33-SDMS-04

Rev.1

SPECIFICATION FOR MV SMART LINE SECTIONALIZER UP TO 36 KV

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Revision History:

#	Date	Revision No.	Revised By	Major Revision Description
1				
2				
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4				
5				
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Prepared by:

No.	Name	Department / Sector	Signature	Date
1				
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1 Scope

This SEC Distribution Materials Specification (SDMS) specifies the minimum technical requirements for design, engineering, manufacture, inspection, testing and performance requirements for pole mounted smart Line Sectionalizer intended to be used in medium voltage overhead distribution system of Saudi Electricity Company (SEC) in Saudi Arabia. It is highly recommended that the Smart line Sectionalizer and the smart OH-LBS to be merged in the same smart device.

2 Cross References

This specification shall always be read in conjunction with SEC General Specification No. 01-SDMS-01 (latest revision) titled "General Requirements for all Equipment/Materials" which shall be considered as an integral part of this specification. It shall also be read in conjunction with SEC purchase order and/or contract schedules, and scope of work/technical specifications for projects, as applicable.

3 Applicable Codes and Standards

The latest revision/amendment of the following codes and standards shall be applicable for the equipment/materials covered in this specification. In case of conflict/difference, the vendor/manufacturer may propose equipment/material conforming to alternative codes or standards; however, the provisions in SEC standards shall supersede the provisions in these standards.

Standard	Description
IEC 60815	Polymer insulators for A.C. systems
IEC 62271-103	High voltage switches for rated voltages above 1 kV and less than 52 kV
IEC 60137	Insulated bushings for alternating voltage above 1000 Volts
IEC 60376	Specification and acceptance of new Sulphur hexafluoride
IEC 60437	Radio interference test on high voltage insulators
IEC 60870-5	Telecontrol equipment and systems - Part 5: Transmission protocols
IEC 61850	Communication networks and systems for power utility automation
ANSI C37.63	Requirements for overhead, pad-mounted, dry-vault and submersible smart line sectionalizer for AC systems
ISO 2063	Metallic coatings-protection of iron and steel against corrosion, metal spraying of zinc and aluminum
BS-EN ISO 1461	Guidelines for zinc coating
ASTM 123	Standard specification for zinc coating (hot dip galvanized) coating of iron and steel
ASTM 153	Standard specification for zinc coating (hot dip) on iron steel hardware
15-SDMS-02	Specification for Overhead Line Polymer Insulators (Latest Revision).

4 Design & Construction Requirements

4.1 Ratings

Ref	Description	Unit	Specified Value	
1	Nominal Voltage	kV	13.8	33
2	Continuous Current Rating	Amps	400	400
3	Symmetrical Interrupting Current	Amps	880	880
4	Making and momentary current, Asymmetrical	Amps	15000	15000
5	Rated short-time current symmetrical, 3- second	Amps	10000	10000
6	Minimum Creepage Distance of Bushings	mm	472	1116
7	Radio Influence Voltage (max.) for 1 MHZ	µV	500	650

It shall be noted, that based on the specific case calculations, higher values of short time current could be required.

4.2 Sequence of Operation

The sequence of operations must have the following characteristics:

a) The smart sectionalizer counts each over-current interruption of the associated up-stream auto-reclosing device and will open after a pre-set number of counts have been registered, within a pre-determined time span. The smart sectionalizer shall only open & lock-out during the dead interval of the upstream auto-reclosing device

b) Total number of counts to opening, adjustable to 1, 2 or 3. Each instantaneous (fast) and delayed interruption of back-up device will be counted individually.

c) The RTU logic shall be ready to take into consideration the EFI as a condition for open & lock-out

4.3 Adjustment and Settings

4.3.1 Minimum actuating-current settings: phase fault sensing; adjustable from 16 to 640 Amps.

4.3.2 Earth fault sensing: adjustable from 3.5 to 320 Amps. Reset / Memory time: adjustable up to 420 second.

4.3.3 It shall be possible to make local configuration and setting through Laptop PC. Further, remote configuration and setting from distribution control center shall be provided.

4.4 Interrupting Medium & Insulation

The interrupting medium shall be vacuum or SF6. The insulation medium shall be SF6 gas. An appropriate gas pressure indication gauge shall be provided to indicate the gas pressure. In case that SF6 gas pressure is abnormal, an alarm signal shall be sent to the control center (Refer to 4.10. DMS Data I/O List).

4.5 Control Panel

4.5.1 The enclosure of the RTU shall be made of stainless steel whose thickness is 1.5 mm or thicker and be protected using proper methods from severe outside conditions such as high temperature and solar radiation. The equipment installed in the control panel shall be capable to operate in service conditions as given in SEC specification 01-SDMS-01 latest revision. The RTU panel shall be manufactured with lifting hook(s) on top and a door with a locking device/hasp for padlocking on front, the door shall be opened by 120° or wider and fixable to allow inside inspection and setting of the equipment. The control panel shall be designed and fabricated mechanically and electrically rigid.

