32-SDMS-13

REV.0

SPECIFICATIONS FOR MV SPECIAL USE SMART RMU (630A)

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1 Scope

This SEC Distribution Materials Specification specifies the minimum technical requirement for design, materials, manufacturing, testing, inspection and performance for OUTDOOR type, medium voltage special use smart ring main unit, for the rated voltage up to 38 KV, and rated currant 360 A, in the medium voltage distribution network of the Saudi Electricity Company (SEC) in Saudi Arabia. This SRMU will be used for Distribution Automation System so that the SMART RMU will be remotely controllable using integrated communication devices such as a RTU and a Modem, and a separated independent switching system ATS patch panel(refer to the attached appendix for the ATS panel requirements .

2 Cross references to other SEC standards

This material standard specification shall be read in conjunction with SEC specification No. 01-SDMS-01 (latest revision) for General Requirement for all Equipment / Materials, which shall be considered as an integral part of this SDMS. This SDMS shall also be read in conjunction with SEC Purchase Order (PO) requirements

3 Applicable codes and standards

The latest revision of the following codes and standards shall be applicable for the equipment/materials covered in this specification. In case of any deviation, the vendor/manufacturer may propose equipment/materials conforming to alternate codes or standards. However, the provisions of SEC standards shall supersede the provisions of these alternate standards in case of any difference.

Standard #	Title
IEC 62271-100	High-voltage alternating-current circuit breakers
IEC 62271-172	HV Alternating current disconnectors and earthing switch
IEC 61869-1	Instruments transformers
IEC 61869-2	Current Transformers
IEC 61869-3	Voltage Transformers
IEC 60255	Electric Relays
IEC 60265	High-voltage switches
IEC 62271-200	AC metal-enclosed switchgear and control gear for rated voltage above 1 kV and up to and including 52 kV
IEC 60337	Control switches (low-voltage switching devices for control and auxiliary circuits, including contactor relays)
IEC 60376	Specification and acceptance of new Sulphur hexafluoride
IEC 60420	High-voltage alternating current fuse-switch combination and fuse-circuit-breaker combination

Standard #	Title
IEC 60529	Classification of degree of protection provided by enclosures
IEC 60694	Common specifications for HV switchgear and control gear standards
ISO 2063	Metallic coatings – protection of iron and steel against corrosion – metal spraying of Zinc and Aluminum
01-SDMS-01	General requirements for equipment/material
50-SDMS-01	Current Transformers
50-TMSS-03	33 & 34.5 KV POTENTIAL TRANSFORMERS
32-SDMS-11	Smart RMU up to 36kV
12 SDMS-01	Termination, joints & accessories up to 36 kV
11-SDMS-04	Specification For Aluminum Unarmored XLPE/LLDPE Insulated Power Cables For Rated Voltages From 15kv Up To 36kv
DPMS-02 R0	Complete Protection IED Specifications & CTs for Automatic RMU
11-SDMS-03	XLPE Insulated Power Cables for Rated Voltages From 15kV up to 36 KV (Um).
DES-P03	protection system requirements for SEC distribution s/s
DES-P04	Relay Setting & Coordination Guidelines for SEC Distribution NW
31-SDMS-11	SPECIFICATIONS FOR TERMINAL BLOCKS FOR PRIMARY S/S
37-TMSS-03	LV circuit breaker.
38-SDMS-03	Low Voltage Digital Panel Meters.
11-SDMS-01	Low Voltage Power And Control Cables
40-SDMS-02A	CT/VT smart meter specification.

Table 1: List of applicable standards

4 Material, general design and construction requirements

4.1. General

4.1.1 The special use smart RMU shall be as per the below requested layout configurations:

- **special use smart RMU 2L2 CB:** 4ways (LBS1-CB2- CB1-LBS2)
- **special use smart RMU 3L1 CB:** 4ways (LBS1-LBS2- CB-LBS3)
- **special use smart RMU 4L:** 4ways (LBS1-LBS2-LBS3-LBS4)
- **special use smart RMU 3L :** 3ways (LBS1-LBS2-LBS3)
- **special use smart RMU 2L+ CB:** 3ways (LBS1-CB -LBS2)

4.1.2 The special use smart RMU shall be outdoor, metal-enclosed, single bus-bar type.

4.1.3 Insulation medium shall be Air or SF6 gas for the MV bus bar, and fault interruption medium for the equipped CB shall be either SF6 gas or vacuum, with fully DC supply operation mechanism, and it must clearly mention on the special use smart RMU name plate.

4.1.4 Degree of protection of the panels shall be class IP-54 at least as per SEC specification No. 01-SDMS-01 for outdoor application. All access to the mechanism shall be protected against dust and moisture.

4.1.5 Humidity and moisture condensation control elements with activation and deactivation thermal control switch shall be provided in each panel.

4.1.6 SF6 gas, Temperature independent gas pressure gauge shall be marked with 3 colored zones, green (safe), yellow(alarm) and red (blocking), The safe operating zone shall correspond to a temperature range of –10º C to +55º C. The unit shall continue to work safely even if the gas pressure inside the tank goes down to the atmospheric pressure. Refilling / re-pressurizing inlet valve, if provided, shall be easily accessible for field refilling and clearly marked with yellow background label, but if the gas pressure is failing to red zone indication, it must be blocking all the electrical operation/tripping for both modes remote/local with sending alarming signals to the control center, and initiate the alarming LEDs in local indication for SF6 gas pressure alarm (yellow LED) and SF6 gas blocking (RED LED), in the alarm stage the operation for closing shall be blocked.

4.1.7 For SF6 gas Refilling / re-pressurizing charging valve, shall be provided, with recharging gas quick guide sticker on the panel, and it shall be easily accessible for field refilling.

4.1.8 The operating mechanisms shall be lockable at each position with padlocks (provided by SEC) having 9 mm shackle diameter and 25 mm clearance. The maximum physical effort required for operating any mechanism shall not exceed 400 Newton. The maximum height of the mechanism operating access shall not exceed 1.3 m.

4.1.9 The operating handle shall have anti-reflex action for load break switches and shall be stored in a proper place at the front or side of the unit. Operating handle inserts shall have marking as appropriate to avoid inserting the wrong end during switching operations. It is preferred to have one common handle for all switches.

4.1.10 All parts of equal size and shape shall be inter-changeable.

4.1.11 All bolted electrical joints shall be secured by fasteners of corrosion-proof materials.

4.1.12 the panel shall be equipped by a CPT with rated = AC load calculation of the panel +20% of it, so it can be feed the panel by a 220 AC supply, also the panel shall be ready to be connected to external AC supply 220 AC , so a changeover system is must to changeover between the self-power supply (from the CPT) and the external power supply , and the priority will be for the internal power supply , and if it fail , the changeover system shall be transfer to the external power supply.

4.1.13 all special use smart RMU LBSs compartments shall equipped by a bay/feeder controller devise for measurements, control functions, currant sensors (CS) and voltage sensors (VS) if required.

4.1.14 all VSs/CSs sensors shall be built in sensors, any external sensors are not accepted.

4.1.15 LV control/protection/automation cabinet, shall have a proper ventilation way with kept the same IP54 rated not affected.

4.1.16 all different type internal DC loads, shall be protected with a segregated MCBs, like protection function load, operation load, mechanism, RTU load…. etc., with provide the labels for each one.

4.1.17 all panel internal labels shall be fixed on a fixed objective. Not a movable one like cable trunk covers.

4.1.18 all panel front side labels shall be in laser print, or an engraving stainless steel labels fixed by screws, while any sticker labels will be rejected.

4.1.19 all panel front side SLD shall be in laser print, normal paint are not accepted.

4.1.22 Auto transfer system (ATS) system will be requested in a separated request, it will be installed in a separated patch panel, and it will manage the sources change over between a multiple source from multiple RMUs, in the same area, the fully system description and requirements will be finding in the attached appendix 1.

4.2 Current rating

4.2.1 Bus bars shall be of electrolytic high grade copper. It shall withstand the mechanical stresses of the rated short circuit current. The continuous current rating at the maximum ambient temperature given in SEC specification 01-SDMS-01 shall be **630A** for ring switches and breaker panels, for an ambient temperature 55 ˚C.

4.3 Ring switches

4.3.1. Ring switches shall be full load break and fault-making type. Ring switches shall be designed for interrupting full rated current as stated in clause 4.2 above, small inductive or capacitive currents involved in disconnecting of unloaded transformers, cables or overhead lines. It shall be suitable for full fault-making current.

4.3.2. Ring switch shall consist of a moving contact assembly with three positions: ‘ON’, ‘OFF’, and ‘Earth’. Two independent manual operating mechanisms for ring and earth switches are also acceptable. The design shall prevent simultaneous closing of the main switch contacts and the earth switch contacts. The earth switch contacts shall be designed to close into a fault and shall have the same short circuit capacity as the main contacts.

