Saudi Electricity Company	الشركة السعودية للكهرباء

SEC Distribution Materials Specification	50-SDMS-03 Rev 0
	DATE: 30-07-2013G

50-SDMS-03

Rev 0

SPECIFICATION

FOR

PRIMARY SUBSTATION POTENTIAL TRANSFORMERS 11KV THROUGH 69KV

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1.0 SCOPE

This SEC Distribution Material Specification (SDMS) specifies the minimum technical requirements for design, engineering, manufacture, inspection, testing and performance of outdoor/indoor free standing inductive potential transformer, 11kV through 69kV, intended to be used in primary substations of distribution system of Saudi Electricity Company, Saudi Arabia.

2.0 CROSS REFERENCES

This Material Standard Specification shall always be read in conjunction with latest SEC General 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 also be read in conjunction with SEC Purchase Order or Contract Schedules for project, as applicable.

3.0 APPLICABLE CODES AND STANDARDS

The latest revision/amendments of the following Codes and Standards shall be applicable for the equipment/material 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	IEC 61869-3	Instrument Transformers, Part 2: Additional Requirements for Inductive Voltage Transformers
3.2	IEC 62155	Hollow pressurized and unpressurized ceramic and glass insulators for use in electrical equipment with rated voltages greater than 1000 V
3.3	IEC 60529	Degree of Protection Provided By Enclosures
3.4	IEC 60836	Specifications for silicone liquids for electrical purposes
3.5	IEEE C57.13	IEEE Standard Requirements for Instrument Transformers

3.6 ASTM 4652 Standard Specification for Silicone Fluid Used for Electrical Insulation

3.7 54-SDMS-01 Mineral Insulating Oil for Electrical Apparatus

4.0 DESIGN AND CONSTRUCTION REQUIREMENTS

4.1 Ratings

4.1.1 The burden indicated in the data schedule is the minimum requirement. Unless otherwise specified in the data schedule, minimum burden of each secondary winding shall be 25 VA. Final burden shall be based on calculation for the intended application.

4.1.2 PT Connection and Voltage Rating

a. PT connection shall be single phase line to ground type or three phase type as specified in the data schedule.

b. The specific voltage rating shall be as specified in the data schedule.

c. Secondary nominal voltage shall be $\frac{115}{\sqrt{3}}$ V or $\frac{110}{\sqrt{3}}$ V or as specified in the data schedule.

4.1.3 Accuracy

a. Unless otherwise specified, the metering accuracy class at 60 Hz shall be 0.2 as per IEC.

b. Unless otherwise specified, the protection accuracy class at 60 Hz shall be 3P per IEC.

c. When specified in the data schedule dual accuracy class shall be provided to suite both metering and protection.

4.1.4 Rated Voltage Factor

Unless otherwise specified in the data schedule rated voltage factor shall per IEC 61869-3.

4.2 Construction

4.2.1 General

a. Type of PT for different voltage class and indoor/outdoor installations shall be as per Table-1.

Table-1

System Voltages (kV)	Installation Indoor / Outdoor	Type of PT
11, 13.8, 33, 34.5, 69	Indoor	Cast Resin Type
33, 34.5, 69	Outdoor	Silicon Rubber or Porcelain Insualted Type (Filled with Silicon Liquid or Mineral Oil)

b. The PTs shall be hermetically sealed. The lower part of the PTs shall consists of a steel tank with secondary terminal compartment, ground terminal (on the case or on the mounting base). The upper part of the transformer shall consists of a porcelain housing, top cap and cover assembly with a primary terminal, an expansion tank and oil/liquid filled indicator. The transformer shall be supplied with lifting lugs.

4.2.2 Insulating Oil

a. PTs shall be filled with mineral insulating oil/liquid silicone as mentioned in Table-1.

b. The insulating oil shall be PCB free.

c. The mineral insulating oil shall conform to 54-SDMS-01.

d. Silicone liquid filled shall be polydimethylsiloxane oil or silicone liquid as per Table I of ASTM D-4652 or type T-1 per IEC 60836 standard.

4.2.3 Insulator Housing of PTs

a. Outdoor insulator housing shall be electrical grade, wet processed porcelain of brown color conforming to IEC 60137 standard or silicon rubber as mentioned in above Table.

b. Outdoor insulator housing shall withstand a washing pressure of 3500 kPa without permitting water ingress into internal of PTs or secondary terminal box of PTs.