4.5.2 The control panel must be incorporated with devices listed below. Arrangement of the devices shall be properly planned. Drawing of the control panel design shall be subject to approval by SEC.

4.5.3 The control panel shall have an entrance hole in the bottom of the enclosure prepared for the installation of communication wire. The holes shall be covered if cables are not installed.

4.5.4 The RTU panel shall be adequately sealed, and dust protected and shall be internally treated to prevent moisture condensation. The degree of protection shall be as given in SEC specification 01-SDMS-01 latest revision.

4.5.5 Supplier shall ensure that both the panel and its door are fitted with suitable earth studs and that good electrical contact can be made between the earth, the panel and door. Connecting of all metal parts to the earthing point is included in the contractor’s scope.

4.5.6 The door of the panel shall be fitted with a robust fastening arrangement with three-point locking (i.e. at the top, center and bottom by rods operated by the door handle) and a door lock as per SEC standard.

4.5.7 The panel shall be easily removable for workshop repair purposes. A nameplate shall be attached to the front door.

4.5.8 The control panel shall be furnished with the following:

a) RTU
b) Remote communication device (modem and/or as per SEC requirement)
c) Main Smart sectionalizer status: closed (red) / open (green)
d) Lock indication of low gas pressure Normal/Abnormal
e) Operation lock indication (RTU/main body)
f) Backup supply and charge circuit status
g) Disconnection/open-phase: each phase on the power side
h) Live line: on the power side (for all 3 phases)
i) Control panel operation status: Normal/Abnormal
j) Operating Electrical Smart sectionalizer: “ON”and”OFF”separate from RTU
Separate Push bottom open/close (Red:close-Green:open) with Status indication
k) Manual operating Smart sectionalizer: Close/Open
l) Operation selector switch: Local/Remote separate from RTU
m) Smart (Line sectionalizer /OH LBS) Mode selector separate from RTU
n) Operation lock switch: Lock/Unlock
o) Terminals for backup supply testing
p) Lamp test switch
q) Control power switch (On/Off) and mini circuit breaker
r) Status indicator lamp (LED)
s) Power outlet: 1 phase AC 230 V.
t) The fault indicator shall have the local lamp & LED indication and the remote signal available.

4.5.9 The control circuit shall be provided with protective devices against over-voltage and current. The discharge of the backup supply must be minimized except when the door of the panel is opened. The control circuit must be designed to be protected from malfunction or wrong information by the malfunction of the devices or elements used for over-voltage protection.

4.5.10 The RTU enclosure must be provided with a ground cable connector terminal which allows direct connection of ground copper wire without extra fastener.

4.6 Control Cable

4.6.1 The control cable must be of the same or equivalent specification of shield cable, easy for installation and operation. The cable must be ultraviolet resistant and protected against external damage and its length shall be at least 10 m.

4.6.2 Both ends of the control cable must be weather proof and quick coupling with the main body and control panel of the switch and provided with lock devices to prevent unwanted decoupling.

4.6.3 The main body and control panel of the switch must be provided with a male, quick coupling type receptacle and a lock-up device to prevent miss-matching of the wiring, respectively.

4.6.4 The receptacles on the main body and the control panel for cable connection must be designed to be protected from damage in transportation, storage, or handling.

4.6.5 The control cable can be disconnected at the control unit while the switch is energized, live, and carrying load, without causing damage or mal-operation. Removing or connecting the control cable while the switchgear is in service shall not result in the switchgear changing open/closed state.

4.6.6 Two-core cable whose length is 7 m or longer must be supplied for the AC operating power supply for the control circuit. The cores of the cable shall be colored in black (ground) and red (voltage). The connector specifications for connection with the control panel shall be the same as those of the control cable.

4.7 Remote terminal Unit (RTU)

The Smart sectionalizer shall have electronic RTU, IP65 protection class, with following capabilities

a) Processing the command of electrical function.
b) Fault detection, inrush restraint and count restraint function.
c) Communication interface facility for local and remote communication.
d) Electronic Log File (To record the operations and alarms for a certain period, period to be specified by the manufacturer during the technical submittal stage).

The RTU's backup power supply shall be easily replaceable, maintainable and shall be capable to operate all the functions for the RTU for at least 10 Hours along with the support for at least eight switching operations without AC supply. The RTU Unit shall contain a 230 volts service outlet inside.

4.7.1 The smart sectionalizer shall be provided with a RTU for local and remote monitoring/measuring/operation.

4.7.2 The RTU shall be installed in a control panel, which shall have included a backup supply set, backup supply charger & battery , and any required devices/materials for remote communication.

4.7.3 Automated smart sectionalizer Operating System (Windows Based) shall have programmability and downloading facility via local and at remote end.

4.7.4 All the programming and protection function selection shall be password protected

4.7.5 All the monitoring and measuring functions, settings of parameters, and electrical operations of the smart sectionalizer shall be performed at the control panel and remotely.