4.3.3 The switching operation shall be local manual (by an operation handle)/local electrical (form a control operation push bottom)/remote operation control by means of fast acting operating mechanism, this 3 ways of operation control must be an independent way of operations , Closing and opening speeds of the switch shall be independent of the speed with which the operating handle is moved by max time of operation for the LBS 3 sec. , and for the CB shall be as per the IEC standard recommendations, all operation position shall have a local indication LED for the actual status of the switching devices with a red color for ON position and green color for the OFF position and yellow color for the earth position.

4.3.4 Ring switch operating mechanism shall have provision for on-site installation (retrofitting) of geared motor mechanism and associated closing and opening coils with necessary contactors for remote and future tele-control operations in the distribution network, max. allowable total time for operation is 3.0 sec.

4.4 Circuit Breaker

4.4.1 Circuit breaker shall be of fixed type, with interruption medium Vacuum or SF6.

4.4.2 Circuit breaker shall be designed to open, close by local push buttons (red color for closing and green color for opening), or by remote signals also availability to trip through protective relay equipped inside the SRMU. Local and remote operation selection shall be by a selector switch on the front panel with lock out tag out facility, and when the selector switch is in local position it shall block all the remote operations and vice versa, also a mimic indication is required inside the panel SLD.

4.4.3 Circuit breaker operation/tripping mechanism shall be fully operated and controlled by a DC supply.

4.4.4 Earthing of circuit breaker shall be by means of a switch with same fault level capacity of the breaker below the breaker in the direction of the MV power cables with a fully interlocking mechanism between the disconnector switch, CB and earthing switch.

4.4.5 Operating mechanism shall be fast acting and independent of the operator action when operating manually and shall indicate the following positions:

a. Circuit breaker ON in (red indication) and OFF in (green indication).

b. Off-Load Isolator ON (red indication) and OFF (green indication).

c. Earthing ON with yellow back indication and OFF for green indication

4.4.6 If circuit breaker panel equipped with an off-load isolator switch, it shall be fully interlocked with the circuit breaker.

4.4.7 The CB/LBS mechanism control, charging motors and operation should be a fully operated by DC voltage, AC not accepted.

4.4.8 In case of installation of SRMUs in Overhead Line Applications, Circuit Breaker Auto-reclosing is important which shall be performed through approved **auto reclose relay,** Control Settings for the Auto-reclosing function will be as per Company Standards and Requirements.

4.5 Protection system requirements:

4.5.1 Relay selection:

Protection Relay to be used in special use smart RMU shall be selected from the latest version of SEC-DBU Unified List of Approved Relays (RMU Relays List) and in compliance with the latest specification of Distribution Protection Material Specifications (DPMS-02). The DC supply of the relay and protection circuits shall be 24V DC, There should also be redundant DC supply (Through UPS). Furthermore, the ordering code of the relay shall be selected based on the following specifications:

a. Dual Powered Relay.
b. Rear Port Communication (Communication Protocol shall be IEC 60870-5-103 / 104, DNP 3.0 or as required by the company).
c. 24 DC voltage supply

4.5.2 Main Signals related to special use smart RMU protection system, which shall be transmitted through the RTU, include but not limited to:

a. Current measurements

b. WATCHDOG (relay error, relay faulty, protection in service, protection healthy…etc.) shall be configured to the RTU through hardware connection and through rear port communication.
c. Segregated Phase and Earth fault Protection Operated Signals shall be configured to the RTU via Hard-wired Connection & Serial Communication
d. Protection Settings, Events and DFRs Records (if applicable).

4.5.3 Protection Relay DC Supply shall be provided via DC MCB and The DC loop shall be supervised by a DC supervision relay with alarming contact coupling with the RTU.

4.5.4 Protection CTs shall be provided for each phase (i.e. (3) Phase CTs are required).

4.5.5 Each Phase Protection CTs shall be Circuit Breaker BUSHING MOUNTED to cover cable termination faults. Installation of Protection CTs at Cable side is not acceptable.

4.5.6 Protection CT Terminals shall allow complete shorting, isolation & earthing.

4.5.7 Auxiliary relays, Terminal blocks, Test switches/blocks etc. shall be provided from latest approved list of SEC- DBU /National Grid Saudi Arabia approved list.

4.5.8 Protection CT specification shall be as follows:

CT Parameter	Value
CT Ratio	Multi-ratio 300-600/1
CT Class	5P15 @ highest tap
Burden	15VA @ highest tap
CT Resistance	≤1.2Ω @ highest tap

Table 2: Protection CT specification

4.5.9 Tripping shall be provided through two paths:

a) Relay Trip Output Contact connected to CB Striker.
b) Relay Output Contact connected to CB Tripping coil.

4.5.10 In case this equipment is installed for OHL Application, auto-reclosing feature may be required. A separate auxiliary-powered relay selected from Unified List of Approved relay shall be installed for auto-reclosing.

4.6 Operations

4.6.1. The SRMU shall be ready for operation as follows:

- Local/Manually as a mechanical operation by a handle (open-close-earth- etc. ...)
- Local/Electrically, open/close with pushbutton, with fully independent operation away from the RTU modules.
- through the RTU modules open/close while it connected to maintenance laptop.
- Remote/fully function access and operation control from distribution control center (SCADA-ADMS) through the RTU modules.

4.6.2. All operating positions shall be on the front of the unit and position of each of the switches shall be displayed on a mimic diagram. Clear indicators showing 'ON', OFF' and 'Earth' shall be provided on polycarbonate or metal painted labels not less than 15 mm in height and 1.5 mm thick (sticker type labels are not acceptable).

4.6.3 the external power AC supply shall be through a protective trunk, and to be marked/tagged with label (external AC supply inlet).

4.6.4 the used communication antenna shall be internal no any external antenna will be accepted.

4.6.5 the LV compartment panel internal LED lighting shall be coupled with the RTU door position for ON/OFF light operation.

4.6.6 (70) degree temperature certificate for the all equipment's inside the control LV compartments panel shall be provided (battery, RTU, protection relay, charger …etc).

4.6.7. Indicator windows shall not be less than 15 mm in diameter and shall be covered with transparent UV resistant material with adequate mechanical strength.

Indicator	Letters	Background
ON	White	Red
OFF	White	Green
Earth	Black	Yellow

Table 3: Indicators

4.6.8 LED back indication for CB, LBS and SF6 status:

Green LED for OFF status independent for each unit.

Red LED for ON status independent for each unit.

Yellow LED for earth ON independent for each unit.

Yellow LED for SF6 gas warning/ **RED** LED for gas operation blocking, common alarm in the front of the operator interface.

4.6.5 In order to prevent unauthorized access for the operation of ring main unit, operating handle entries for ring & tee-off switches shall have padlocking provision. It shall be suitable for 9 mm shackle lockout hasp, the padlocking provision material shall be adequately strong and compatible with the life of ring main unit, if that provide by the manufacture.

4.6.6 Selector switch for local/remote as described with lockout tagout facility.

4.6.7 Selector switch for lock/unlock for every unite independent (LBS/CB).

4.6.8 Push bottom for ON operation for every unite independent (LBS/CB) with a feedback light indication on the control box front side with a RED color, also a pushbutton with light indication is accepted.

4.6.9 Push bottom for OFF operation (LBS/CB), with a feedback light indication on the control box front side with a GREEN color, also a pushbutton with light indication is accepted.

4.6.10 All pushbutton, indication LED, selector switch for lock/unlock and selector switch for the local /remote shall be labeled with an engraved label fixed by screws or by a laser printing facility indicate the labels sequence for LBS1, CB, LBS2 and so on, no any stickers labels will be accepted.

4.6.11 The front of the SRMU control box shall be equipped with a 2 LED for the gas alarming and blocking of operation, as the 1st one will be with yellow color to for warning that SF6 gas is going to low stage but still the operation could be, and the 2nd one will be a RED color for the blocking operation as the SF6 gas is going to a blocking level which is preventing any electrical operation locally or remotely, and for the alarming status the closing operation shall be blocked.

4.7 Cable Testing Facility:

Ring switches shall have a test bushings facility with independent door, and independent interlocking mechanism, with a caution / warning labeling with black color writing on a red color background, on the testing bushing door, this door shall be not fixed by any screws, only interlocked up to the operation status, and it shall be equipped by a hand for close and open the door.

4.8 Interlocks

Interlocks shall be provided to make the following operations impossible:

a. Operation of the ring switch or circuit breaker directly from 'ON' to 'Earth' or from 'Earth' to 'ON'.
The following additional requirements apply if the unit offered has two independent manual operating mechanisms for ring and earth switches:

- Operation of the 'Earth ON / Earth OFF' mechanism of earth switch unless the 'ON/OFF' mechanism of ring switch is in the 'OFF' position.
- Operation of the 'ON/OFF' mechanism of ring switch unless the 'Earth ON / Earth OFF' mechanism of earth switch is in the 'Earth OFF' position.

b. Opening of the cable test cover without the associated ring switch being in the 'Earth' position.

c. Closing ring switch to 'ON' with the test plug inserted and /or the cover open.

d. Insertion or withdrawal of the test plugs with the switch in any position other than 'Earth' position.

e. Opening of cable boxes without the associated ring switch or breaker in the 'Earth' position.

f. Opening the off-load isolator switch (if any) unless the circuit breaker is in OFF position.

g. Closing the circuit breaker unless the off-load isolator switch (if any) is in ON position.

