical position indicator for the Auto-reclosers main contacts. It shall be possible to manually trip the auto-recloser which will trip the same, to lockout position and disable recloser sequence until it is closed again. The manual tripping shall be achieved by pressing a trip button on the control panel or by a manual control lever or by a remote operator via modem interface. Manual closing shall be done by the control panel or by a remote operator only.

Mechanical and electrical Endurance of Auto-recloser shall be 10,000 or more in/out operations. Auto-recloser operations shall be recorded by which can be accessed in the field via control panel display unit and field computer using the associated computer software package.

All non-metal parts including insulating materials of cables shall be able to withstand effects due to ultra violet radiation.

The design of the Auto-recloser shall permit the application of suitable live-line working techniques to disconnect and remove the Auto-recloser from the line for maintenance at ground level or reconnect it to the line.

The Auto-recloser shall be provided with suitable Steel Mounting Frame with Lifting Tackle,

Earthing terminal suitable to accommodate two Nos. 5 mm dia. to 15 mm diameter earthing conductors shall also be provided for bonding the Auto-recloser tank, mounting frame, cabinet, etc... earth terminal to the local earthing electrodes.

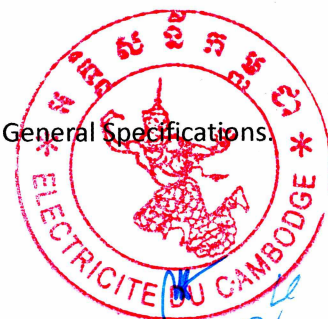
The Auto recloser shall be supplied complete with manufacturer mounting structures for one concrete pole mounting.

A complete auto-recloser manufacturer fitting set shall also be provided for the mounting and linking of the control box to the Auto recloser.

6.4 Mounting Arrangement and Fabrication

6.4.1 Tank

The units shall be weatherproof in the climatic conditions defined in General Specifications.



The tank shall be made of stainless steel or solid polymer material and strong enough to support dynamic short circuit forces and the vibration of the automatic recloser during operation and for transportation.

It shall be fully welded, sealed and of compact dimensions.

6.4.2 Insulation

Pole mounted three phase 22 kV and 35 kV automatic recloser shall be of Gas Insulation System (GIS) type or solid insulation type.

In case of GIS type, the Insulation media shall be sulphur hexafluoride (SF6) gas.

For solid insulation type, the insulation material shall be of weather proof material and any disk or fins shall be integral part of the insulation (moulded). Any silicon (or other material) disks or fins that are added around solid insulating tank will result in the rejection of the offer.

6.4.3 Breaking

The breaking chambers shall be of vacuum type.

6.4.4 Maintenance

Breaking chambers shall be of maintenance free.

In general, the pole mounted auto recloser shall be of low maintenance type.

6.4.5 Mechanism

6.4.5.1 Operating mechanism

The operating mechanism shall consist of a device mounted internally to the automatic recloser. Contact closing energy shall be provided by a LV closing solenoid, which shall also store up energy in the trip mechanism. The mechanism shall operate to open and close the three phases of the device simultaneously.

If lockout has occurred, it shall only be removed by a manual closing operation or through RTU after proper unlocking safety procedure.

An operation counter shall be provided within the control cabinet.

A contact position indicator shall be provided to beware the status "I / O" relevant to the truly corresponding position of the main contacts during operation. It shall be external to the automatic recloser tank, and where it is clearly visible to a person standing at ground level.

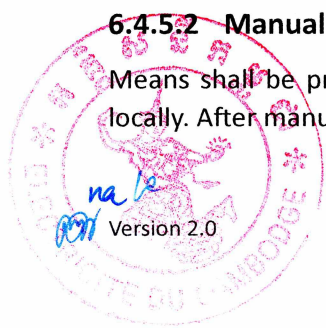
Electronic controls (sensors) inside the recloser tank shall sense earth and over-current fault conditions and trip the recloser.