4.7.6 Operation history: Up to 150 operation history data including the date/time of occurrence, control signal source (remote/local), and smart sectionalizer status shall be able to be indicated and stored in the sequence of occurrence.

4.7.7 The RTU shall include real time network condition monitoring of voltage, current, power, power factor and frequency.

4.7.8 The RTU must be able to store the waveform of the fault current 10 cycles prior to the breaking by other devices up to 4 or more times by 12 or more sampling per cycle.

4.7.9 The RTU must be provided with the functionality to monitor normal functions of components, store the results, and trigger warning, and provide the distribution automation system with the information.

4.7.10 Operating, maintenance and setting software, which can collect and manage various operational information of the switch including operating history, fault current waveform, load current measurement data, etc. shall be provided.

4.7.11 The selected RTU shall have adequate protection against reversed polarity, over current/voltage and under voltage condition and all the RTU components shall support a ambient temperature of 70°C.

4.7.12 Remote operating time

4.7.13 When RTU receives the command from the ADMS SCADA, FLISR or any other authorized master device, the operation shall be done within three (3) seconds which exclude signal transmission time.

4.7.14 All digital inputs shall be time-stamped to 1ms accuracy.

4.7.15 The RTU shall include the following minimum safety features for control outputs:

a) Select-and-execute sequence for control output.

b) No control command shall be generated during power up or power down of RTU.

c) No more than one control point shall be selected at any given time.

d) When the RTU of the smart sectionalizer is placed in the “local control” position, then control outputs of the remote SCADA can be tested without activating the field device. The RTU shall send a status indication of the local/remote switch to the master station or SCADA.

4.7.16 Control Outputs: The RTU shall provide the capability for a master station (ADMS SCADA or FLISR functions) to set two control outputs which shall be provided for each controllable device after receiving the command using the check before execute sequence.

The appropriate control output shall be operated for a preset time period which is adjustable for each point from 0.1 to 3 seconds

4.8 Power supply (AC, Charger & battery)

4.8.1 The battery proposed as Backup Supply, shall be crystal led with 3 years' warranty.

4.8.2 One of the voltage transformers on the source side shall be designed as power voltage transformer (refer to section 4.12). The power VT shall be a single phase AC220V (+/- 10%) /60Hz.

4.8.3 The power source shall properly charge the RTU, the battery and the smart sectionalizer (motor or Actuator)

4.8.4 All functions of the smart sectionalizer including open/close, Monitoring, RTU and Control, shall be powered by the same power source and the backup supply (battery) will back up the power source.

4.8.5 A power outlet (AC220V/60Hz) shall be installed in the Control Box to power a portable O&M device such as Lap-top computer.

4.8.6 The backup supply shall be capable to back up the monitoring, communication and operation of the RTU for 8 hours without AC source. The backup supply shall be capable of providing power to perform at least 50 operation cycles (open-close) without AC source. The supplier shall size the backup supply per smart sectionalizer, specifying the lifetime and the duty cycle of such period of life.

4.8.7 Batteries shall be maintenance free and sealed. No lead acid batteries are allowed.

4.8.8 Batteries shall be rechargeable and shall be suitable for temperature of 70 Degree centigrade.

4.8.9 The backup supply charger shall have temperature compensated to maximize battery

4.8.10 life and usable capacity.

4.8.11 The charger shall have filter to provide 2% or better ripple voltage when operated on a resistive load (from 5 to 100% full load).

4.8.12 The charger shall be provided with protection against overcharging. The supplier shall specify the proposed charging time.

4.8.13 The charging unit for the backup supply shall be capable to work at 110 Volts and 230 volts (phase to ground voltage).

4.8.14 "Low Backup Supply Charge" indication shall be available locally and remotely. When low backup supply charge alarm is "on" then the remaining capacity shall allow for at least 4 consecutive close operation and 4 consecutive open operations.

4.8.15 It shall be possible to test the battery.

4.8.16 All the alarms related to Charger & battery shall be wired to the RTU in order to be transmitted to the control center

4.9 Communication Requirements

4.9.1 General

The RTU shall either provide an integrated communication module or interfaces to external telecommunication devices as specified below. Via these interfaces communication is realized to the Distribution Management System (DMS) control center and/or to other Intelligent Electronic Devices (IEDs), the RTU is collecting data from, if applicable.

It is mandatory to apply standardized communication protocols.

The communication protocol towards the DMS shall be selected as per project requirements. The equipment shall be able to handle the following tele control protocol types:

a) IEC 60870-5-101
b) IEC 60870-5-104
c) IEC 61850 (future).

For communication to other intelligent electronic devices, for example digital protection relays, the RTU shall use the following protocols:

a) In case of existing IEDs as per available protocol in the IED

b) In case of new IEDs IEC 61850.

The Bidder/Contractor shall include in his bid all co-ordination, engineering and parameterization to guarantee interoperability with equipment from other suppliers via the specified protocols.

