Saudi Electricity Company	الشركة السعودية للكهرباء

SEC DISTRIBUTION MATERIALS SPECIFICATION	57-SDMS-01 Rev. 00
	DATE: April 2017G

57-SDMS-01

REV. 00

SPECIFICATIONS

FOR

NEUTRAL GROUNDING RESISTOR
11 KV THROUGH 34.5 kV
FOR
PRIMARY DISTRIBUTIONSUBSTATAIONS

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1.0 SCOPE

This SEC Distribution Material Standard Specification (SDMS) specifies the minimum technical requirements for design, engineering, manufacture, inspection, testing and performance of Indoor/Outdoor Neutral Grounding Resistor rated 11 kV up to 34.5 kV, intended to be used in the Distribution Network of Distribution Sector of the Saudi Electricity Company, Saudi Arabia.

2.0 CROSS REFERENCES

This Material Standard Specification shall always be read in conjunction with 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 60071-1	Insulation Coordination Part-1: Definition,Principles and rules
3.2	IEC 60071-2	Insulation Coordination Part-2: Application Guide.
3.3	IEC 62271-200	A.C Metal Enclosed Switchgear and Controlgear for Rated Voltage above 1 kV and up to and including 52 kV
3.4	IEC 60529	Degrees of Protection provided by Enclosures (IP code)
3.5	IEC 60137	Insulated Bushings for Alternating Voltages above 1000 Volts
3.6	IEC 60273	Characteristics of Indoor and Outdoor Post Insulators for Systems with Nominal Voltages greater than 1000 volts

3.7	IEC 60168	Tests on Indoor and Outdoor Post Insulators of Ceramic Material or Glass for Systems with Nominal Voltages greater than 1000 volts
3.8	ANSI/NFPA 70	National Electrical Code
3.9	ANSI/IEEE 32	Requirements, Terminology and Test Procedures for Neutral Grounding Devices

4.0 DESIGN AND CONSTRUCTION REQUIREMENTS

4.1 General

4.1.1 The Neutral Grounding Resistor shall meet or exceed the requirements of this specification in all respects.

4.1.2 The Neutral Grounding Resistor shall be manufactured in accordance with ANSI/IEEE 32 and IEC 60071-1, 60071-2.

4.1.3 The Neutral Grounding Resistor shall be designed for outdoor / Indoor use.

4.2 Ratings and Performance Characteristics

The Neutral Grounding Resistor ratings and Performance Characteristic shall be as specified in Data Schedule.

4.3 Materials

4.3.1 Enclosure

a. The framework of the Neutral Grounding Resistor shall be made of steel and protected form corrosion either by hot dip galvanizing or painting suitable for outdoor use and designed to give a degree of protection IP41/ 54 for (Indoor/outdoor) without forced cooling**.** For coastal area, duplex system, which a combination of galvanizing and painting, shall be used. Material made of stainless steel is also acceptable.

b. The paints shall be heat resistant to withstand high temperature.

c. The enclosure color shall be RAL 7033.

d. The enclosure shall have four lifting eyebolts on top with minimum hole diameter of 20mm for balanced lifting.

e. Earthing of the enclosure shall be via two separate M12 stud terminals fitted diagonally opposite each other with solderless connectors and suitable for termination of copper conductor of size 240 mm^2. For substation fault current level of 40 kA and below, One (1) run of 240 mm^2 for each grounding pad shall be provided as specified in the data schedule.

f. For floor or steel plinth mounting, the enclosure shall be provided with fixation holes.

4.3.2 Neutral Bushing

a. The neutral bushing with M12 brass stud in an air insulated cable box shall be mounted on the side of the enclosure with undrilled removable gland plate and cover. The cable box shall be suitable for terminating the incoming cable(s), and shall house one current transformer (or more as specified in DATA SCHEDULE). The CT(s) ratings as approved by SEC shall be wired down to a terminal box mounted between 1.0 m to 1.5 m height from ground level.

b. For neutral bushing mounted on the top cover, the enclosure shall be mounted on a plinth or structure to raise the height of the bushing 2.5 meters from the ground level to avoid accidental contact. The steel plinth shall be part of supply.

c. The neutral bushing ratings shall be as specified in the data schedule.

d. The NGR shall have provision for connection of neutral of more than one transformer (in parralel) as specified in DATA SCHEDULE.