4.9 Terminations / Cable compartments

4.9.1 Termination in ring switches units shall be suitable for dry type cable terminations, inside cable boxes suitable for accepting couple of three core Aluminum or Copper, XLPE insulated cables of outside diameter of 70-110 mm. Each cable box shall have split-type removable bottom plates and cable clamps to facilitate cable installation. Bottom plate shall be in two halves with two cable entry holes of 115 mm diameter each.

4.9.2 Termination in circuit breaker units shall be suitable for dry-type cable terminations, inside cable box, suitable for accepting three core Aluminum or Copper, XLPE insulated cables of outside diameter of 70-110 mm. Each cable box shall have split-type removable bottom plates and cable clamp to facilitate cable installation. Bottom plate shall be in two halves with single cable entry holes of 115 mm diameter.

4.9.3 Cable clamps shall be detachable semi-circular halves suitable to hold the cables inside the cable box without cable glands. Suitable rubber grommets or bushings shall be supplied fitted to each cable entry hole to cater for the cables in order to prevent cables from coming in contact with the edges of the gland plate hole.

4.9.4 Cable entry hole shall be provided with rubber grommets to suit the required size of cable.

4.9.5 Bottom plate shall be in two halves and the number of cable entry shall be as the following:

Special use smart RMU 630 A	
No. of Cable entry hole for each cable box for CB	1 cable hole of outside diameter 110 mm
No. of Cable entry hole for each cable box for LBS	2 cables hole of outside diameter 110 mm

Table 4: No. of Cable entry hole

4.9.6 Cable shall be terminated using single hole cable lugs suitable for bolt size of M16. Cable termination shall be by means of bolted connection on cable bushing with screened pre-molded termination. Plug-in type termination shall not be used.

4.9.7 Cable bushing shall be Interface C type with M16 bolted contact for terminating cables with the use of screened Premoled separable connectors (elbow) and complete with brass or hot dipped galvanized fasteners (nuts, bolts and washers).

4.9.8 Vertical distance from the top of cable clamp to the centerline of cable bushings shall be suitable for terminations as mentioned in 12-SDMS-01 (latest revision) and not less than 750 mm. The clearances in the ring and Tee- Off cables compartment shall be sufficient for cable maneuvering for termination applications.

4.9.9 Distance between terminal bushing and cover of cable box shall not be less than 350 mm to suit pre-molded separable elbows coupling approved by SEC. For ring switch, inter-distance between terminal bushings shall not be less than 125 mm

4.9.10 Removal and installation of cable compartment covers shall be with minimum number of bolts.

4.10 Earthing

A ground bar of not less than 25 x 5 mm tin copper strip shall be provided bolted to the frame. It shall be located so as to facilitate earthing of cable sheaths and earthing devices. In addition, a terminal having M12 stud and nut shall be provided in the back of the panel with clear grounding mark, with a tine coated, and a ground simple in yellow color paint, on a black color background, all stickers are not accepted, it shall be paints or lase printed.

4.11 Voltage Indicators / Phase Comparators

A continuous indication without push-button type neon voltage indicators shall be provided together with low voltage hot phasing facility on ring switches and circuit breaker panels. The lamps shall be powered by bushing type capacitive voltage dividers. Internal wiring in cable boxes shall be covered with heat resistant tape/tube, to protect it against flame temperature of gas torch during the cable termination.

4.12 Earth Fault Indicator (EFI) (optional):

Earth fault indicator (SEC approved type) with automatic resetting on 220-230V single-phase AC supply, split core type sensor of internal diameter not less than 130 mm shall be supplied. EFI shall be protected inside separate sunshield cover with a mesh front (drawn from the same metal sheet). EFI shall be installed on the left-hand side line-feeder. It shall be with two auxiliary's contacts, one for light signal and the other for remote monitoring. Three-pin plug for testing of EFI by primary current injection shall be provided in separate compartment with screwed cover, below the EFI housing. SEC may require to supply the EFI loose in an outdoor box with 15 meters of control cable for installation on masonry wall. The EFI shall communicate with RTU.

4.13 AC auxiliary Power supply and back up battery for control/operation/protection circuits:

4.13.1 The special use smart RMU shall be equipped by a CPT and an external auxiliary AC power supply, the supply is controlled by a bi stable aux. relay for supply auto change from the main supply (the installed CPT) to the external AC supply.

4.13.2 CPT burden shall be = AC load calculation+20% for the panel, this CPT circuit shall be protected by an MCB (burn out fuse is not accepted) and the rated currant for this MCB shall be compatible with the CPT burden.

4.13.3 CPT sizing, calculations for the panel shall be provided.

4.13.4 The secondary output shall for the CPT should be AC 220V (+/- 10%) /60Hz.

4.13.5 the DC supply should be 24 VDC

4.13.6 the battery / DC charger capacity shall be adequate for all operation/control/protection functions, like spring charging motors, switching operations, status indications, RTU components, charge the battery, necessary contactors for control and monitoring of ring switches, protection tripping …. etc.

4.13.7 All functions of the special use smart RMU including switching, Monitoring, RTU and Control, shall be powered by the power source and the battery will back up the power source.

4.13.8 The backup battery shall be with a prober technology guarantee for a 5 years maintenance free, it will be under guarantee of the vendor/manufacture, for this operation period, and vendor/manufacture shall be replaced it if it fail during this period without charging any extra coasts, the battery burden shall be capable to back up the monitoring, communication and operation of the RTU for 12 hours without AC source, with alarming signals for battery going to low.

4.13.9 The batteries shall be installing in a separated compartment with a suitable ventilation.

4.13.10 The Batteries shall be maintenance free and sealed, Battery maintenance shall be possible without power source cut off.

4.13.11 Battery/charger shall be suitable for temperature of 70 Degree centigrade.

4.13.12 The battery charger shall have temperature compensated to maximize battery life and usable capacity.

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

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

4.13.15 It shall be possible to test the battery.

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

4.13.17 Battery leads shall be covered by any protective means.

4.13.18 Battery data (voltage, burden….etc.) shall be labeled on the front cover for the battery, so it is easy to access and readable, without removing the battery.

4.13.19 The external AC supply cable shall lay in a protective path on the RMU body from outside and through the panel inside, like cable trunk, pipe …etc., and the main cable inlet shall be marked with labels (AC external supply inlet) laser print or engraving labels.

4.13.20 Battery /charger sizing/calculation for the DC loads shall be provided.

4.14 Metering VT/CT:

4.14.1 A (3) VTs, for measurements purpose shall be installed, for measurements / protection purpose, that VTs manufactures shall be as per the last updated SEC/NG approved vendor list, the VT accuracy, class, burden and specification shall per as per SEC recommendations and requirements, also to be matched with the smart meter specification and requirements **40-SDMS-02A**

	Smart MRMU 630 A
Voltage	13.8 kV / 110 V OR 33 KV / 110 V
Frequency	60Hz
Burden	25VA
Class	0.2

Table 5: voltage transformer for metering

4.14.2 Current transformers for metering according to SEC specification 50-SDMS-01 shall be fitted in the circuit breaker panel, the metering core accuracy must be compatible with the accuracy class required by CT/VT smart meter specification **40-SDMS-02A**, that CTs manufactures shall be as per the last updated SEC/NG approved vendor list.

	Smart MRMU 630 A
Current ratio	400 /1 A
Burden for metering	10 VA
Class for metering	0.2 SF5

Table 6: current transformer for metering

4.14.3 all CT/VT wiring and used terminal blocks shall be as per the SEC protection specifications and requirements.

4.14.4 All the CTs shall be busing fixed CTs, other CTs fixing way are not accepted.

4.14.5 CT/VT sizing calculation for metering shall be submitted

4.14.6 Final Parameters for CT/VT shall be based on approved CT/VT sizing calculation

4.15 Terminal blocks

4.15.1 All Terminal blocks shall be, identified and clearly marked. For the CT terminal blocks shall have CT shorting and isolate and testing facility and tagged with caution with red color mark (short before isolate), and for the VTs TB, shall have voltage disconnection facility without disturbing the wiring connections to facilitate isolation of VTs from circuits to perform voltage injection tests as per DES-P03, all this TB must be from approved vendor up to the last SEC approved vendor list (AVL), all the CT connection shall be with a ring lugs connections.

4.15.2 Terminal blocks for current injection test facility for protective relay shall be provided, identified and clearly marked.

4.15.3 Terminal blocks for remotely installed alarm shall be provided, to indicate exceeding of the allowed load during the peak period.