4.2.4 Terminals

a. The primary terminals shall be round or flat studs made of non-corrodible material and shall be suitable for copper or aluminum connectors as specified in the data schedule.

b. The secondary terminals shall accept a copper wire size of 2.5mm^2 minimum. Removable cable gland plate shall be provided on the terminal box.

c. The degree of protection of enclosures for secondary terminal box shall be per 01-SDMS-01.

d. Primary and secondary terminals and polarity shall be marked as per applicable standards.

4.2.5 Protection of Secondary

PT secondary circuit shall be protected by Miniature Circuit Breakers (MCBs) or fuses as specified in the data schedule. Separate terminals shall be provided for PT-fuse supervision or MCB tripped signal.

4.3 Grounding

The PT shall be provided with grounding terminal sized to accommodate bare copper conductor of size 1x240mm^2 for station fault current level upto 40kA and 2x240mm^2 for station fault current levels above 40kA.

4.4 Nameplate

The nameplate to be provided shall be:

4.4.1 Written in English containing the information listed in IEEE C57.13 or in IEC 61869-3 plus additional information as follows:

a. The words "_____kV Potential Transformer"

b. SEC Purchase Order Number and Contract No./Job Order No.

c. Design Ambient Temperature

d. 50-SDMS-03, Rev.0

4.4.2 The nameplate shall be of stainless steel fastened to the equipment by stainless screws or rivets.

5.0 TESTS

All tests result shall be provided for review and acceptance.

5.1 Type (Design) Tests

5.1.1 All type (design) tests described in the relevant IEC standard shall be performed on the representative unit or on the first unit of every new design or rating to be supplied.

5.1.2 Chopped impulse test shall be carried out additionally for all PTs manufactured per IEC standard.

5.1.3 In lieu of the actual type (design) tests, certified test reports of type (design) tests performed on an identical unit may be submitted for review and approval during the bidding stage.

5.1.4 If PT is manufactured as per ANSI/IEEE standard then partial discharge test shall be carried out as a routine test.

5.2 Routine (Production) Tests

5.2.1 All routine (production) tests prescribed in the relevant IEC or equivalent IEEE standard shall be performed on all potential transformers.

6.0 DATA SCHEDULE

PRIMARY SUBSTATION POTENTIAL TRANSFORMERS
11KV THROUGH 69KV

SEC Enquiry No. _____ Date: _____

SEC Purchase Order No. or Contract No. _____ Date: _____

SEC PTS No./Project Title with J.O. No. _____

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
	Nominal System Voltage (kV) (11/13.8/33/34.5/69)			
	System Short Circuit Current (kAsym.) at rated system voltage (Single Phase to Ground)			
	Type of System Grounding Installation (Outdoor/Indoor)			

'A' – SEC SPECIFIED DATA/PARAMETER
'B' – BIDDER/SUPPLIER/VENDOR/CONTRACTOR PROPOSED DATA/PARAMETERS
'C' – REMARKS SUPPORTING THE PROPOSED DEVIATION IN COLUMN 'B'
(*) – DATA/PARAMETER TO BE PROVIDED/PROPOSED BY THE BIDDER/SUPPLIER/ VENDOR/CONTRACTOR IN COLUMN 'B'

6.0 DATA SCHEDULE

PRIMARY SUBSTATION POTENTIAL TRANSFORMERS 11KV THROUGH 69KV

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
3.0	APPLICABLE CODES AND STANDARDS			
	Applicable Industry Standard	*		
4.0	DESIGN AND CONSTRUCTION REQUIREMENTS			
4.1	Ratings			
	Maximum Rated Primary Voltage (kV_{rms}) (Phase to Ground)			
	Rated Voltage Factor			
	Rated Secondary Voltage (V_{rms}) (Nominal)			
	• Secondary-1			
	• Secondary-2			
	Rated Burden (VA)			
	• Secondary-1			
	• Secondary-2			
	Continuous Thermal Burden (VA)			
	Type of insulation (Liquid/Solid)			
	Maximum Partial Discharge Level			