4.9.2 RTU Interfaces: All parameters are to be set and configured locally through front panel HMI keyboard facilities, through laptop PC with the respective software and from remote (Distribution Control Center). The following interfaces are the minimum requirement:
a) Ethernet 10/100 Base T for local configuration and setting from Laptop PC
b) 1 x Interface to telecommunication equipment (to distribution control center), type as required for selected telecommunication technique.

4.9.3 Communication Channel Speed: All serial channels, if any, shall be configurable between 300-64000 bps. The Ethernet port is 10/100Mbps with auto negotiation.

4.9.4 Communication Options: The RTU Modem's communication port to the DMS shall make it possible to utilize different communication medias such as:

a) 2G (GSM, GPRS, EDGE, CDMA)/3G (e.g. UMTS, CDMA)/4G (LTE)/5G (5G NR)
b) eSIM (Digital SIM card)
c) fiber optics
d) Wi-Fi
e) Narrowband IoT (internet of things)
f) Narrowband PLC
g) UHF/VHF
h) Mesh Wireless Networks.

4.9.5 In case of external telecommunication devices will be used, it must be ensured that the telecommunication device (modem, radio etc.) can be installed inside the smart sectionalizer RTU enclosure. Even though the RTU supplier will confirm that it can communicate through most communication media mentioned above, the supplier shall be responsible to do all necessary actions to ensure system compatibility (testing and reconfiguration) with SECs communication and DMS control center requirements.

4.9.6 For remote operation, the Bidder/Contractor has to cover and include all necessary actions including coordination with the DMS Supplier to guarantee interoperability

between the RTU and the DMS, as well as all necessary adaptation, extension of hardware, software and application of the DMS system and respective test and commissioning of that portion.

4.9.7 Protocol Support: The protocols shall perform a half-duplex operation as a polling protocol.

All protocols shall fully support time synchronization with the DMS System and time stamping in applicable protocols. It shall be configurable or designated on which communication port the DMS will be connected.

There shall be diagnostic functions such as protocol debugger, protocol simulator, tracing etc.

4.9.8 DMS Data Communication Interoperability List

The Bidder/Contractor shall assure the compliance with the DMS data communication interoperability list.

4.10 Control Functions: DMS Data-Base I/O List (appended)

The Bidder/Contractor shall fulfil the requirements as per DMS standard signal list.

The following are the minimum signals required:

4.10.1 Automated Smart sectionalizer shall be operated electrically, locally at the control panel and remotely from the Distribution Management System (DMS). In case the electrical operation fails, there shall be the possibility to manually operate the Smart sectionalizer.

4.10.2 If the signal of open/close operation is received through the communication devices, the operation action shall be completed within 1 second and all changed values and status shall be provided to the RTU and to the DMS.

4.10.3 The status of the backup supply charging device and backup supply itself shall be monitored and indicated at the RTU and transmitted to DMS.

4.10.4 There shall be the possibility to lock/unlock the operation.

4.10.5 The operational information including operating history of the Smart sectionalizer shall be able to be monitored and read-out with a laptop at the site.

4.10.6 DMS Data List

The Bidder/Contractor shall fulfil the requirements as per DMS standard signal list.
The following are the minimum signals required:

1) Alarms/Events (Digital input):

To be sent as spontaneous messages in case of appearance.

a) fault Indication (1Φ/earth - 2Φ - 3Φ):
the alarm Should automatically be reset after restoration of the electricity supply)
b) Voltage miss-phase (LOP: loss of phase)
c) Dispatch phases (phases sequence reversed)
d) Unbalanced load
e) Gas Pressure
f) Backup supply (Battery) Status
g) Charger status
h) AC power supply status
i) DC power supply status
j) Open door
k) RTU alarms

2) Status (Digital input):

To be sent as spontaneous messages in case of change of the status and during general interrogation:

a) Smart line sectionalizer Open/Closed
b) Local/Remote
c) Smart line sectionalizer Lock / Unlock

3) Commands(Digital output):

To be ordered from the control center or from Laptop

a) Close / Open
b) Reset the counter
c) Fault indication reset: reset remotely & locally (lamp + LED) even before supply restoration

4) Measurements (Analog input):

To be sent after exceeding the configured limit of change, during general interrogation and after a configurable cycle time:

a) Counter Reading (1-2-3)
b) Current (three phases).
c) Voltage (three phases)
d) Active and Reactive power (three phases).
e) Power factor
f) All logical calculated functions needed by ADMS.

4.11 Cyber Security requirements

4.11.1 Application whitelisting shall be implemented on Smart Devices to monitor and ensure that only authorized applications are executed without affecting operations.

4.11.2 Smart Devices shall be configured to produce and store event logs recording activities, exceptions, faults and information security events.

4.11.3 Smart Devices shall have the capability to log the following information and activities:

a) Timestamps for each event. System clocks shall be synchronized to a single reference time source to facilitate forensic analysis of actions taken on the device.
b) Incident management activities.
c) Utility programs that can override system and application controls.
d) Cryptographic key management related activities.