4.15.4 Separate Terminal Blocks shall be provided for the spare contacts Binary Inputs/outputs for the used protection relay for the future used.

4.15.5 Not more than two (2) terminations shall be connected to one side of a terminal block.

4.15.6 CT/VT terminal blocks for the future used, to connect the smart meter shall be provide with cautions labels, and to be shorted the CT TB and open the VT TB for that circuit, also the VT circuit for the smart meter shall be protected by a proper rating 3 phase MCB.

4.15.7 the future for metering CT/VT connection trunk, shall be available and be marked/tagged as (metering CT/VT connection for the smart meter).

4.16 Indicating meters

Digital Indicating meters approved from SEC for three phase current and voltage with phase selector switches shall be provided. Current indicating meters shall be provided with 15 minutes maximum demand indicator.

4.17 Over-pressure Release

In order to ensure maximum personal safety, Metered Ring Main Unit shall be designed to withstand any overpressure due to an internal fault by rupture of a gas escape membrane located at the rear or bottom of the enclosure. The gas shall be led out through a flap in the rear panel to the bottom of the enclosure.

4.18 Nameplate

The switchgear shall be provided with Aluminum /Stainless steel / Brass nameplate showing the following information indelibly marked in Arabic and English:

- Manufacturer's Name
- Country of Origin

- Type/Model
- Vendor's Name
- Reference of SEC specification
- Manufacturer's Serial Number
- SEC Purchase Order Number
- SEC Item Number
- Year of Manufacture
- Voltage Rating kV
- Current Rating Amps
- BIL kV
- Short Circuit Rating / Duration kA / Sec
- Rated Frequency 60Hz
- Rated Making Current kA
- Rated Breaking Current kA
- Gross Weight kg
- CB interruption medium type:
- CT / VT specifications
- The CTs, VTs, nameplate shall be visible and fixed in front side of SRMU by screws or rivets.
- CB interruption medium technology:

4.19 Circuits

Circuit Labels :

Ring switches and circuit breaker panels shall be provided with circuit number plates of dimension 150 x 50 mm without inscription. Plate shall be made of three-layer traffolyte material (white/black/white) of 3 mm thickness as per SEC drawing No. SEC-01- 03.

4.20 Monograms and Danger Plates

Danger plate and SEC monogram as per SEC drawings No. SEC-01-01 and SEC-01-02 respectively shall be provided and installed at the front panel (on SEC approved location) of the switchgear using M5 hot dipped galvanized / stainless steel / brass fasteners (oval head rounded neck bolts with nuts and external tooth lock washers) not removable / accessible from the front i.e. without opening the door / front cover.

SEC shall approve location and samples of danger & monogram plates prior to Installation.

5 Automation and RTU requirements:

5.1 Control functions

Each special use smart RMU shall be provided with an integrated (Built in) RTU without changing the dimensions of special use smart RMU and communication device in order to provide capabilities for remote monitoring and control via the ADMS system.

The ADMS system includes standard SCADA and FLISR functionality and advanced capabilities.

special use smart RMU shall be capable of supporting these SCADA and FLISR monitoring and control functions. SEC reserves the right to require a demonstration of the special use smart RMU /RTU capabilities to support ADMS SCADA and FLISR functionality. Please refer to the ADMS specification for ADMS SCADA and FLISR functionality requirements. Design for special use smart RMU /RTU configuration shall be approved before supply.

RTU control panel shall be available for the following solutions:

- Main Design : RTU (integrated) built in
- Optional Design : RTU Separated cabinet (with plug cable connector solution)

5.1.1 The digital I/O list of signals to be wired to the RTU includes:

Status information (Digital Input)	
Close / Open (Per circuit)	Double Point
Earth (Per circuit)	Single Point
Lock / Unlock (Per circuit)	Single Point
Local/ Remote (Per SMART RMU)	Double Point
Gas Pressure (Per SMART RMU)	Single Point
Battery Status (Per SMART RMU)	Single Point
Control Power Fail (Per SMART RMU	Single Point
Door Open (Per SMART RMU)	Single Point
Relay Fail / Healthy	Single Point
Protection Relay operated / Normal	Single Point

Table 7: The digital I/O list

Control signal (Digital Output) to be wired to the RTU

- Close / Open

5.1.2 The analog inputs to be wired to the RTU:

- Phase-to-ground Voltage (Aø, Bø, Cø) for all voltage sensors
- Phase Current (Aø, Bø, Cø, Nø) from all current sensors

The voltages communicated to SCADA DMS shall be three phase-to-phase (VΦ-Φ).

And all logical calculated functions needed by an Advanced Distribution Automation System P, Q, Power factor etc.

5.1.3 Digital I/O LIST & TESTS

All the Data base (I/O lists) are illustrated in the appendix.2 as follows:

- Special use smart RMU: 3/4ways

The selected RTU shall have adequate protection against reversed polarity,over current/voltage and under voltage condition.

5.1.4 Remote operating time

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.

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

5.1.6 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.

When the control switch in the SMART MRMU is placed in the “local control” position, then control outputs of the RTU may 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.

5.1.7 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

5.1.8 Communication Ports and Protocols

The RTUs minimum requirement for communication ports is as follows:

- Two Ethernet ports
- Two RS232 ports.
- One port for the RTU maintenance and configuration computer.
- One port for local access to the data and connecting a printer.

The RTU shall respond to independent scans and commands from Master Station, maintenance and configuration computer, and the local access computer simultaneously.

There shall be possible to change RTU setting and configuration remotely.

The RTU shall support the use of a different communication data exchange rate (bits per second) and scanning cycle on each port.

RTU Type Test (to be provide):

- IEC 60870-5-101 KEMA Test or equivalent
- IEC 60870-5-104 KEMA Test or equivalent
- IEC 61850 KEMA Certification or equivalent
- DNP3.0 KEMA Certification or equivalent
- IEC 62351 cyber Security test certification

Communication protocols:

The required protocols regarding the RTU/Modem are as follows:

- IEC 60870-5-101/104
- IEC 61850
- DNP3.0 serial and Ethernet
- Modbus RTU and TCP

Communication Options:

The RTU's communication port to the Control center (DMS) shall make it possible to utilize different communication medias such as:

- 2G (GSM, GPRS, EDGE, CDMA)/3G (UMTS, CDMA)/4G (LTE)/5G (5G NR)
- Fiber optics
- Wi-Fi
- Narrowband IoT (internet of things)
- Narrowband PLC and/or Broadband PLC
- UHF/VHF

- Mesh Wireless Networks.

In the case of using SIM Card for communication, the modem must be designed to fit SIM normal standard format size Capability of time stamp and time synchronization shall be provided

5.1.9 RTU Functions

This document describes the minimum functionalities of the RTU. The minimum functions to be performed are:

- Data gathering. Collect digital status inputs, analog inputs, and information points from devices, relays and/or IED's. RTU shall be multi- center multi-protocol
- Receiving and processing digital and analog control commands from the master station or SCADA.
- RTU shall be compatible with protocol 61850 and 60870-5-101/104 for communication with relays or IEDs.
- RTU shall support Sequence of Events feature.
- RTU shall have an IEC 61131-3 logic engine or similar to allow customized automation schemes.
- RTU shall have internal battery backup for memory and data/time. The RTU shall send a status battery indicator to the master station or SCADA.
- RTU shall act as a data concentrator for acquiring data from slave RTU's and exercising supervisory control on slave RTU's
- RTU shall accept polling messages from at least two master stations simultaneously using separate logical databases for each master station.
- RTU shall Communicate simultaneously on all communication ports.
- The RTU shall have the option of redundant communication through the Ethernet ports.
- It shall be possible to export database to an excel or similar software application.
- Data transmission rates up to 9600 baud for serial ports and 10/100 Mbps for TCP/IP
- Ethernet ports.
- RTU shall have the capability of automatic re-start after a power outage.
- RTU shall be scalable. Supplier shall state how the scalability is achieved.

- The RTU shall be designed to perform with a minimum 15 relays or IED's connected with 200 points (variables) per device.
- The RTU shall be capable to calculate all logical functions needed by an Advanced Distribution Management System such as Power factor, Active power , Reactive power
- Distortion, harmonics; it shall be possible to send the output of the logical functions on request.
- The RTU shall determine and send earth fault indication to an Earth fault indication.
- lamp to be mounted in the front of the SMART MRMU. Earth fault indication shall be also sent to the control center.
- RTU and Control box shall be illuminated by a lamp for easy O&M.
- RTU shall be capable to report by exception in case of any change in the status.
- The RTU shall have Modem -with routing features if needed- to communicate wireless 3G/4G or fiber optics, in accordance with SEC telecom specifications; minimum 4 ports shall be provided.