6.0 DATA SCHEDULE

PRIMARY SUBSTATION POTENTIAL TRANSFORMERS 11KV THROUGH 69KV

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.1	Ratings (*Continued*)			
	Phase to Earth (PC)			
	• @ maximum rated voltage	*		
	• @ 1.2 x max. rated voltage / √3	*		
	Maximum Radio Influence Voltage (RIV)			
	At 1.1 x maximum rated voltage/√3	≤ 2500 µV		
	Winding Insulation and Class	*		
	Winding Material (Al or Cu)	*		
	BIL of Winding (kV_{peak})	*		
	Power Frequency Withstand Voltage of Winding (kV_{rms})	*		
	Accuracy Class			
	• Secondary-1			
	• Secondary-2			
4.2	Construction			
	Type of PT (Cast rasin/ Mineral Oil Filled/Silicone Liquid Filled)			
	3-Phase Type or Single Phase Type			
	Manufacturer's Type Designation	*		
	Country of Manufacture	*		
4.2.2(c)	Insulating Oil [Refer to Data Schedule of 54-SDMS-01, Vendor to fill-in column 'B' of the same]			

6.0 DATA SCHEDULE

PRIMARY SUBSTATION POTENTIAL TRANSFORMERS
33KV THROUGH 69KV

REFERENCE SECTION NO.	DESCRIPTION			'A'	'B'	'C'
4.2.2(d)	Silicone Liquid					
		IEC	ASTM			
	Applicable Standard	60836	D4652			
	Color (Max.)	35	15			
	Appearance	*	*			
	Viscosity Max. at 40°C (mm^2/s)	40 + 4	39			
	Flash Point, Min (°C)	240	300			
	Pour Point, Max (°C)	-50	-50			
	Density at 20°C (kg/dm^3)	0.955 to 0.970	*			
	Dissipation Factor tan δ at 60Hz @					
	• 25°	*	0.01			
	• 90°	0.0012	*			
	Dielectric Breakdown Voltage at 60Hz,Min (kV)	40	35			
	Neutralization Value, Max. (mg KOH/g)	0.02	0.01			
	Water Content (ppm)	50	50			
	PCB Content	*	*			

6.0 DATA SCHEDULE

PRIMARY SUBSTATION POTENTIAL TRANSFORMERS 33KV THROUGH 69KV

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.2.3	High Voltage Insulator Housing			
	Name of Manufacturer	*		
	Type (Porcelain/Silicon Rubber)			
	Rated Voltage (Nominal, kV_{rms})	*		
	BIL (kV_{peak})			
	Power Frequency Withstand Voltage: (Wet Withstand Applicable for Outdoor Housings Only)			
	• 1 minute dry (kV_{rms})	*		
	• 10 seconds wet (kV_{rms})	*		
	Creepage Distance (mm)	*		
	Color	*		
	Cantilever Strength (kg)	*		
4.2.4	Terminals			
4.2	Primary Terminal Connector:			
	• For Conductor Material (Al/Cu)			
	• Size (mm^2)			
	• Number of Conductor/phase			

	Degree of Protection of Enclosure for Secondary Terminal Box	*		

6.0 DATA SCHEDULE

PRIMARY SUBSTATION POTENTIAL TRANSFORMERS
11KV THROUGH 69KV

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.2.5	Protection of Secondary			
	PT Secondary MCB/Fuse Rating (A)			
4.4	PT Overall Dimensions (mm)	*		
	Weight (kg)			
5.0	Tests			
	Optional or Special Test requirements (if any)			

6.0 DATA SCHEDULE

PRIMARY SUBSTATION POTENTIAL TRANSFORMERS
11KV THROUGH 69KV

A. ADDITIONAL TECHNICAL INFORMATION OR FEATURES TO BE FURNISHED BY SEC:

B. ADDITIONAL SUPPLEMENTARY DATA OR FEATURES PROPOSED BY BIDDER/VENDOR/SUPPLIER/CONTRACTOR:

C. OTHER PARTICULARS TO BE FILLED UP BY BIDDER/VENDOR/SUPPLIER/ CONTRACTOR:

	Actual Manufacturer of Equipment/Material	Vendor/Supplier/ Contractor
Name of the Company Location and address	_____ _____ _____	_____ _____ _____
Name and Signature of authorized Representative and date	_____ _____ _____	_____ _____ _____
Official Seal/Stamp	_____	_____

of the Company &		
Date		