Closing energy shall be provided by LV closing solenoid which shall simultaneously charge the opening springs in readiness for tripping operation.

The energy shall be powered from a battery located in the automatic recloser control box. In case rechargeable batteries are used, the bidder shall provide relevant battery charger along with 35 kV/ 0.23 kV or 22 kV/ 0.23 kV Voltage Transformer depending the voltage line level, having sufficient capacity for the whole auxiliary supply including the necessary future equipment for later SCADA system.

6.4.5.2 Manual operations

Means shall be provided to permit manual tripping, closing and lockout of the automatic recloser locally. After manual tripping, the automatic reclosing shall lock out.



The units shall be capable of manual operation from ground level of a control cubicle push button. Nevertheless, the pole mounted auto recloser can be tripped from the ground by means of a hookstick.

6.4.6 Bushings

The bushings shall be made of water-proof silicon, epoxy-resin or porcelain insulation as well as resistance against environmental effects with a minimum creepage distance of 25mm/kV.

The bushings shall be rated to carry full line current. Parts carrying heavy current shall be made of copper, bronze or aluminum. Contacts shall be made of suitable material to ensure long life with a low maintenance operation.

Termination shall be suitable for connection of compression terminal lugs and supplied with nuts and bolts and lugs for aluminum 240 mm² conductor size.

The bushings shall be clearly and unambiguously labelled A, B, C for each of the phases. The labelling of the phases shall be made by embossing or engraving. Phase identification by adhesive stickers is not acceptable.

6.4.7 Control box

The Pole mounted automatic reclosers shall be fitted with a separate control box suitable for fitting along the pole below the automatic recloser. All fittings required for mounting shall be supplied. All operating parameters of the automatic recloser (minimum trip current, time-current trip characteristics, reclosing and reset times, operating sequences, etc..) shall be controlled from the control box. All control parameters and functions shall be programmable and access via the front panel of the control box without aid from other device. Ratings shall be clearly marked in relevant units of measure with no interpretation multipliers or conversion being required.

The control technology shall be of microprocessor-based type and the specific software shall be provided accordingly. The control shall be capable of operating in the environmental conditions defined above.

LV powering supply shall be mandatorily protected by LV surge arrestors in order to avoid over voltages.

6.4.8 Auto recloser Pole mounting frame

Pole mounted auto reclosers shall be supplied with their pole (round or square) mounting frame.

The pole mounting frame shall allow the centre of gravity to be as close as possible to the pole.

All items and other parts of fabricated material, as delivered, shall be free of winds, warps, local deformations, unauthorized splices, or unauthorized bends. Holes and other provisions for field connections shall be provided when the units are assembled in the field. When required, either by notations on the drawings or by the necessity of proper identification and fitting or field connections, the connections shall be match-marked.

Shapes and plates shall be fabricated and assembled in the shop to the greatest extent practicable. Shearing, flame cutting, and chipping shall be done carefully, neatly and accurately. Holes shall be cut, drilled, or punched at right angles to the surface and shall not be made or enlarged by burning. Holes shall be clean-cut without torn or ragged edges and burrs resulting from the drilling or reaming operations shall be removed with the proper tool.

Shapes and plates shall be fabricated to tolerances that will permit field erection.

Contact surfaces at all connections shall be free of loose scale, dirt, burrs, oil and other foreign materials that would prevent solid seating of the parts.



Metal materials which are specified herein shall be stainless or hot dip galvanized steel (85µm thickness). Materials specified to be galvanized shall be prepared for galvanizing by being properly cleaned, pickled, rinsed, and dried. The cleansed materials shall be immediately galvanized before any rusting can occur.

Detailed drawings of mounting arrangements shall be submitted with the offer.

Lifting lugs shall be provided such that the automatic recloser can be lifted with a single hook without damage.

All units shall be provided with a grounding terminal with a 10mm diameter hole.

6.4.9 Surge arresters

For efficient protection against overvoltage, surge arresters shall be installed directly on the pole mounted recloser.