5.2 Cyber security

The RTU shall support features and mechanisms to enable cyber security operations and be configured as follows:

- Application whitelisting shall be implemented on RTU to monitor and ensure that only authorized applications are executed without affecting operations.
- RTU shall be configured to produce and store event logs recording activities, exceptions, faults and information security events.
- RTU shall have the capability to log the following information and activities:
- 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.
- Incident management activities.
- Utility programs that can override system and application controls.
- Cryptographic key management related activities.
- Logging mechanisms shall not adversely affect device critical functions and performance.
- RTU shall recover to a secure state in the event of a disruption or failure.

- RTU 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).
- RTU 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

Table 8: Password Requirement

- RTU shall lock the access after several authentication failures. Device shall be capable of sending an account lock alarm.
- All RTU shall implement and enable audit and logging capabilities when possible.
- RTU 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.
- Any security vulnerability Identified by SEC during RTU lifetime shall be remedied and patched.
- A list of identified potential security risks and best way to mitigate them shall be provided.
- RTU shall be secure by design. Security shall be integrated throughout each phase of systems lifecycle.

- Smart Device shall be properly hardened as per the guidelines provided below to harden networks, operating systems, applications and RTU.
- 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.
- Any time data is input by a user, it shall undergo input validation to ensure only proper authorized characters are accepted.
- RTU shall provide the capability to set outputs to a predetermined state if normal operation cannot be maintained because of an attack.
- RTU shall identify and handle error conditions in a manner such that effective remediation can occur without disclosing unnecessary information to an attacker.
- 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.
- RTU shall support encryption on all supported protocols. If some protocols do not support encryption, then the smart device shall support secure IPsec VPN tunneling.
- Where mobile code is not required, it shall be disabled.
- 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.
- Any approved mobile code shall require proper authentication and authorization of origin and its use shall be monitored.
- RTU shall be able to verify the integrity of the mobile code before allowing code execution.
- Where cryptography is determined to be required, RTU shall use cryptographic algorithms, key sizes, and mechanisms for key establishment and management according to commonly accepted security industry practices and recommendations.

- Established and tested encryption shall be employed to reduce risk of information leakage or tampering.
- RTU shall utilize established and tested encryption to protect sensitive data at-rest where required.
- RTU utilizing PKI shall provide the capability to operate it according to commonly accepted best practices.
- RTU utilizing PKI as part of their identification or authentication process shall employ validity checking of certificates.
- Certificates CA signature shall be verified to confirm that the certificate has not been tampered since it was first signed.

- RTU utilizing PKI shall consult with CRL or OCSP to determine the revocation status of all certificates.
- RTU 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.
- RTU shall be able to produce machine-readable report of deployed security settings.

5.3 CS-VS Sensors (if required):

CS and VS are for Measurement and shall comply to IEC 61869 standard.

5.3.1 Current Sensor(CS):

1 set of CSs (composed of three phases CSs):

- 1 set of CSs for LBS

The CS shall be Bushing mounted.
CS accuracy shall be less than 1% in order to meet the requirement to have an accuracy of 1% for the whole chain (Sensor-data cable-RTU).
CS ratios shall be compatible with the provided RTU.
In addition, there shall be CS dedicated for the protection as per protection specifications.

All sensors shall be a built in sensors.

5.3.2 Voltage Sensor(VS):

(2% for the whole chain (Sensor - data cable -RTU).
VT ratios shall be compatible with the provided RTU.
All sensors shall be a built in sensors.

6 Testing and Inspection

6.1 All equipment shall be type tested at an independent laboratory from approved laboratory list for SEC. in accordance with the latest standards and as specified herein and test report shall be submitted for SEC review and approval.

6.2 The SRMU offered shall meet the type test requirements of the standards listed below:

6.2.1 High-voltage switches per IEC 60265

a. Dielectric Tests
b. Temperature Rise Tests
c. Making and Breaking Tests
d. Peak and Short Circuit Withstand Current Tests
e. Operation and Mechanical Endurance Tests
f. Internal arc test certificate

6.2.2 Circuit- breaker per IEC 60056

a. Dielectric Tests
b. Temperature Rise Tests
c. Measurement of the resistance of the main circuit
d. Short-time and Peak Withstand Current Tests
e. Mechanical and Environmental Tests
f. Making and Breaking Tests
g. Short-circuit Tests

6.2.3 Degree of protection IP54 per IEC 60529.

6.2.4 CT/VT type test as per IEC 61869.

6.3 The SRMU offered shall meet the routine test requirements of the standards listed below:

6.3.1 High-voltage switches per IEC 60265

a. Power Frequency Voltage Tests
b. Voltage Tests on Auxiliary Circuits
c. Measurement of Resistance of Main Circuit
d. Operation Tests

e. Operation and Mechanical Endurance Tests

6.3.2 Circuit breaker per IEC 60056

a. Power Frequency Voltage Tests

b. Voltage Withstand Tests on Control and Auxiliary Circuits

c. Measurement of Resistance of Main Circuit

d. Mechanical Operating Tests.

6.3.3 battery load profile test.

6.4 SEC reserve the right to visit the factory during manufacture of any or all items covered by this specification, for inspection of material or witness of tests. Accordingly, the manufacturer shall give SEC adequate notice of manufacturing and testing schedule. Manufacturer shall also provide FAT protocols for approval.

7 Packing and Shipment

7.1 The switchgear shall be delivered ready for installation (three panels fitted together).

7.2 Switchgear shall be individually packed in non-returnable cases as per packing/ shipping requirements in relevant clauses of 01-SDMS-01.

7.3 For container shipment, switchgear bolted on wood pallet is acceptable.

7.4 Units shall be supplied complete with all operation and installation accessories.

8 Guarantee

8.1 Guarantee for the SRMU and RTU shall be against all defects arising out of faulty design or workmanship or defective material for a period of five (5) years from the date of delivery.

8.2 Warranty period for gas tightness shall conform to clause 5.15.3 of IEC 60694. For the maintenance-free version the vendor / manufacturer shall assume full responsibility for no as leakage during the service life (25years).

In case of gas leak during the service life, all expenses for repairs and replacements shall be borne by vendor / manufacturer.

If no exception to this specification and no list of deviations are submitted, it shall be deemed that, in every respect, smart metered ring main unit offered shall conform to this specification. SEC interpretation of this specification shall be accepted.

8.3 **battery warranty is 5 years.**

9 Submittals

9.1 Vendor shall complete and return one copy of the attached Technical Data Schedule.

9.2 Vendor shall provide the following with the Quotation:

a. Clause by clause compliance with this specification.

b. Drawing showing the full constructional detail with dimensions of smart metered rings main unit and all associated accessories.

c. Drawing of mounting details with respect to the position of cables in the switchgear room.

d. Drawings of cable boxes.

e. Schematic Diagrams showing the SLD (control circuit, components list, protection & tripping circuit, closing circuit, voltage supply circuit, VT and CT connections, Alarms, Communication, components reference sheet, terminal blocks reference sheet, etc.).

f. Installation and maintenance instructions of the smart metered ring main unit in both English & Arabic.

g. Comprehensive list of manufacturer's recommended spare parts. The quantities offered should be adequate for the initial 5 years of operation. Firm price and delivery period shall be quoted for each item.

h. Copy of type test report for all equipped dives witch are required a type test as per SEC standard.

i. A certificate from the termination manufacturers that the cable box size in all respect (technical, cable handling and making termination) is suitable for heat & cold shrink and pre-mold terminations

j. Descriptive leaflet and literature of smart metered ring main unit offered.

k. Checklist of quotation request.

l. List of customers in case of new manufacture / vendor.

m. Provide connecting cables for (LMS, PROTACTION, RTU, and UPS).

n. CPT sizing calculations.

o. Battery load profile/ battery sizing calculations.

p. CT/VT sizing calculations.

9.3 Vendor shall provide the following after signing of purchase order:

a. Details of manufacturing and testing schedules.
b. Routine test reports.
c. As-built drawings (layout and electrical) for SEC final review/approval.
d. Prototype for SEC inspection/approval prior to mass production.
e. SRMU control, and protection connection scheme.

