

Saudi Electricity Company



الشركة السعودية للكهرباء

SEC DISTRIBUTION MATERIALS SPECIFICATION

56-SDMS-02, Rev.01

DATE: 6-04-2004G

56-SDMS-02

REV. 01

SPECIFICATIONS

FOR

13.8KV PACKAGE SUBSTATIONS

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CONTENTS

	<u>PAGE No.</u>
1.0 SCOPE	3
2.0 CROSS REFERENCES	3
3.0 APPLICABLE CODES AND STANDARDS	3
4.0 DESIGN AND CONSTRUCTION REQUIREMENTS	4
4.1 System Characteristics	4
4.2 Package Substation Compartments / Components	4
4.2.1 Skid and Enclosure	4
4.2.2 Doors & Others	5
4.2.3 Transformer	5
4.2.4 Medium Voltage Termination Box	6
4.2.5 Ring Main Unit	6
4.2.6 Low Voltage Compartment	7
4.3 Dimensions	7
4.4 Package Substation Foundation	8
4.5 Provision for Mobile Generator Cables	8
4.6 Name Plate	8
4.7 Circuit Identification	8
4.8 Danger Plate and SEC Monogram	8
5.0 TESTING	9
6.0 SUBMITTALS	9
7.0 DATA SCHEDULE	11

LIST OF DRAWINGS

FIGURE-1a	Package Substation Component Lay out (RMU Door on the Front)	14
FIGURE-1b	Package Substation Component Lay out (RMU Door on the Side)	14
FIGURE-2	Package Substation Front and Accessories	15
FIGURE-3	Generator Cable Opening on the left Hand Side	16
FIGURE-4	Hardwood Cable Clamp for Medium Voltage Cable Termination box	17



1.0 SCOPE

This Saudi Electricity Company (SEC) Distribution Material Specifications (SDMS) specifies the minimum technical requirements of design, engineering, manufacturing, inspection, testing and performance of outdoor Package Substation (PS) intended to be used in 13.8 kV system of the Saudi Electricity Company (SEC), Saudi Arabia.

A package substation combines power transformer, MV switchgear and LV distribution panel in a single transportable unit ready for operation on being fixed in position on prepared concrete foundation and connected to the power system.

2.0 CROSS REFERENCES

This SDMS shall always be read in conjunction with SEC specification No. 01-SDMS-01, titled "General Requirements for All Equipment/Materials", which shall be considered as an integral part of this SDMS. This SDMS shall be also read in conjunction with SEC Purchase Order (PO) requirements.

3.0 APPLICABLE CODES AND STANDARDS

The latest revisions of the following Codes and Standards listed shall be applicable for the equipment / materials covered in this SDMS. In case of conflict, the vendor / manufacturer may propose equipment / material conforming to one group of Industry Codes and Standards quoted hereunder without jeopardizing the requirements of this SDMS.

- | | | |
|-----|------------|---|
| 3.1 | 51-SDMS-01 | Distribution Transformer Up to 33kV |
| 3.2 | 31-SDMS-01 | Low Voltage Distribution Panel |
| 3.3 | 32-SDMS-01 | SF6 Ring Main Unit, 15 kV |
| 3.4 | 37-SDMS-01 | Low Voltage Molded Case Circuit Breakers |
| 3.5 | 11-SDMS-03 | 15 kV XLPE Insulated Power Cables |
| 3.6 | IEC- 61330 | High-voltage / low-voltage prefabricated substation |
| 3.7 | IEC- 60529 | Classification of degree of protection provided by enclosures |



4.0 DESIGN AND CONSTRUCTION REQUIREMENTS

4.1 System Characteristics

The Package substation shall be suitable for operation in system characteristics as given in SEC specification 01-SDMS-01 and including the following:

MV neutral arrangement	Solidly Grounded or Low Resistance
LV neutral arrangement	Solidly Grounded

4.2 Package Substation Compartments / Component

4.2.1 Skid and Enclosure

4.2.1.1 RMU, Transformer MV termination box and LV compartment shall all be mounted on a common galvanized steel skid (see Figure 1-a, 1-b for layout)

4.2.1.2 RMU, transformer, MV and LV compartments shall all be provided with factory assembled removable enclosure. The enclosure shall mechanically have arrangement to be de-assembled / assembled at site / workshop technicians and by the use of normal / simple tools.