For this purpose, the tank or the frame of the recloser shall be designed and manufactured for installing 3 surge arresters (not supplied) on both side of the recloser.

This surge arrester arrangement shall be originated from recloser manufacturer only. Any arrangement or botch up made latter by other shall result in the rejection of the offer.

6.4.10 Identification

Each automatic recloser shall be fitted with an easily readable nameplate of weatherproof material specifying the following details:

- Type of automatic recloser
- Manufacturer's name
- Manufacturer's serial number
- Year of manufacture
- Rated frequency
- Rated voltage
- Rated continuous current
- Rated symmetrical interrupting current
- Rated power frequency withstands voltage
- Rated impulse withstand voltage
- Rated control voltage(s)
- Gross weight

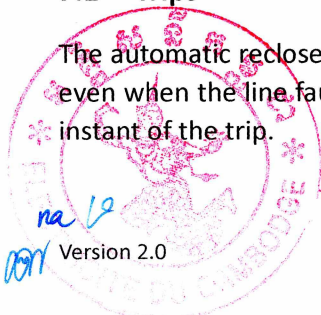
Plate marking shall be embossed or engraved. Painting or stickers are not accepted.

7 Automatic Recloser Operational Characteristics

The units shall be capable of operating at more than 10 000 operations at rated load without maintenance.

7.1 Trips

The automatic recloser shall be capable of performing a sequence of up to four trips prior to lockout, even when the line fault is so close to the recloser terminals that the voltage is essentially zero at the instant of the trip.



Means shall be provided to enable each trip to be set individually, to either “instantaneous” or “delayed” operation as defined below. Means shall be provided to enable the number of trips to be set to one, two, three or four.

7.2 One Shot Trip Function

An auto-reclosing on/off control function shall be provided, which will switch from a nominal reclosing operation to one operation to lockout.

7.3 Resets

If upon any recloser normal conditions are restored on the line, the automatic recloser shall reset at an adjustable time and be ready for a completely new sequence of operations. The reset timer shall not start if phase current is greater than the set minimum phase trip current.

Provision shall be made to obtain an individually adjustable time interval between each opening and closing operation.

A sequence coordination facility shall be provided which, when enabled, will co-ordinate between the delayed tripping characteristics of two automatic reclosers in series, such that only the recloser nearest to the fault will only operate. Coordination shall be achieved by the addition of a definite time delay in the instantaneous tripping characteristics of the upstream automatic recloser. The definite time delay or constant time added shall be programmable in the range of 0.01 to 100 seconds with increments of 0.01 seconds.

7.4 Protection Characteristics

Means shall be provided for over current, short circuit and earth fault detection for each phase, with adjustable minimum phase trip current settings.

The automatic recloser shall operate for sensitive earth faults (SEF) with one definite time delay to lockout.

The range of sensitive earth fault pick up level shall have a minimum of 4A. The time delay shall be programmable in the range of 0.1 to 999 seconds, with increments of 0.1 second.

The automatic recloser is required to provide selectivity with fuses (NEMA standard “K” speed fuses) but only during delayed tripping operations.

An instantaneous tripping operation shall result in current clearing times of less than 0.10 seconds at 1.5 times minimum phase trip current, and at less than 0.05 seconds at 5 times minimum phase trip current. A delayed tripping operation shall be characterized by control unit response time. Three options shall be available: response times which follow characteristics of curve types A, B, and C as per IEC 60225-4.

Additionally, the recloser shall provide under/overvoltage protection that shall be selectable and adjustable.

The controller shall include the following curves:

- Three IEC 60255 curves: Inverse, Very Inverse and Extremely Inverse
- Three IEEE C37.112 Inverse Time curves: Moderately Inverse, Very Inverse and Extremely Inverse.
- And at least 40 non-standard curves in order to adapt the setting to all field conditions.



Fault indication shall be available within the automatic recloser control box, indicating the nature of the network fault which resulted in the recloser lockout (short circuit, earth fault or sensitive earth fault, etc...)