4.11.4 Logging mechanisms shall not adversely affect device critical functions and performance.

4.11.5 Smart Devices shall recover to a secure state in the event of a disruption or failure.

4.11.6 Smart Devices shall have access controls implemented at both the software level (such as operating system and applications level) and hardware/device level. Access controls shall be established with the following principles and capabilities:

a) Least privilege – access shall be limited to only information or resources that are necessary to accomplish a legitimate purpose.

b) Privileged access – access controls shall establish privileged and non-privileged levels for users and processes. Access controls shall prevent non-privileged users or processes from executing privileged functions (such as installing software or changing system configurations).

4.11.7 Smart Devices shall at least enforce the following Password change, complexity, re-use, and lockout constraints for access control:

Minimum Age	Maximum Age	Minimum Length	Password Reuse	Complexity Requirements	Account Lockout Threshold	Account Unlock Action
1 day	2 years	10 characters	10 passwords remembered	4 of 4 (uppercase, lowercase, numbers, symbols)	25 invalid attempts within 1 hour	Admin or Supervisor unlock

4.11.8 Smart Devices shall lock the access after several authentication failures. Device shall be capable of sending an account lock alarm.

4.11.9 All Smart Devices shall implement and enable audit and logging capabilities when possible.

4.11.10 Smart Devices shall be up-to-date with the latest security related patches as much as it is operationally safe and feasible. When it is not possible, a justification shall be provided and countermeasures identified and implemented.

4.11.11 Any security vulnerability Identified by SEC during Smart Devices lifetime shall be remedied and patched.

4.11.12 A list of identified potential security risks and best way to mitigate them shall be provided.

4.11.13 Smart Devices shall be secure by design. Security shall be integrated throughout each phase of systems lifecycle.

4.11.14 Smart Device shall be properly hardened as per the guidelines provided below to harden networks, operating systems, applications and Smart Devices.

4.11.15 Appropriate security test cases shall be created to provide scenarios that detail both how the device is intended to be used and how it should not be used.

4.11.16 Any time data is input by a user, it shall undergo input validation to ensure only proper authorized characters are accepted.

4.11.17 Smart Devices shall provide the capability to set outputs to a predetermined state if normal operation cannot be maintained because of an attack.

4.11.18 Smart Devices shall identify and handle error conditions in a manner such that effective remediation can occur without disclosing unnecessary information to an attacker.

4.11.19 If session IDs are used on a Smart Device, it shall provide the capability to protect the integrity of sessions and reject any usage of invalid session IDs.

4.11.20 Smart Devices shall support encryption on all supported protocols. If some protocols do not support encryption, then the smart device shall support secure IPsec VPN tunneling.

4.11.21 Where mobile code is not required, it shall be disabled.

4.11.22 Any mobile code that is necessary for application operation shall be presented to the Distribution Cyber Security for review and approval to ensure proper protections and restrictions are in place.

4.11.23 Any approved mobile code shall require proper authentication and authorization of origin and its use shall be monitored.

4.11.24 Smart Devices shall be able to verify the integrity of the mobile code before allowing code execution.

4.11.25 Where cryptography is determined to be required, Smart Devices shall use cryptographic algorithms, key sizes, and mechanisms for key establishment and management according to commonly accepted security industry practices and recommendations.

4.11.26 Established and tested encryption shall be employed to reduce risk of information leakage or tampering.

4.11.27 Smart Devices shall utilize established and tested encryption to protect sensitive data at-rest where required.

4.11.28 Smart Devices utilizing PKI (Public Key Infrastructure) shall provide the capability to operate it according to commonly accepted best practices.

4.11.29 Smart Devices utilizing PKI as part of their identification or authentication process shall employ validity checking of certificates.

4.11.30 Certificates CA (Certificate Authority) signature shall be verified to confirm that the certificate has not been tampered since it was first signed.

4.11.31 Smart Devices utilizing PKI shall consult with CRL or OCSP to determine the revocation status of all certificates.

4.11.32 Smart Devices shall be able to determine whether a given human, software process, or device user took an action based on the use of non-repudiation techniques.

4.11.33 Smart Devices shall be able to produce machine-readable report of deployed security settings.

4.12 Voltage Transformer

4.12.1 Three (3) single phase Voltage Transformers (VT's) in the source side and three (3) single phase VT's in the load side, complying to IEC-61869-3 or equivalent, shall be delivered and installed together with Smart Line sectionalizer and its cost shall be included in the respective bid price. They shall be dry type, epoxy encapsulated. The measuring windings shall have a ratio of 33kV/ √ 3/230V respectively 13.8kV/ √ 3/230V. The VT' s shall be designed for 60Hz and shall have an accuracy class of 1.0 or better. The rated output (burden) shall be selected as required for the equipment to be supplied and fulfilling the requirements as stated in IEC 61869..