4.2.1.3 Enclosure and skid shall have adequate mechanical strength for lifting, mounting, and transportation of the package substation as one unit. Lifting provision of package substation shall be an integral part of the skid.

4.2.1.4 Enclosure shall be weatherproof, double roof and of robust construction and shall be provided with watershed top. It shall be manufactured from galvanized sheet steel or aluzinc of at least 3 or 2 mm thickness respectively.

4.2.1.5 Enclosure shall be provided with adequate ventilation for different components of package substation to permit natural circulation of air. The ventilation apertures shall be screened with galvanized / aluzinc double steel mesh to prevent entry of vermin and other foreign bodies. The degree of protection of transformer compartment shall be IP-23 with sand trap and remaining compartments shall be as given in 01-SDMS-01 for outdoor application.

4.2.1.6 Enclosure and skid galvanizing / surface protection against corrosion, painting and finish color (Cement gray RAL 7033) shall comply with the requirements as given in SEC specification 01-SDMS-01.



4.2.2 Doors & Others

- 4.2.2.1 Access doors of LV compartment, transformer and RMU compartments shall be integrated as a part of the enclosure body. These doors shall be hinged, press fit type gasketed and fitted with a heavy-duty locking bar to secure it at the top and bottom. A central handle, locking bar, handle integral lock and pad locking provision shall be provided as given in the enclosure section of SEC material specification 31-SDMS-01. Locks and keys of LV and RMU compartments shall be different from each other. However, the key of the RMU compartment shall be suitable to open the lock of LV compartment.
- 4.2.2.2 All doors shall be provided with door stoppers and locking at open position to protect from swinging in order to avoid accident.
- 4.2.2.3 All door hinges shall be concealed and made of stainless steel or brass.
- 4.2.2.4 All doors shall be bonded to the framework (enclosure) by a bolted removable 35 mm² tinned copper braid.
- 4.2.2.5 All parts of equal size and shape shall be interchangeable. The general design shall be made with minimum number of joints.
- 4.2.2.6 All insulating materials shall be non-hygroscopic and resistance to tracking.
- 4.2.2.7 All bolted electrical joints shall be secured by means of corrosion proof steel fasteners. These fasteners (bolts, nuts, and washers) shall be galvanized and comply 01-SDMS-01.
- 4.2.2.8 All fasteners except the transformer shall not be accessible from outside of the enclosure of package substation.

4.2.3 Transformer

- 4.2.3.1 Transformer shall be of suitable for package substation, outdoor ground-mounted type and generally shall comply with all applicable clauses of SEC specification 51-SDMS-1 and including the following requirements.
- 4.2.3.2 MV bushings shall be located horizontally on the right hand side (facing package unit from the front) in a cable termination box. Bushing shall be suitable for M16 bolted type connection with heat/cold shrinkable or premoulded termination with separable elbow connectors.



The bushing shall be fitted with a stud having an outer size of M12 for single hole flat pad lug with 50-70 mm² medium voltage cable as given in SEC specification 11- SDMS-03.

4.2.3.3 MV and LV bushings shall be identified, labeled and printed with black paint as follows:

MV bushings: **U V W**
 LV bushings: **u v w n**

4.2.3.4 Oil level & temperature indicators and off-load tap changer operating knob shall easily be accessible / readable and operate-able from LV panel compartment with adequate safety. Oil temperature indicator shall be equipped with tripping contact if requested and specified in the tender / data schedule.

4.2.3.5 Oil drainage / sample and pressure relief valves shall on the transformer and easily accessible from the transformer compartment.