The selection of all variables of operation, including operating sequence, times and characteristics, shall be achieved by means of devices located in the control box, without the need for component replacement.

7.5 Self-monitoring

As a minimum the following shall be continually monitored and made available in the event of a malfunction:

- Auxiliary battery voltage (protection and control circuits)
- Microprocessor controller
- Automatic recloser switching operation (for instance: fail to close)
- SF6 pressure for GIS type

Local indication shall be available, detailing the nature of the fault.

7.6 Remote Control Facilities

The pole mounted auto-Recloser shall be capable of remote controlled operations (SCADA, mini SCADA, GSM (SMS), by Smart phone etc.) at installation time or extended later. At least, the following commands and indications shall be available:

Remote operation:

- Recloser status (trip/close)
- Reclosing facilities enabling/disabling (Auto/one shot)
- Sensitive earth fault (SEF) enabling/disabling (where applicable)
- Control/protection characteristics setting

Status indications:

- Double tele indication for the status of the recloser (open or close)
- Reclosing facilities enabled/disabled
- Faults indication/alarm
- SEF in/SEF out (where applicable)

Recloser security indications:

- Local/remote switch status
- Equipment failure (including recloser failure, DC supply failure, etc.)

Accessibility and support:

- Smart phone or PC
- User management
- Control management
- GIS support (where applicable)
- User operation event record
- Top up balance in case use local SIM Card

Line measures:

- Voltage
- Current
- Power factor
- Power flow, etc.

A local / remote control switch shall be located within the automatic recloser control box.

In the local mode, only the local control operations are authorized. In the remote (supervisory) mode, the local control operations are inhibited, only remote operations are authorized.

8 Accessories

The following accessories shall be included in the automatic reclosers:

- 500VA of 2-phase Voltage transformer for auxiliary LV supply (in case the VT is not integrated).
- Umbilical control cable from automatic recloser switch to control box for a 14 m height pole.
- Termination shall be suitable for connection of compression terminal lugs and supplied with nuts and bolts and lugs for aluminium 240 mm² conductor size.
- Pole mounting structure.
- Software relevant to usage of setting/control for reclosers.

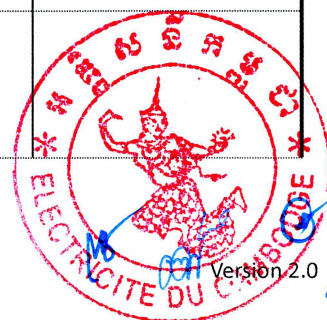


9 Technical Data Sheets

9.1 35 kV Pole Mounted Recloser

No.	Description	Unit	Requirement	Supplier's Offer
General				
1	Country		to be specified	
2	Manufacturer		to be specified	
3	Manufacturer's reference		to be specified	
4	Type		to be specified	
5	Standards		to be specified	
Electrical characteristics				
6	Insulating medium		SF6 or Solid	
6.a	For solid insulation, disks/fins are integral part of the solid insulation		Yes	
7	Interrupter type		Vacuum	
8	Operating voltage	kV	35	
9	Rated voltage	kV	38	
10	Rated impulse withstand voltage (1.2/ 50 μ s)	kV peak	170	
11	Rated impulse withstands voltage of the auxiliary circuits	kV peak	3	
12	Power frequency withstand voltage for the recloser (50 Hz)	kV rms	70	
13	Rated continuous current	A	200 400 630	
13-1	Cable Charging interrupting current	A	40	
13-2	Line Charging interrupting current	A	5	
14	Rated interrupting current	kA	12.5	
15	Rated symmetrical making current	kA	31.5	
16	Operations without maintenance		$\geq 10\,000$	
17	Stainless steel Tank		Yes	
18	Recloser IP		To be specified	
19	Trips in sequence to lockout		1 to 4	
20	Closing and tripping mechanism		LV solenoid	
	- closing time of circuit breaker	ms	To be specified	
	- opening time of circuit breaker	ms	To be specified	