4.12.2 One of the voltage transformers on the source side shall be designed as power voltage transformer. The power voltage transformer, which combines the attributes of an inductive voltage transformer with the application of a small power transformer, shall provide windings for measurement, see paragraph above, and a winding for giving auxiliary power supply to the Smart sectionalizer electronic equipment of 230V. The rated continuous output power shall be calculated and selected as per consumption present, with safety margin of 20%. The power VT shall be maintenance free.

Accuracy of the VT sensor shall be 1% or better

4.13 Current transformer

4.13.1 Three (3) current transformers as per IEC 61869-1/-2 and SEC Specification 50-SDMS-01 for fault current detection and current measurement shall be designed in bushing-type structure to be able to be mounted inside the main body of the Smart Line Sectionalizer and have sufficient mechanical and electrical strengths. Alternatively, current sensors shall be provided. For all the solutions, the accuracy class as given in the data schedule shall apply.

4.13.2 The current transformers shall have primary current as per rated continuous current, and its rated burden and error characteristics shall be suitable for the operational characteristics of the RTU.

4.13.3 The current transformers shall have sufficient over-current coefficient to enable transformation without being saturated at the maximum fault current in the distribution line as well as at a current smaller than normal load current and must not affect the measuring circuit when transforming a large fault current.

4.13.4 The main body must be provided with a CT protection circuit to prevent exposure of the CT secondary circuit even when the control cable is disconnected.

Accuracy class of the CT shall be 1.0 or better

4.14 Operating Mechanism

Means shall be provided to permit manual operation of the smart sectionalizer through operating rod or built in extensible lever system from the ground level and for remote operation from the Distribution Control Center. The smart sectionalizer shall be equipped with a Local/Remote switch, mounted in the control panel.

4.15 Pole Mounting Frame

All units shall be supplied with a galvanized steel mounting frame suitable for SEC standard octagonal steel pole (Refer to 20-SDMS-01) and Pre-stressed concrete pole (Refer to 20-SDMS-03). Appropriate clamping ring shall be provided for the smart sectionalizer and RTU secure the unit with a pole without using bolts through the pole.

4.16 Lifting Lugs

Lifting lugs shall be provided such that smart sectionalizer can be lifted with a single hook without damage.

4.17 Grounding terminal

All units shall be provided with an appropriate ground terminal.

4.18 Tank

The tank shall be preferably made of stainless steel of minimum thickness 3 mm, strong enough to support the vibration of the smart sectionalizer.

The tank and its accessories shall be adequately protected against corrosion and the supplier shall include a statement of the method of protection proposed.

Hot dip galvanization is preferred (in case tank is not stainless steel fabricated), otherwise large size tanks shall be sand-blasted and then immediately zinc sprayed to an average weight deposit in accordance with BS-EN ISO 1461. This shall be followed by zinc or zinc chromate based primary paint and two coats of durable oil and weather resisting paint shall be applied. These colors of each coat shall be easily distinguishable. The final coat shall be epoxy based. Finish color shall be cement gray RAL-7035, as per Deutsches Institute für Normung e.v. Zinc spray shall be in accordance with ISO-2063.

The tank shall be perfectly sealed and dielectric fluid tight, with all fittings in place. The tank shall be weather proof, sealed and suitable to operate under all operating conditions.

The tank shall be equipped with two brackets each to accommodate three nos. lightning arresters (conforming to 35-SDMS-01 for Surge Arresters) both on incoming and outgoing side respectively.

4.19 Bushings

The Smart sectionalizers shall be fitted with polymer bushings conforming to latest respective international Standards and compatible with SEC service conditions and system parameters. The bushings shall be provided with anti-bird devices / caps. The bushings shall be terminated by flat pad terminals to accept vertical connection with ACSR conductor size 70 mm^2 to 170 mm^2.

4.20 Position Indicator

The smart sectionalizer shall be provided with position indicator, or other suitable means, which will clearly indicate the position OFF (in Green) and ON (in Red). This indicator shall be visible from the ground.

5 Marking

Each smart sectionalizer shall be fitted with an easily readable nameplate of weather Proof material giving the following details marked in English and Arabic.

- Manufacturer name
- SEC item number
- Serial number
- Year of manufacture
- Country of origin
- Rated voltage
- Rated impulse withstand voltage
- Rated frequency
- Rated symmetrical interrupting capacity
- Rated continuous current
- Rated frequency
- Manufacturer name and reference number
- CT & VT ratio rating and class
- Interruption medium
- Insulation Medium
- SEC purchase order number
- Reference to SEC specification
- SEC monogram
- Gross weight.

6 Testing and Inspection

6.1 General

6.1.1 All equipment shall be type tested at SEC-approved independent testing laboratory in accordance with the latest standards and as specified herein. Test reports shall be submitted for SEC review and approval.

6.1.2 The equipment offered shall meet the type test requirements of the latest version of ANSI C37.63 and IEC 60437 or equivalent.