4.2.4 Medium Voltage Termination Box

4.2.4.1 Medium voltage termination box shall be part of transformer and shall be located as shown in Figures 1-a & 1-b.

4.2.4.2 Medium voltage termination box shall enclose cable clamps, grounding connectors and medium voltage bushings.

4.2.4.3 The MV cable clamps shall conform to Figure-4

4.2.4.4 Medium voltage termination box shall have adequate size for terminating three single core or one three core MV cables as per SEC specification 11-SDMS-03, sizes 50 to 70 mm² Aluminum or Copper with heat / cold / pre-mold termination. This box shall be single gasketed removable bolted cover. Bottom plate shall be in two halves and cable entry with steel knockouts suitable for above cables. Loose rubber bushings shall be provided inside of this box for these knockouts.

4.2.5 Ring Main Unit (RMU)

4.2.5.1 RMU shall be of indoor type and shall generally comply with SEC specification 32-SDMS-01. It shall be mounted on the common skid of package substation on the right hand side to the MV cable box as given in Figures 1-a & 1-b.



4.2.5.2 SEC approved Earth Fault Indicator (EFI) shall be provided and installed at suitable location as shown in the Figure 1-a and 1-b.

4.2.6 Low Voltage Compartment

4.2.6.1 Low voltage compartment shall comply with SEC specification 31-SDMS-01. In case any conflict between this specification and SEC specification 31-SDMS-01, this specification shall apply.

4.2.6.2 As an option if requested in the tender, LV Panel for bulk power supply shall be equipped with main circuit breaker without outgoing MCCBs and provision for direct connection of customer cables on the bus-bar.

4.2.6.3 For the details of the following items, refer to SEC specifications 31-SDMS-01:

- i. Ratings of transformer LV phase links
- ii. Main / incomer CT rating
- iii. Transformer connection with LV panel
- iv. Number of out going circuits
- v. Clearances between outgoing circuits
- vi. Bus-bar sizes / ratings
- vii. Indicating instruments
- viii. Fault level
- ix. Provision for installing CT for revenue metering part of the panels

4.3 Dimensions

Maximum overall dimensions of package substation shall be as given Table-1.

Table -1 (Package Substation Dimensions)

Package Substation Ratings		Overall Dimensions in (mm)			
KVA	Low Voltage (V)	Length		Width	Height
		Design (a)	Design (b)		
300	231/133	3000	2500	2000	2200
	400/231	3000	2500		
500	231/133	3000	2500		
	400/231	3000	2500		
1000	231/133	3500	3000		
	400/231	3500	3000		
1500	231/133	3500	3000		2300
	400/231	3500	3000		



4.4 Package Substation Foundation

Prefabricated steel reinforced concrete foundation shall be used for the installation of package substation. This foundation shall be unified suitable to accommodate 300, 500, 1000 and 1500 KVA package substation. Refer Drawing No. 56SDMS02-01 for civil details.

4.5 Provision for Mobile Generator Cables

4.5.1 Two gasketed openings of 250 mm x 250 mm for the generator cables on the front and sides (refer Figure-3) shall be provided. These openings shall be provided with M8 size, round, non-slotted bolted cover with nuts and washers. Unbolting of these covers shall be accessible from inside of the package substation only. The gasket of these opening shall be pressure fit type.

4.5.2 Two (2) holes up-to 500 KVA and four holes (4) exceeding 500 KVA package substation, each 13 mm diameter for installation of mobile generators cables shall be provided on the left hand side (facing the package substation) vertically extended LV busbars.

4.6 Name plate

Aluminum name plates for the transformer and the low voltage compartment with the information required in SEC specifications 51-SDMS-1 and 31-SDMS-01 respectively and including item identification and PO numbers for the package substation and shall be fixed inside the left door of the low voltage compartment.

4.7 Circuit Identification

Circuit identification shall be provided as given in the Label section of SEC material specification 31-SDMS-01.