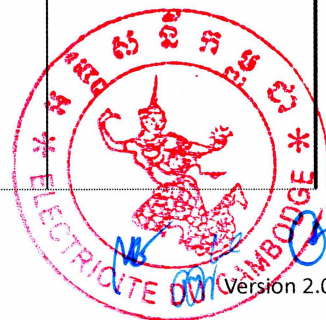
No.	Description	Unit	Requirement	Supplier's Offer
21	Bushing material		water-proof silicon, epoxy-resin or porcelain	
21.a	Minimum creepage distance 25mm/kV	mm	950	
21.b	Original manufacturer installation frame		Mandatory	
Control Box (Software installed)				
22	Material		Stainless steel	
23	Control box IP		to be specified	
24	Means for avoiding overheating		to be specified	
25	Means for avoiding moisture		to be specified	
26	Remote operation: <ul style="list-style-type: none"> Recloser status (trip/close) Reclosing facilities enabling/disabling (Auto/one shot) Sensitive earth fault (SEF) enabling/disabling (where applicable) Control/protection characteristics setting 		yes	
26.a	Status indications: <ul style="list-style-type: none"> Double tele indication for the status of the recloser (open or close) Reclosing facilities enabled/disabled Faults indication/alarm SEF in/SEF out (where applicable) 		yes	
26.b	Recloser security indications: <ul style="list-style-type: none"> Local/remote switch status Equipment failure (including recloser failure, DC supply failure, etc.) 		yes	
26.c	Accessibility and support: <ul style="list-style-type: none"> Smart phone or PC User management 		yes	



f na

No.	Description	Unit	Requirement	Supplier's Offer
	<ul style="list-style-type: none"> Control management GIS support (where applicable) User operation event record Top up balance in case use local SIM Card 			
67.d	Line measures: <ul style="list-style-type: none"> Voltage Current Power factor Power flow, etc. 		yes	
Protection Function Characteristics				
27	Reclosing interval			
	-First	sec	0.5 to 180	
	-Second	sec	2 to 180	
	-Third	sec	2 to 180	
	-Timing resolution	sec	0.1	
28	Phase minimum trip setting	A	to be specified	
29	Ground minimum trip setting (At least 30% of phase minimum trip setting)	A	To be specified	
30	Trip to lockout		Selectable from 1 to 4	
31	Instantaneous tripping Multiple setting Minimum tripping time Timing resolution Setting Range <ul style="list-style-type: none"> Current time 	 sec sec sec sec	Yes To be specified To be specified To be specified To be specified	
32	SEF tripping Multiple setting Minimum tripping time Timing resolution Setting Range <ul style="list-style-type: none"> Current time 	 sec sec sec	Yes To be specified To be specified To be specified To be specified	
33	Time Current Curve Setting -Minimum current -Current setting resolution	A A	To be specified 1	

No.	Description	Unit	Requirement	Supplier's Offer
	-Time Multiplier Setting range	Sec	0.05 to 10	
	-Time resolution	Sec	0.01	
34	Definite time Setting - Minimum current - Current setting resolution - Multiple setting Range - Time range - Time resolution	A A Sec Sec	10 1 To be specified 0.01 to 100 0.01	
35	Curves - 3 IEC curves - 3 IEEE curves - TMS of standard curves ranges from 0.05 to 10 - ≥ 40 non-standard curves		yes	
36	Under/Overvoltage protection selectable		Yes/No	
37	Frequency protection		Yes	
38	Loss of phase detection		Yes	
39	Negative phase sequence detection		Yes	
40	Directional overcurrent protection		Yes	
41	Cold load picks up		Yes	
42	Inrush restraint		Yes	
43	Measurements - Voltage - Current - Power Factor - Power - Power flow etc.		Yes Yes Yes Yes yes	
44	-Remote control capability (SCADA, mini SCADA, GSM, by Smart phone etc.)		Yes	
45	Communications			
45.a	Communication ports		3x RS232 1x RJ485 1x USB 1x ETHERNET 1x V23 modem <u>Options</u> -GSM (SMS)	