4.3.3 Ground Terminal Bushing

A ground terminal bushing with M12 brass stud shall be provided through the enclosure wall for the resistor earth connection to the substation earth mesh. The connection between the resistor and earth mesh shall be through.

a terminal with M12 brass stud and shall be suitable to accept a 240mm2 hard drawn circular stranded copper conductor to form part of the earth grid mesh.

4.3.4 Resistance Grid

a. The active part shall be made of robust, non-corrosive, non-inductive, non-magnetic high temperature grid type stainless steel metal alloy or similar approved material capable of withstanding operating temperature conditions whilst retaining its strength. The resistor shall be rated for 10 seconds unless otherwise specified in the data schedule.

b. The ends of each resistor element made of stainless steel alloy shall be connected by tig weld or connected by nickel plated copper jumpers using two bolts per joint.

c. Each resistor elements on supporting bank shall be locked by clamp and all electrical connections between elements shall be made by double bolted copper connections

d. The resistor elements shall be adequately supported on steel rods and porcelain insulators and designed to withstand the current flowing under fault conditions. Adequate primary insulating barriers shall be provided for inter-girder and grid ends to prevent internal flashover. The secondary support insulators shall be designed and arranged to allow free expansion and contraction of the resistor assembly at operating temperature conditions without failure.

4.3.5 Nameplate

a. A nameplate shall be fixed on the side of the Neutral Grounding Resistor enclosure. The nameplate material shall be stainless steel and shall be fastened by stainless steel screws or rivets.

b. The nameplate information shall be stamped or laser engraved into the nameplate. The information on the nameplate shall be applied such that it is weatherproof, ultraviolet resistant, scratch resistant and permanent for the life of the NGR under normal handling and operating conditions. Silk-screened and laser etched paint are not acceptable. The nameplate information shall include the following:

a. Neutral Grounding Resistor
b. Manufacturer's Name
c. Country of Origin
d. Applicable Standard
e. Date of manufacture
f. Type
g. Manufacturer's Serial number
h. No. of Resistor Frames
i. Network System Voltage (kV_{rms})
j. Rated Voltage (kV_{rms})
k. Rated Frequency (Hz)
l. Rated Short Time Withstand Current (kArms)
m Rated Peak Withstand Current (kAp)
n. Rated Duration of Short Circuit(Sec)
o. Resistance at 20ºC
p. Temperature Coefficient of resistance at 20ºC
q. Temperature Rise (ºC)
r. Mass/Frame (kg)
s. CT rating information (Ratio, Accuracy, Burden and Voltage class)
t. Degree of Protection of Enclosure (IP)
u. Design Ambient Temperature (ºC)

5.0 TESTS

Neutral Grounding Resistor shall be tested in accordance with the latest relevant referenced standards and as specified herein. The assigned serial number of the Neutral Grounding Resistor shall be engraved on its body before testing to ensure the proper identity of the equipment to be tested. All test results shall be provided for review and approval of SEC.

5.1 Type (Design) Tests

5.1.1 All type (design) tests prescribed in the relevant IEC and ANSI/IEEE standards shall be performed on the first unit of every new design, rating and size of Neutral Grounding Resistor to be supplied to SEC. The following type tests, which are not covered by ANSI/IEEE 32 and IEC60529 shall be performed :

a. Measurement of Degree of Protection of Enclosure.
b. Temperature Rise Test
c. Measurement of Resistance Value at Stable Temperature.

5.1.2 Certified type tests report performed on identical Neutral Grounding Resistor acceptable to SEC may be submitted for review and approval in lieu of the required type tests.