6.2 Type Test

6.2.1 The following tests shall be carried out in accordance with ANSI C37.63 except for bushings and insulators, which shall be as per IEC 60437. It shall be performed at SEC approved laboratories and shall consider the environmental conditions applicable.

6.2.2 SEC reserves the right to attend and witness the tests.

6.2.3 SEC reserves the right to request the supplier/manufacturer to repeat the type test every five (5) years, or as needed should the supplied devices have frequent faults and failures.

6.3 Routine Tests

Routine tests in conformance with the applicable clauses of ANCI C37.63 and IEC 60437 or equivalent shall be performed on all MV line sectionalizes. Electronic copies of the test reports shall be submitted to SEC in USB thumb drive for each batch to be delivered prior to issuance of the releases.

In addition to the ANCI C37.63 and IEC 60437 production tests, the following tests shall be performed on samples:

a) Communication test.
b) As a special testing requirement, the mounting and fitting test considering the design of standard overhead lines constructions as defined in SEC overhead line standard specification shall be implemented.
c) Backup power supply (Temperature raise to 70˚C, operating the control panel functions for 10 Hours without AC supply and capable to perform eight switching operations within these 10 Hours) shall be tested.

6.4 Sample Inspection

Samples together with actual CAD drawings, user manual and routine test reports shall be submitted for inspection/evaluation prior to issuance of approval for mass production. The following attributes shall be checked:

a) Dimensional verification
b) Markings
c) User Manual
d) Packaging
e) Functionality
f) Communication
g) SIM Card Slot.

7 Packing and Shipment

7.1 Packing and shipping requirement shall generally be as per latest revision of SEC General Requirements for Equipment/Materials, 01-SDMS-01 or as per purchase order requirements.

7.2 Each MV line smart sectionalizer shall be packed in a box as a complete unit and shall be delivered ready for use. Accessories shall be supplied in a separate box with printed marking relating to the box of the MV line smart sectionalizer.

7.3 Packing shall protect the MV line smart sectionalizer against damage during shipment and site handling.

7.4 Suppliers shall coordinate with SEC Warehousing Department for additional packing, handling, and or shipping instructions, as applicable.

7.5 Each box shall be printed with the following information:

a) Purchase Order Number/ Tender Number
b) Smart sectionalizer rating and Nominal voltage
c) Manufacturer 's Name and Model/Type
d) Year of Manufacture & gross weight
e) SEC Item Code
f) Position of slinging points and other relevant handling instructions

7.6 Packing notes in Arabic and English shall be included in each case giving a description of the goods packed.

8 Spare Parts

8.1 A comprehensive list of manufacturer's recommended spare parts shall be included in the tender. The quantities offered should be adequate for the initial five (5) years of operation.

8.2 A firm price and delivery period shall be quoted for each item.

8.3 Spares supplied shall be packed to provide long storage without deterioration. Each package shall be clearly marked and labeled in Arabic and English with the description of its contents.

8.4 If any spare part requires special storage conditions, these conditions shall be detailed.

9 Guarantee

The supplier shall guarantee the smart sectionalizer and its accessories against all defects arising out of faulty design, faulty workmanship or of defective material for period of five (5) years from the date of delivery.

10 Training

The supplier shall provide onsite training, regarding programming and commissioning for an adequate period, to be agreed upon by the SEC and the supplier after supply of the smart sectionalizer.

11 Submittals

11.1 Submittals required with Tender/Inquiry

11.1.1 Summary in table form with the following information: list of items offered, manufacturer, origin, catalogue number, and quantity.

11.1.2 Clause-by-clause compliance with the latest revision of SEC specification 33-SDMS-04.

11.1.3 Manufacturer's Catalogue in English language.

11.1.4 User Manual in both English and Arabic language.

11.1.5 Certificate stating that the raw material has been sampled, tested and inspected in accordance with relevant standard specifications.