No.	Description	Unit	Requirement	Supplier's Offer
			-Smart phone	
45.b	Communication protocols		to be specified	
46	Stored events		$\geq 20\,000$	
47	Battery type/capacity		to be specified	
48	Battery life	year	≥ 5	
49	Battery hold up time	hour	≥ 48	
50	Battery charger		to be specified	
51	VT for LV auxiliary supply 35/0.23 kV	VA	2-phase, 500VA	
52	Secondary voltage	V	230	
53	Accessories,		sufficient	
54	Pole mounting frame, bolt, nuts, washers		Sufficient	
55	The recloser includes specific device for 6 surge arresters installation		Mandatory	
56	Dimension (L x W x H)	mm	to be specified	
57	Weight	kg	to be specified	

Supplier's offer column must be properly filled with the right figures. "Compliant, Yes, ", V , etc..." are not accepted

Deviation from the technical specification:

The bidder shall list point after point and explain here in after all deviation from the requested technical specification.

1/

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Full technical information shall be supplied within the bid.


Bidder signature:



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9.2 22 kV Pole Mounted Recloser

No.	Description	Unit	Requirement			Supplier's Offer
General						
1	Country		to be specified			
2	Manufacturer		to be specified			
3	Manufacturer's reference		to be specified			
4	Type		to be specified			
5	Standards		to be specified			
Electrical characteristics						
6	Insulating medium		SF6 or Solid			
6.a	For solid insulation, disks/fins are integral part of the solid insulation		Yes			
7	Interrupter		vacuum			
8	Operating voltage	kV	22			
9	Rated voltage	kV	24			
10	Rated impulse withstand voltage (1.2/ 50µs)	kV peak	125			
11	Rated impulse withstands voltage of the auxiliary circuits	kV peak	3			
12	Power frequency withstand voltage for the recloser (50 Hz)	kV rms	50			
13	Rated continuous current	A	200	400	630	
13-1	Cable Charging interrupting current	A	25			
13-2	Line Charging interrupting current	A	5			
14	Rated interrupting current	kA	12.5			
15	Rated symmetrical making current	kA	31.5			
16	Operations without maintenance		≥ 10 000			
17	Stainless steel Tank		Yes			
18	Recloser IP		To be specified			
19	Trips in sequence to lockout		1 to 4			
20	Closing and tripping mechanism - closing time of circuit breaker - opening time of circuit breaker	ms ms	LV solenoid To be specified To be specified			
21	Bushing material		water-proof silicon, epoxy-resin or porcelain			



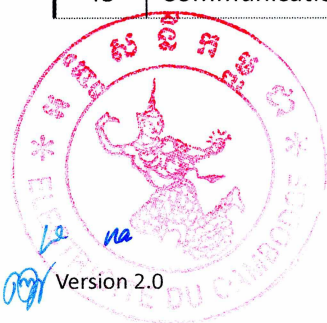
No.	Description	Unit	Requirement	Supplier's Offer
21.a	Minimum creepage distance 25 mm/kV	mm	600	
21.b	Original manufacturer installation frame		Mandatory	
Control Box (Software installed)				
22	Material		Stainless steel	
23	Control box IP		to be specified	
24	Means for avoiding overheating		to be specified	
25	Means for avoiding moisture		to be specified	
26	Remote operation: <ul style="list-style-type: none"> Recloser status (trip/close) Reclosing facilities enabling/disabling (Auto/one shot) Sensitive earth fault (SEF) enabling/disabling (where applicable) Control/protection characteristics setting 		yes	
26.a	Status indications: <ul style="list-style-type: none"> Double tele indication for the status of the recloser (open or close) Reclosing facilities enabled/disabled Faults indication/alarm SEF in/SEF out (where applicable) 		yes	
26.b	Recloser security indications: <ul style="list-style-type: none"> Local/remote switch status Equipment failure (including recloser failure, DC supply failure, etc.) 		yes	