4.8 Danger Plate and SEC Monogram

Danger plate and SEC monogram as per SEC drawings No. SEC - 01- 01 and SEC - 01-02 respectively shall be provided and installed on the front (on SEC approved location) of the package substation 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 the drawing for locations and samples of danger & monogram plates prior to installation.

**5.0 TESTING**

- 5.1 Complete type and routine testing of Package Substation shall be carried out as per IEC 61330.
- 5.2 The acceptance criteria for the Package type Substation shall be based on Class 10 (for measurement of transformer temperature rise in an enclosure - IEC 61330).

6.0 SUBMITTALS

- 6.1 The vendor shall complete and submit filled-in data schedule and clause-by-clause compliance of the following SEC specifications with the quotations:

31-SDMS-01
32-SDMS-01
37-SDMS-01
51-SDMS-01

- 6.2 The following dimensional drawings and associated information shall be provided with the quotation for each package substation rating:
- 6.2.1 Outline of package substation showing position of fittings, attachments and mounting arrangements
- 6.2.2 Details of RMU, Transformer, MV termination box and LV Compartments
- 6.2.3 Single line diagram of package substation with all electrical components
- 6.2.4 Details / catalog of the following:
- i. Skid layout and mounting arrangement
 - ii. All fittings & attachments
 - iii. Enclosure parts, gates & assemblies
 - iv. Fixing arrangement of LV MCCBs
 - v. Hardwood cable clamps
 - vi. Nameplate information



- 6.2.5 Mounting and installation details of package substation installed on pre-fabricated concrete foundation
- 6.2.6 Comprehensive list of recommended spare parts with complete details including drawings, catalog number / part number, manufacturer / supplier name of each item shall be submitted
- 6.2.7 Copy of type test report
- 6.2.8 List of customers in case of new manufacture / vendor
- 6.2.9 Details of manufacturing and routine test testing schedules (after signing of purchase order)



7.0 DATA SCHEDULE

13.8 kV/LV PACKAGE SUBSTATION

(Sheet 1 of 3)

SEC Inquiry No. _____ Item No. _____

REF. SEC.	DESCRIPTION	SEC SPECIFIED VALUE	VENDOR PROPOSED VALUES
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4.0 DESIGN AND CONSTRUCTION REQUIREMENTS

1. Nominal Unit S/S rating	300 kVA 500 kVA 1000 kVA 1500 kVA	
2. Number of Distribution units	2, 4, 8, 10, 12	
3. Main breaker requirement	Yes / No ()	

4.2 PACKAGE SUBSTATION COMPARTMENTS / COMPONENTS

1. Length, mm		
2. Width, mm		
3. Height, mm		
4. Length of MV termination		
5. Center to center distance between HV bushings, mm		
6. Horizontal clearance between the outer MV bushing(s) and the inside of the MV compartment, mm		
7. Center to center distance between MCCBs, mm	150	
8. Space between MCCBs, mm	10	
9. Phase bus-bar current rating,		
10. Phase bus-bar size, mm		
11. Neutral bus-bar current		
12. Neutral bus-bar size, mm		
13. Oil temp. Indicator with trip	Yes / No	



SEC DISTRIBUTION MATERIALS SPECIFICATION

56-SDMS-02, Rev.01

DATE: 6-04-2004G

7.0 DATA SCHEDULE**13.8 kV/LV PACKAGE SUBSTATION**

(Sheet 2 of 3)

SEC Inquiry No. _____ Item No. _____

4.2	FINISH OF ENCLOSURE		
	Finish method		
	Finish color	Cement Gray RAL 7033	
4.2	Transformer		
	1. Temperature indicator with tripping contacts requirement	Yes / No	
4.5	PROVISION FOR GENERATOR CABLES		
	Diameter of hole on the bus-bar,	13	
	1. Number of holes on each phase bus-bar	4 each for 1500kVA & 1000kVA 2 each for 500kVA & 300kVA	
	2. Number of holes on neutral bus-bar	2 each for 1500kVA & 1000kVA 1 each for 500kVA & 300kVA	