10 Technical data schedule

SMART RING MAIN UNIT 17.5KV / 36 KV/38 KV, 630A
(Sheet 1 of 4)

SEC Inquiry No: Item No:

No	Description	SEC Specified Values (*)	Vendor Proposed Values (**)
1	**General**		
1.1	Design	Metal-Enclosed	*
1.2	Type	outdoor	*
1.3	Number of cubicles	3 or 4	*
1.4	Installation medium	SF6 /Air	*
1.5	Degree of Protection	IP-54	*
1.6	Rated Voltage	13.8 kV / 33 KV/34.5 KV	*
1.7	Maximum Operating Voltage	17.5 kV / 36 KV/38 KV	*
1.8	Rated Frequency	60 Hz	*
1.9	Rated Current	630A	*
1.10	Short circuit withstand current for 1 second	21 KA / 25 KA	*
1.11	Basic insulation level BIL	As per (01-SDMS-01)	*
1.12	Rated Making Current for Ring switches (peak)	-	*
1.13	Rated Making Current for Earthing Switches (peak)	-	*
1.14	Impulse Withstand Voltage	As per (01-SDMS-01)	*
1.15	Power Frequency Withstand Voltage (1 min.)	As per (01-SDMS-01)	*
1.16	Internal Arc fault withstand for 1 second	21 kA / 25 KA	*
1.17	Operating handle anti-reflex type	Yes	*
1.18	Max. height of operating access	1.3 m	*
1.19	Max. physical effort required to operate any mechanism.	400 N	*
1.20	Cable testing facility	-	*
1.21	Interlocks as per clause 4.8	Yes	*
1.22	Provision of gas pressure gauge	Yes	*

SMART RING MAIN UNIT 17.5KV / 36 KV/38 KV, 630A
(Sheet 2 of 4)

SEC Inquiry No: Item No:

No	Description	SEC Specified Values (*)	Vendor Proposed Values (**)
2	**CIRCUIT BREAKER**		
2.1	Type	Fixed	*
2.2	Insulation medium	SF6 /vacuum/other	*
2.3	Interruption medium	SF6 / Vacuum/other	*
2.4	Rated Voltage	13.8 kV / 33 KV/34.5 KV	*
2.5	Maximum Operating Voltage	17.5 kV / 36 KV/38 KV	*
2.6	Rated Frequency	60 Hz	*
2.7	Rated Current of CB	630 A	*
2.8	Rated Short circuit level (1 s)	21 kA / 25 KA	*
2.9	Basic insulation level BIL	As per (01-SDMS-01)	*
2.10	Rated Making Current		*
2.11	Re-striking Voltage Ratio		*
2.12	Duty Cycle		*
2.13	Making time		*
2.14	Opening time		*
2.15	Arc Duration		*
2.16	Total breaking Time		*
2.17	Operating Mechanism	Spring Charged	*
2.18	Protective E/F & O/C relay	As per Latest version of SEC-DBU Unified List of Approved Relays	*
2.19	Provision of isolator switch	-	*
3	**TERMINATIONS / CABLE COMPARTMENTS**		
3.1	Cable compartment with bottom plate and cable clamps	yes	*
3.2	Two cables of 70-110 mm diameter shall be accepted	Yes or N\A	*
3.3	Two holes of 110 mm in the bottom plate in two halves	Yes or N\A	*
3.4	Fasteners supplied with bushing	yes	*
3.5	Type of termination	screened Premoled separable (elbow)	*
3.6	Bolt size for cable termination	M16	*

3.7	Clearance between clamp and bushing	Suitable for screened Premoled separable (elbow) with min. 750mm	*

SMART RING MAIN UNIT 17.5KV / 36 KV/38 KV, 630A
(Sheet 3 of 4)

SEC Inquiry No: Item No:

No	Description	SEC Specified Values (*)	Vendor Proposed Values (**)
4	**ACCESSORIES**		
4.1	Ground bar 25x5 mm & M12 Stud	yes	*
4.2	Voltage indicator lamps	yes	*
4.3	Phase comparators	yes	*
4.4	Approved type EFI	yes	*
4.5	Auxiliary Powered Protection Relays	yes	*
4.6	Load management system	yes	*
4.7	Voltage transformers rated as per clause 4.15.1	yes	*
4.8	Current transformers rated as per clause 4.15.2	yes	*
4.9	Terminal blocks for KWH meter, relay testing and alarm provided	yes	*
4.10	Indicating meters	yes	*
4.11	Over-pressure release	yes	*
4.12	Name Plate	yes	*
4.13	Circuit labels	yes	*
4.14	SEC Monogram	yes	*
4.15	Danger Plate	yes	*
5	**panel**		
5.1	Maximum height	As per clues 12.	*
5.2	Max. width of CB panel	As per clues 12.	*
5.3	Max. width of LBS panel	As per clues 12.	*
5.4	Depth suitable for 600 mm cable trench	Yes	*
5.5	Paint finish Method		*
5.6	Finish Color	RAL 7035 (Front side, Right side, Left side)	*
6	**Communication**		

6.1	Communication Requirements	Conforming to specs	*
6.2	SIM Card Slot Available	YES/NO	*
6.3	SIM Card Size	Standard	*
6.4	Mobile/Cellular Network Type	GPRS/2G/3G/4G/5G/NB-IoT	*
6.5	Communication Protocols	IEC 60870-5-104/101 /DNP3.0 /IEC 61850	*
6.6	Communication Interface for external comm. modem	Yes (Specify) / No	*
7	**Cyber Security Requirements**		
7.1	Cyber Security Requirements	Fully Comply/Not Comply	*

(*) – Values to be provided/proposed by the Vendor

(**) – Please provide explanation for deviations, if any

SMART RING MAIN UNIT 17.5KV / 36 KV/38 KV, 630A
(Sheet 4 of 4)

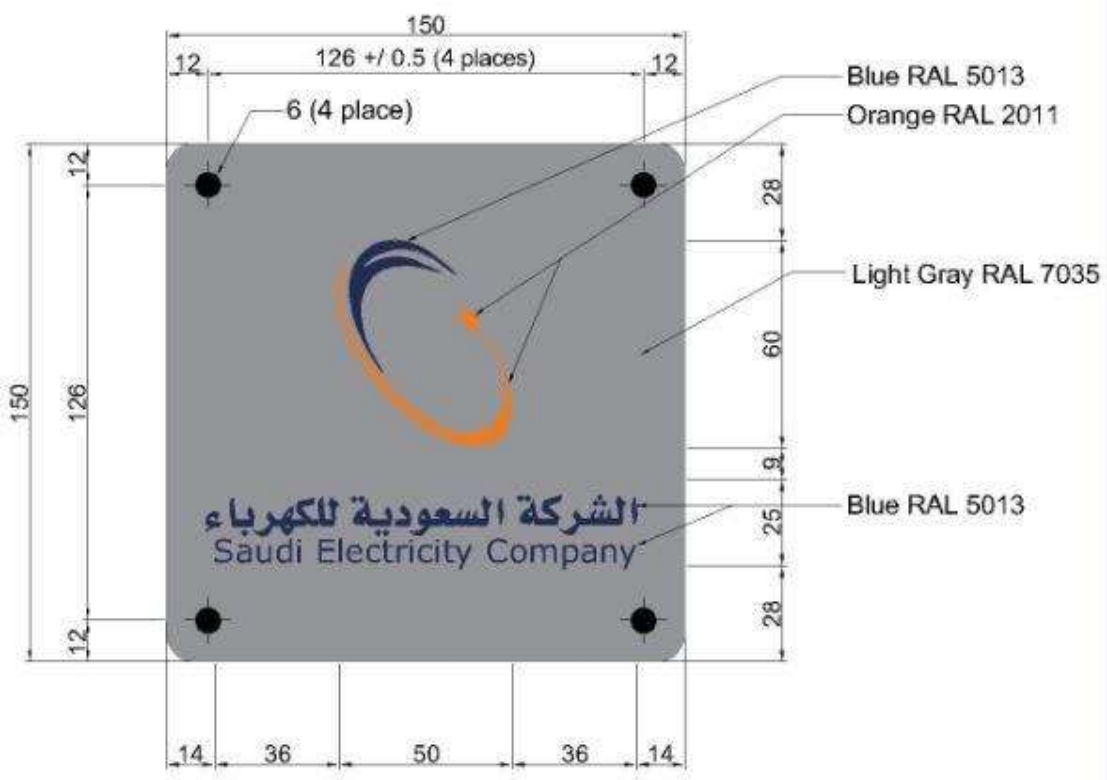
SEC Inquiry No: Item No:

- 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		

11 Drawings

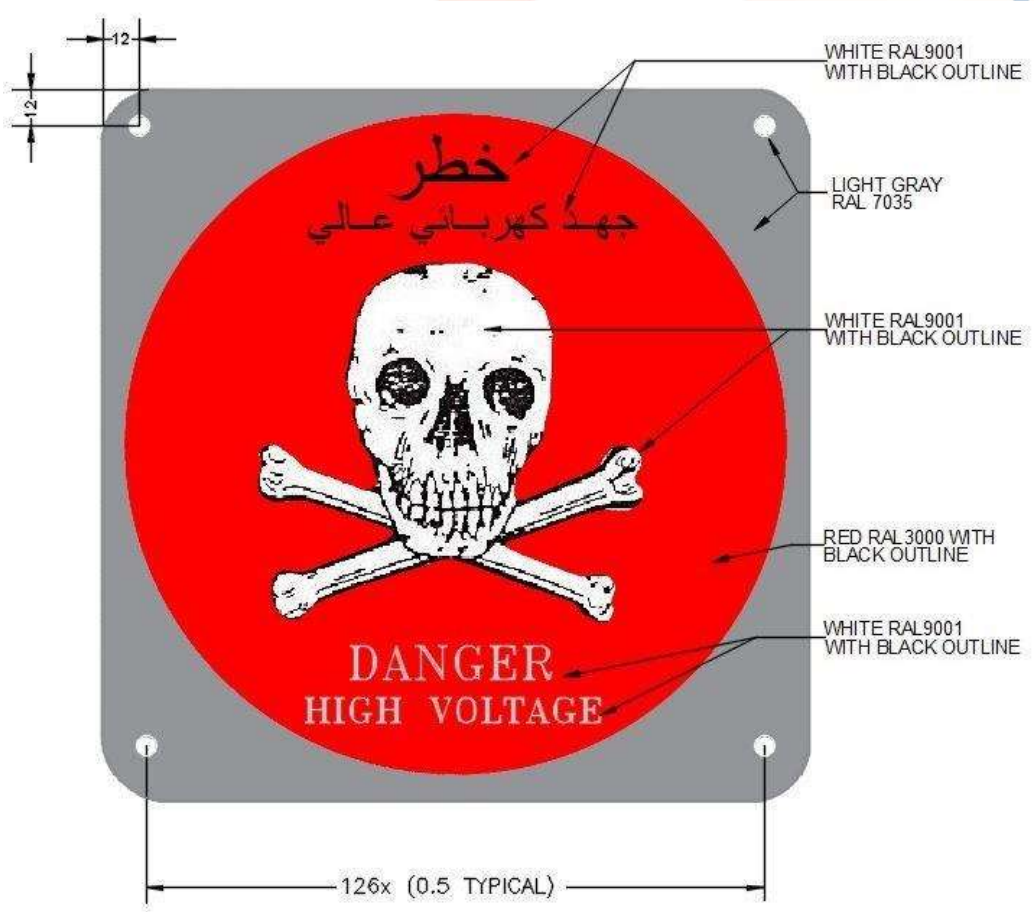
11.1 MONOGRAM FOR EQUIPMENT



Note:

1) All Dimension are in millimeters.
2) 150 X 150 X 1.5 thick, aluminum plate with three (3) color monogram.
3) Specimen for color shades shall be obtain from SEC.
4) Size of symbols and lettering shall be proportion to the overall dimension of the monogram.

11.2 DANGER SIGN FOR EQUIPMENT

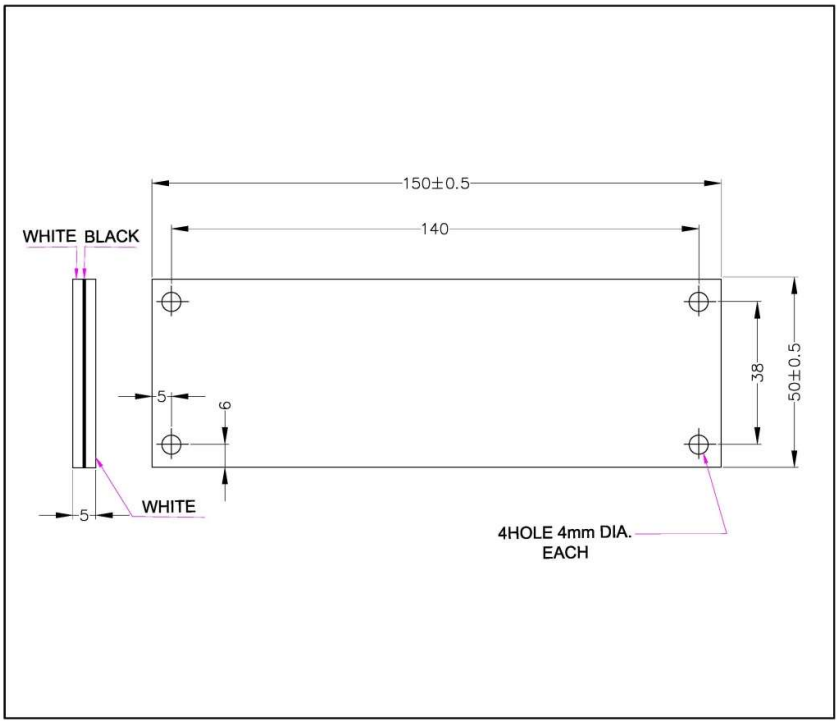


Note:

1) All dimension are in millimeters.
2) 150 x 150 x 1.5 Thick, Aluminum plate for equipment mounting.
3) Specimen for color shoes shall be obtained from SCE.
4) High gloss enamel paint.
5) Size of symbol and lettering shall be proportional to the overall dimension of the sign.
6) For the installation of this sign on the parameter fence and gate of the Transmission substation. The size of the sign shall be 510 x 510 and 255x255 respectively, where in the hole centers will be 25 & 15 & hole diameters will be 10 & 6 respectively.

7) The sign plate shall have rounded corners and NO sharp rough edges.

11.3 CIRCUIT LABEL PLATE



Note:

1) Dimension are in millimeters.
2) Material Traffolyte white – black – white Thickness 3mm.
3) This plate will be used to engrave letters and numbers by using Engraving machine.

12. panel dimensions:

The panels max. dimensions shall be not exceeding the below:

Type	3-way	4-way
Width (W)	1600	2200
Depth (D)	1200	1200
Height (H)	2100	2100
Cable termination box width	400 (minimum)	
Operating mechanism height	1300 mm (maximum)	

Appendix.1

ATS patch panel requirements

General requerments:

1- ATS system will be delivary up to independent request, and up to SEC need.

2- ATS system will be installed in a patch panel, by the dimension of 60 cm * 60 cm , with astandard depth enough to install the ATS equipments.

3- main core for the ATS system will be performed through a digital BCU(bay control unite) relay have the below requerments:

a- binary I/P shall have a spare inputs not less than 20 %.

b- binary O/P shall have a spare ouputs not less than 20 %..

c- aprogramable BCU relay, easy to configure and reconfigure up to the actutal status in the field , the vendor/manfacture will be responsible to intial configure the BCU up to the provided requerments field data from SEC engineers, training and final commission at the site.

d-interface softwere to be provided with fully licence, if any update requred in the soft were with in 5 years , the vendor/manfacture gurantee to provide it.

e- controller BCU relay shall be not have any password protection, only this option will be leave to SEC engineer to did it.

f- PLC controller is rejected , only digital BCU(IED-intelligent electronic device) devices accepted.

j- BCU will collect all I/P data from multi sources , and tack the correct decision for the switching action through the O/P , and send the araming or backfeed indication data to the RTU devices or direct to control center.

h- the RTU services will be independent and will be not included inside the ATS patch panel.

i- all requered interface communication cabels form the BCU/IED to the labtop to be provide with the delevary.

4- the patech panel shall have a 3 type for terminal blocks, as mention below, all this terminal bloks shall be provided from a pproved venors for SEC:

a- power supply TB, to feed the BCU/IED, it shall be marked and have a protective color, for both AC and DC supply.

b-I/P and O/P , terminal blocks.

c- alarming/back feed indication TB.

5- the ATS patch panel shall meet all SEC requerments in 1-SDMS-01 for the outdoor equipments, to be complied with it , and provide IP54, and ambient tempreture 55 c.

6- prober ventellation for the ATS patch panel shall be provided and gurantee to not affect the IP54 rate.

7-a copy for the final logic and quick guid instruction to be provided in the panel insdie pcket.

8- ATS enable/disable selector switch , to be provided with alarming contact, and lockout tagout facility, and loking by a padlock if need.

9- abck indication LED is requered inside the panel to indicate the below:

a- ATS system faulty.(red color)

b-ATS system blocked.(yellow color)

c-ATS system disabled.(red color)

10- ATS BCU shall be accepted to be disabled through local enable/disable switch or through a remote command from the RTU.

11- final requested ATS logic will be provided to the vendor/manfacture during pedding/manfacturing stage.

12- ATS patch panel shall be have the facility to be install in acongrate base, or to be hang on a wall , or to be hange on a supporter steel poles.

13- ATS patch panel shall be equipped with external door with alarming limitte switc , if it open by any one , it will send alarm to the RTU, all wires for this limitte switch to be wired to the araming TB.

14- ATS patch panel shall have internal light work with the doore open, also a hummidty controller device with thermal controller, and AC plug in with secure cover as per SEC standard.

15- all internal panel wiring shall as per SEC standard.

15- a copy from the panel scheme and wiring shall be attached in every delevarable patch panel inside the panel internal pocket.