No.	Description	Unit	Requirement	Supplier's Offer
26.c	Accessibility and support: <ul style="list-style-type: none"> • Smart phone or PC • User management • Control management • GIS support (where applicable) • User operation event record • Top up balance in case use local SIM Card 		yes	
26.d	Line measures: <ul style="list-style-type: none"> • Voltage • Current • Power factor • Power flow, etc. 		yes	
Protection Function Characteristics				
27	Reclosing interval			
	-First	sec	0.5 to 180	
	-Second	sec	2 to 180	
	-Third	sec	2 to 180	
	-Timing resolution	sec	0.1	
28	Phase minimum trip setting	A	to be specified	
29	Ground minimum trip setting (At least 30% of phase minimum trip setting)	A	To be specified	
30	Trip to lockout		Selectable from 1 to 4	
31	Instantaneous tripping Multiple setting Minimum tripping time Timing resolution Setting Range <ul style="list-style-type: none"> - Current - time 	 sec sec	Yes To be specified To be specified To be specified To be specified	
32	SEF tripping Multiple setting Minimum tripping time Timing resolution Setting Range <ul style="list-style-type: none"> - Current - time 	 sec sec	Yes To be specified To be specified To be specified To be specified	



No.	Description	Unit	Requirement	Supplier's Offer
33	Time Current Curve Setting -Minimum current -Current setting resolution -Time Multiplier Setting range -Time resolution	A A Sec Sec	To be specified 1 0.05 to 10 0.01	
34	Definite time Setting - Minimum current - Current setting resolution - Multiple setting Range - Time range - Time resolution	A A Sec Sec	10 1 To be specified 0.01 to 100 0.01	
35	Curves - 3 IEC curves - 3 IEEE curves - TMS of standard curves ranges from 0.05 to 10 - ≥ 40 non-standard curves		yes	
36	Under /over voltage protection selectable		Yes	
37	Frequency protection		Yes	
38	Loss of phase detection		Yes	
39	Negative phase sequence detection		Yes	
40	Directional overcurrent protection		Yes	
41	Cold load pick up		Yes	
42	Inrush restraint		Yes	
43	Measurements - Voltage - Current - Power Factor - Power - Power flow etc.		Yes Yes Yes Yes Yes	
44	-Remote control capability (SCADA, mini SCADA, GSM, by Smart phone, etc.)		Yes	
45	Communications			



No.	Description	Unit	Requirement	Supplier's Offer
45.a	Communication ports		3x RS232 1x RJ485 1x USB 1x ETHERNET 1x V23 modem <u>Options</u> - GSM (SMS) - Smart phone	
45.b	Communication protocols		to be specified	
46	Stored events		≥ 20 000	
47	Battery type/capacity		to be specified	
48	Battery life	year	≥ 5	
49	Battery hold up time	hour	≥ 48	
50	Battery charger		to be specified	
51	VT for LV auxiliary supply 22/0.23 kV	VA	2-phase, 500 VA	
52	Secondary voltage	V	230	
53	Accessories,		sufficient	
54	Pole mounting frame, bolt, nuts, washers		Sufficient	
55	The recloser includes specific device for 6 surges arresters' installation		Mandatory	
56	Dimension (L x W x H)	mm	to be specified	
57	Weight	kg	to be specified	
Supplier's offer column must be properly filled with the right figures. "Compliant, Yes, ", V , etc..." are not accepted				



No.	Description	Unit	Requirement	Supplier's Offer
<p align="center">Deviation from the technical specification:</p> <p>The bidder shall list point after point and explain here in after all deviation from the requested technical specification.</p> <p>1/ 2/ 3/ x/</p> <p align="center">Full technical information shall be supplied within the bid.</p> <p align="center"><u>Bidder signature:</u></p>				