7.0 DATA SCHEDULE

13.8 kV/LV PACKAGE SUBSTATION

(Sheet 3 of 3)

SEC Inquiry No. _____ Item No. _____

- A. ADDITIONAL TECHNICAL INFORMATION OR FEATURES SPECIFIED BY SEC:**
- B. ADDITIONAL SUPPLEMENTARY DATA OR FEATURES PROPOSED BY BIDDER/VENDOR/SUPPLIER:**
- C. OTHER PARTICULARS TO BE FILLED UP BY BIDDER/VENDOR/ SUPPLIER:**
- D. LIST OF DEVIATIONS & CLAUSES TO WHICH EXCEPTIONS ARE TAKEN BY THE BIDDER/VENDOR/SUPPLIER: (USE SEPARATE SHEET IF NECESSARY)**

	MANUFACTURER OF MATERIALS/EQUIPME	VENDOR / SUPPLIER
Name of Company		
Location and Office Address		
Name and Signature of Authorize Representative		
Official Seal / Stamp		

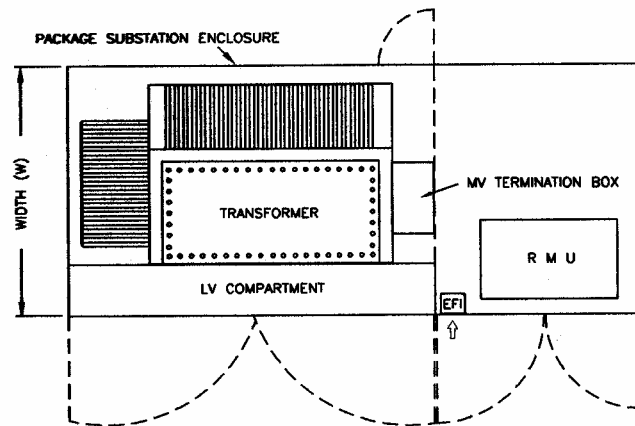


FIGURE-1(A): PACKAGE SUB-STATION COMPONENT LAY-OUT
(RMU DOOR ON THE FRONT)

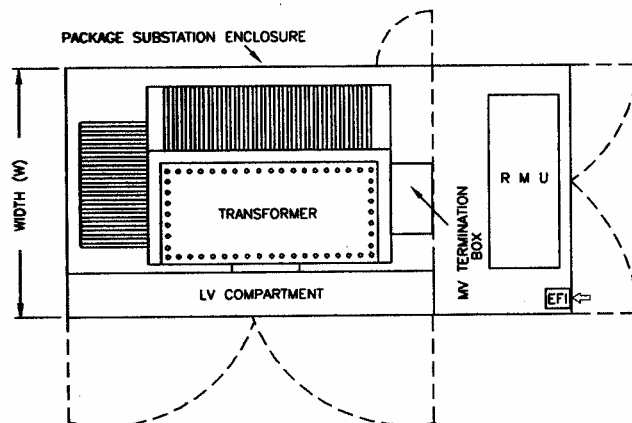
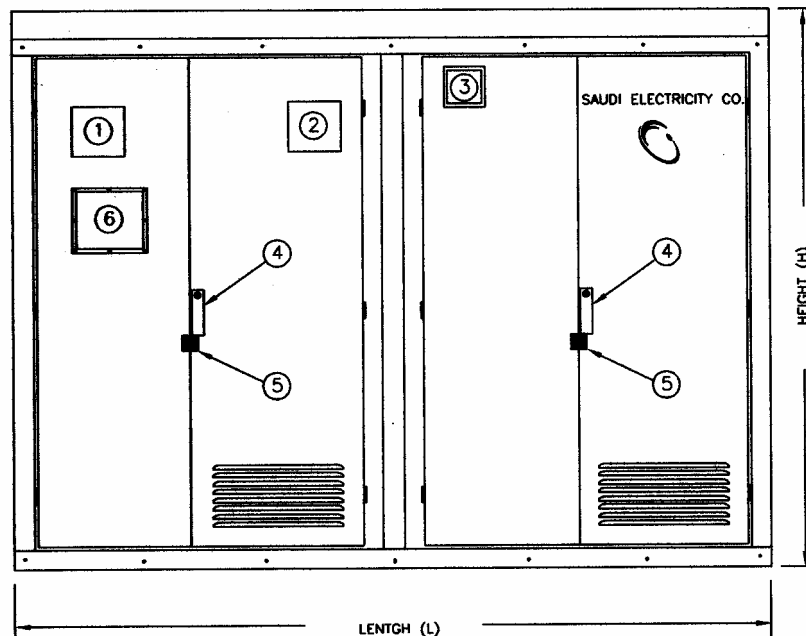