11.1.6 Product type test reports and certificates carried out from SEC approved laboratories.

11.1.7 Filled-up technical data schedule on each of the items offered.

11.1.8 Manufacturer CAD drawings for each of the items offered, including mounting methods and accessories.

11.1.9 USB Flash Drive containing e-copy of all the documents mentioned above.

11.2 Vendor shall submit the following after the contract award:

11.2.1 Samples in compliance with Clause 6 of this specification.

11.2.2 Quality assurance tests.

11.2.3 Manufacturing and routine test schedules.

11.2.4 Special tests, if applicable.

12 Technical Data Schedule

MV SMART LINE SECTIONALIZER UP TO 36 KV

SEC Inquiry No. _____ *Item No.* _____

No.	Description		SEC Specified Values/ Requirements		Vendor Offered Value
1	Nominal System Voltage (kV)		13.8	33	
2	Maximum Operating Voltage (kV) (Nominal)		15.2	36	
3	B.I.L. (kV)		95, 110	170, 200	
4	Continuous Current Rating (Amps.)		400	400	
5	Minimum Actuating current (Amps.)		16 - 640 (adjustable)		
6	Minimum Earth fault-sensing current (Amps.)		3.5 - 320 (adjustable), block		
7	Number of counts to open		1, 2, 3		
8	Inrush restraint	Phase (cycle)	5 – 20		
		Ground (sec)	0.3 – 5		
9	Phase actuating level multiplier (inrush restraint)		X1 - X8, block		
10	Interrupting Rating Max. Value (Amps)		880	880	
11	Rated making current RMS, asymmetrical. (Amps)		15000	15000	
12	Short time Current for 1 second. (Amps)		10000	10000	
13	Minimum Creepage Distance of Bushing		472 mm	1116 mm	
15	Radio Influence Voltage (µV)		500	650	
16	Pole Mounting Frame		Required for SEC poles types		
17	Power Voltage Transformers a- Number of Power VTs b- Measurement/Protection Winding Primary Secondary Class VA to be specified by Bidder		1 per each phase 13.8kV/√3 0.11kV/√3 0.5/5P to be specified by Bidder	1 per each phase 33kV/√3 0.11kV/√3 0.5/5P to be specified by Bidder	

No.	Description	SEC Specified Values/ Requirements		Vendor Offered Value
	c- Auxiliary Supply Winding Primary Secondary VA	13.8kV/√3 230V to be specified by Bidder	33kV/√3 230V to be specified by Bidder	
18	Current Transformers Measurement/Protection Primary current Secondary current Class Burden	 600 1 0.5/5P 20 to be specified by Bidder	 600 1 0.5/5P 20 to be specified by Bidder	
19	Finish Color	RAL 7035		

SMART SMART LINE SECTIONALIZER UP TO 36 KV

SEC Inquiry No: …….. *Item No:……..*

- Additional Technical Information or Features Specified by SEC

- Additional Supplementary Data or Features Proposed by Bidder/Vendor/Supplier.

- Other Particulars to be filled-up by the Bidder/Vendor/Supplier.

- List of Deviations and Clauses to which exception is taken by the Bidder/Vendor/Supplier. (Use separate sheet, if necessary).

Description	Manufacturer of Material/Equipment	Vendor/Supplier
Name of Company		
Location and Office Address		
Name and Signature of Authorized Representative with Date		
Official Seal / Stamp		

DISTRIBUTION AUTOMATION PROGRAM
SMART OH-LBS/LINE SECTIONALIZER
I/O LIST DATA POINTS

Bay / CIRCUIT no.	Point name / Message	IOA / IEC OBJECT ADRESS	
DIGITAL OUTPUT (DO) COMMANDS			
OH-LBS/Sectionalizer	CLOSE COMMAND	1	
OH-LBS/Sectionalizer	OPEN COMMAND	1	
DIGITAL INPUT (DI) GENERAL ALARMS / INDICATIONS			
OH-LBS/Sectionalizer	CLOSE INDICATION	11000	
OH-LBS/Sectionalizer	OPEN INDICATION		
OH-LBS/Sectionalizer	REMOTE	11001	
OH-LBS/Sectionalizer	LOCAL		
OH-LBS/Sectionalizer	OH-LBS MODE	11002	
OH-LBS/Sectionalizer	LINE SECTIONALIZER MODE		
COMMON	LOCK/UNLOCK INDICATION	1000	
COMMON	Battery low	1001	Alarm
COMMON	Gas Low (if the Sectionalizer is SF6)	1002	Alarm
COMMON	AC power fail	1003	Alarm
COMMON	Door open	1004	Alarm
COMMON	DC power fail	1005	Alarm
COMMON	Motor/Actuator(Open/Close) Circuit Fail	1006	Alarm
COMMON	Phase loss (miss-phase)	1007	Alarm
COMMON	Overcurrent (load)	1008	Alarm
COMMON	Unbalance (Load)	1009	Alarm
COMMON	Under voltage	1010	Alarm
COMMON	RTU Self diagnostic (RTU alarm)	1011	Alarm
COMMON	Fault indication	1012	Alarm
COMMON	Dismatch phases	1013	Alarm Phases: (R-S-T) (U-V-W)
ANALOG INPUT (AI) MEASURMENTS			
Current	I Current (A)	13000	
Current	I Current (B)	13001	

Current	I Current (C)	13002	
Current	I Current (N)	13003	Vector sum of three currents
Voltage	Voltage (R-S)	13004	Phase to phase
Voltage	Voltage (S-T)	13005	Phase to phase
Voltage	V_voltage (R-T)	13006	Phase to phase
Voltage	Voltage (N)	13007	Vector sum of three voltages
Voltage	Voltage (U-V)	13008	Phase to phase
Voltage	V_voltage (V-W)	13009	Phase to phase
Voltage	V_voltage (U-W)	13010	Phase to phase
Voltage	Voltage (N)	13011	Vector sum of three voltages
Power	P (KW)	13012	Total of three phases
Power	Q (KVAR)	13013	Total of three phases
Power	Power Factor	13014	
Counter	Counter Setting	13015	1-2 or 3