Appendix.2

STANDARD DATA BASE I/O list

DISTRIBUTION AUTOMATION PROGRAM
SMART FIELD EQUIPMENT
DATA POINTS LIST FOR 2L1T SMART MRMU (LVL)

Bay / CIRCUIT no.	Point name / Message	IOA / IEC OBJECT ADRESS	REMARKS
DIGITAL OUTPUT (DO) COMMANDS			
CIRCUIT1 (LBS)	CLOSE COMMAND	1	
CIRCUIT1 (LBS)	OPEN COMMAND	1	
CIRCUIT2 (TRx)	CLOSE COMMAND	5	
CIRCUIT2 (TRx)	OPEN COMMAND	5	
CIRCUIT3 (LBS)	CLOSE COMMAND	9	
CIRCUIT3 (LBS)	OPEN COMMAND	9	
DIGITAL INPUT (DI) GENERAL ALARMS / INDICATIONS			
CIRCUIT1 (LBS)	CLOSE INDICATION	11000	
CIRCUIT1 (LBS)	OPEN INDICATION		
CIRCUIT1 (LBS)	LOCK/UNLOCK INDICATION	1000	
CIRCUIT1 (LBS)	GROUND INDICATION	1001	
Circuit2 (TRx)	CLOSE INDICATION	11001	
Circuit2 (TRx)	OPEN INDICATION		
Circuit2 (TRx)	LOCK/UNLOCK INDICATION	1002	
Circuit2 (TRx)	GROUND INDICATION	1003	
CIRCUIT3 (LBS)	CLOSE INDICATION	11002	
CIRCUIT3 (LBS)	OPEN INDICATION		
CIRCUIT3 (LBS)	LOCK/UNLOCK INDICATION	1004	
CIRCUIT3 (LBS)	GROUND INDICATION	1005	
COMMON	REMOTE	11004	Alarm
COMMON	LOCAL		Alarm
COMMON	Battery low	1008	Alarm
COMMON	Gas Low	1009	Alarm
COMMON	AC power fail	1010	Alarm
COMMON	Door open	1011	Alarm
COMMON	DC power fail	1012	Main DC power for charger/Circuit Breaker
COMMON	Motor CIRCUIT fail	1013	Regrouped information for all circuits (Spring charger, DC motor)
COMMON	RTU Self diagnostic (RTU alarm)	1277	Alarm
COMMON	EFI (FAULT INDICATION)	1278	Alarm
COMMON	Protection Health (Normal/Fail)	1279	Alarm
COMMON	Protection Trip (Earth fault)	1280	Alarm
COMMON	Protection Trip (Phase fault)	1281	Alarm
COMMON	Load Management system operate	1283	Alarm

ANALOG INPUT (AI) MEASURMENTS			
Circuit1 (LBS)	I_Current (A)	13015	
Circuit1 (LBS)	I_Current (B)	13016	
Circuit1 (LBS)	I_Current (C)	13017	
Circuit1 (LBS)	I_Current (N)	13018	
Circuit1 (LBS)	S (KVA)	13057	Calculated from power factor and voltage value from TRx
Circuit1 (LBS)	P (KW)	13058	
Circuit1 (LBS)	Q (KVAR)	13059	
Circuit2 (TRx)	I_Current (A)	13019	
Circuit2 (TRx)	I_Current (B)	13020	
Circuit2 (TRx)	I_Current (C)	13021	
Circuit2 (TRx)	I_Current (N)	13022	
Circuit2 (TRx)	V_voltage (A-B)	13060	Phase to phase
Circuit2 (TRx)	V_voltage (B-C)	13061	Phase to phase
Circuit2 (TRx)	V_voltage (C-A)	13062	Phase to phase
Circuit2 (TRx)	V_voltage (N)	13063	
Circuit2 (TRx)	S (KVA)	13064	
Circuit2 (TRx)	P (KW)	13065	
Circuit2 (TRx)	Q (KVAR)	13066	
Circuit2 (TRx)	Power Factor	13067	
Circuit3 (LBS)	I_Current (A)	13023	
Circuit3 (LBS)	I_Current (B)	13024	
Circuit3 (LBS)	I_Current (C)	13025	
Circuit3 (LBS)	I_Current (N)	13026	
Circuit3 (LBS)	S (KVA)	13068	Calculated from power factor and voltage value from TRx
Circuit3 (LBS)	P (KW)	13069	
Circuit3 (LBS)	Q (KVAR)	13070	
Common	Temperature (External) of Transformer if available	13100	
Common	Internal Temperature of RMU/SS	13101	

*** Please be noted that there is one circuit (LBS) has no measurments and it will be calculated in ADMS in control center (power flow)**

DISTRIBUTION AUTOMATION PROGRAM
SMART FIELD EQUIPMENT
DATA POINTS LIST FOR 2L1T SMART MRMU (LVL)
with integrated ATS

Bay / CIRCUIT no.	Point name / Message	IOA / IEC OBJECT ADRESS	REMARKS
DIGITAL OUTPUT (DO) COMMANDS			
CIRCUIT1 (LBS)	CLOSE COMMAND	1	
CIRCUIT1 (LBS)	OPEN COMMAND	1	
CIRCUIT2 (TRx)	CLOSE COMMAND	5	
CIRCUIT2 (TRx)	OPEN COMMAND	5	
CIRCUIT3 (LBS)	CLOSE COMMAND	9	
CIRCUIT3 (LBS)	OPEN COMMAND	9	
COMMON	ATS SWITCH IN/OUT	17	
DIGITAL INPUT (DI) GENERAL ALARMS / INDICATIONS			
CIRCUIT1 (LBS)	CLOSE INDICATION	11000	
CIRCUIT1 (LBS)	OPEN INDICATION		
CIRCUIT1 (LBS)	LOCK/UNLOCK INDICATION	1000	
CIRCUIT1 (LBS)	GROUND INDICATION	1001	
CIRCUIT1 (LBS)	CVI (ATS voltage presence)	2000	
Circuit2 (TRx)	CLOSE INDICATION	11001	
Circuit2 (TRx)	OPEN INDICATION		
Circuit2 (TRx)	LOCK/UNLOCK INDICATION	1002	
Circuit2 (TRx)	GROUND INDICATION	1003	
Circuit2 (TRx)	CVI (ATS voltage presence)	2001	
CIRCUIT3 (LBS)	CLOSE INDICATION	11002	
CIRCUIT3 (LBS)	OPEN INDICATION		
CIRCUIT3 (LBS)	LOCK/UNLOCK INDICATION	1004	
CIRCUIT3 (LBS)	GROUND INDICATION	1005	
CIRCUIT3 (LBS)	CVI (ATS voltage presence)	2002	
COMMON	REMOTE	11004	Alarm
	LOCAL		Alarm
COMMON	Battery low	1008	Alarm
COMMON	Gas Low	1009	Alarm
COMMON	AC power fail	1010	Alarm
COMMON	Door open	1011	Alarm
COMMON	DC power fail	1012	Main DC power for charger/Circuit Breaker
COMMON	Motor CIRCUIT fail	1013	Regrouped information for all circuits (Spring charger, DC motor)
COMMON	RTU Self diagnostic (RTU alarm)	1277	Alarm
COMMON	EFI (FAULT INDICATION)	1278	Alarm
COMMON	Protection Health (Normal/Fail)	1279	Alarm
COMMON	Protection Trip (Earth fault)	1280	Alarm
COMMON	Protection Trip (Phase fault)	1281	Alarm
COMMON	Load Management system operate	1283	Alarm
COMMON	ATS SWITCH IN/OUT	2004	
COMMON	ATS TRIP (Act / Deact)	2005	

ANALOG INPUT (AI) MEASURMENTS			
Circuit1 (LBS)	I_Current (A)	13015	
Circuit1 (LBS)	I_Current (B)	13016	
Circuit1 (LBS)	I_Current (C)	13017	
Circuit1 (LBS)	I_Current (N)	13018	
Circuit1 (LBS)	S (KVA)	13057	Calculated from power factor and voltage value from TRx
Circuit1 (LBS)	P (KW)	13058	
Circuit1 (LBS)	Q (KVAR)	13059	
Circuit2 (TRx)	I_Current (A)	13019	
Circuit2 (TRx)	I_Current (B)	13020	
Circuit2 (TRx)	I_Current (C)	13021	
Circuit2 (TRx)	I_Current (N)	13022	
Circuit2 (TRx)	V_voltage (A-B)	13060	Phase to phase
Circuit2 (TRx)	V_voltage (B-C)	13061	Phase to phase
Circuit2 (TRx)	V_voltage (C-A)	13062	Phase to phase
Circuit2 (TRx)	V_voltage (N)	13063	
Circuit2 (TRx)	S (KVA)	13064	
Circuit2 (TRx)	P (KW)	13065	
Circuit2 (TRx)	Q (KVAR)	13066	
Circuit2 (TRx)	Power Factor	13067	
Circuit3 (LBS)	I_Current (A)	13023	
Circuit3 (LBS)	I_Current (B)	13024	
Circuit3 (LBS)	I_Current (C)	13025	
Circuit3 (LBS)	I_Current (N)	13026	
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Circuit3 (LBS)	P (KW)	13069	
Circuit3 (LBS)	Q (KVAR)	13070	
Common	Temperature (External) of Transformer if available	13100	
Common	Internal Temperature of RMU/SS	13101	

*** Please be noted that there is one circuit (LBS) has no measurments and it will be calculated in ADMS in control center (power flow)**