FIGURE-1(B): PACKAGE SUB-STATION COMPONENT LAY-OUT
(RMU DOOR ON THE SIDE)

ALL DIMENSIONS ARE IN MILLIMETER

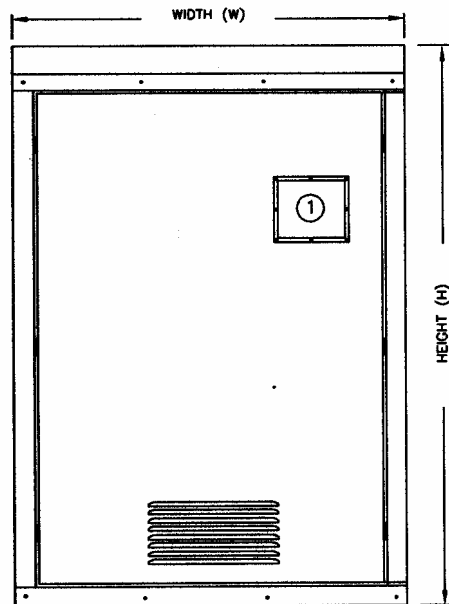


LEGEND:

- ① SEC DANGER PLATE
- ② SEC MONOGRAM PLATE
- ③ WINDOW FOR E F I
- ④ DOOR HANDLE COVER
- ⑤ PADLOCKING PROVISION HASP ON BOTH DOORS
- ⑥ GENERATOR CABLE ENTRY WINDOW COVERED WITH STEEL PLATE

FIGURE-2: PACKAGE SUB-STATION FRONT VIEW & ACCESSORIES

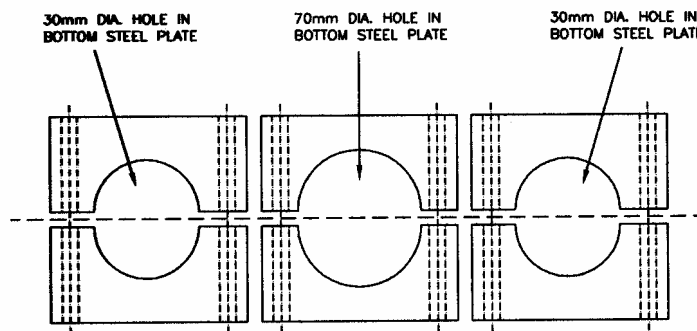
ALL DIMENSIONS ARE IN MILLIMETER



LEGEND:

- ① GENERATOR CABLE ENTRY WINDOW COVERED WITH STEEL PLATE (ALTERNATIVE)

**FIGURE-3: SIDE VIEW OF PACKAGE SUBSTATION
GENERATOR CABLE OPENING ON THE LEFT HAND SIDE**
ALL DIMENSIONS ARE IN MILLIMETER



CABLE CLAMPS BOLTS ARE M16

FIGURE-4: WOODEN CABLE CLAMP FOR MV TERMINATION BOX

ALL DIMENSIONS ARE IN MILLIMETER