5.2 Routine (Production) Tests

5.2.1 All routine (production) tests prescribed in the relevant IEC and ANSI/IEEE standards, shall be performed on each Neutral Grounding Resistor. Test results shall be provided for review and acceptance/approval by SEC prior to delivery. The following Routine tests, which are not covered by ANSI/IEEE 32, shall be performed:

a. Visual and Dimensional Check to Relevant Drawings
b. Resistance Measurement at Ambient Temperature
c. One Minute Power Frequency Withstand Voltage Test
d. Insulation Resistance Measurement before and after Dielectric Test

6.0 TECHNICAL DATA SCHEDULE

(NEUTRAL GROUNDING REISISTOR 11 kV THROUGH 34.5 kV)
(Page 1 of 6)

SEC Enquiry No. _____ Item No. _____

SEC Ref.	Description	Unit	SEC Specified Values	Vendor Pro-posed Values
3.0	**APPLICABLE CODES AND STANDARDS**			
	Applicable Industry Standards		*	
4.0	**DESIGN AND CONSTRUCTION REQUIREMENTS**			
4.1	General Application (Indoor / Outdoor) Design Ambient Temperature (°C)		 *	
4.2	System Voltage Rating (kV rms) Resistance at 20 °C (Ohms) Initial Fault Current (A) Fault Current Duration (s) Power frequency Withstand Voltage (kVrms) Impulse Withstand Voltage (BIL) (kV peak) Rated Time Temperature Rise.		15kV /34.5 kV * (as per table 5 of IEEE-32 -as above- * (as per table 6 of IEEE-32	
4.3	**Material** **Enclosure** IP code Type of material Weight (kg) **Neutral Bushing** Manufacturer Type		 * * * * *	

6.0 TECHNICAL DATA SCHEDULE

(NEUTRAL GROUNDING REISISTOR 11 kV THROUGH 34.5 kV)
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SEC Enquiry No. _____ Item No. _____

SEC Ref.	Description	Unit	SEC Specified Values	Vendor Pro-posed Values
	Material		*	
	Location (Top, Side)		*	
	Color		*	
	Rated Voltage (kV rms)		*	
	Rated Maximum Voltage (kV rms)		*	
	Rated Current (A rms)		*	
	Basic Impulse Withstand		*	
	Voltage, kV peak		*	
	One minute Power Frequency Dry/Wet-		*	
	- withstand Voltage (kV rms)			
	Creepage Distance (mm)		*	
	Cantilever Strength (N)		*	
	NEMA Terminal Pad:		*	
	Size (mm x mm)		*	
	No. of holes		*	
	Terminal Take –Off Angle (degree)		*	
	Terminal Pad Material		*	
	For Conductor Size (mm sq.)		*	
	No. Of Conductor		*	
	Conductor Material (CU or AL)		*	
	No. of Incomers		*	
	Ground Terminal Bushing:			
	Manufacturer			
	Type		*	
			*	

6.0 TECHNICAL DATA SCHEDULE

(NEUTRAL GROUNDING REISISTOR 11 kV THROUGH 34.5 kV)
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SEC Enquiry No. _____ Item No. _____

SEC Ref.	Description	Unit	SEC Specified Values	Vendor Pro-posed Values
	Material		*	
	Rated Voltage (kV rms)		*	
	Power Frequency Voltage (kV rms)		*	
	Power Frequency Withstand Voltage (kV rms)		*	
	CURRENT TRANSFORMER (CT)			
	Nos.			
	Type		*	
	CT Ratio		*	
	Accuracy Class		*	
	Burden (VA)		*	
	Short Time Withstand Current Rating (kA/s)		*	
			*	
	Resistance Grid			
	Manufacturer			
	Type of elements		*	
	No. of Resistor Bank		*	
	No. of Resistor Bank		*	
	Guaranteed Resistance ± 10 % (Ohm)		*	
	Rated Short –Time Withstand Current Rating (kA rms)		*	
	Rated Duration of Short Circuit (sec)		*	
	Temperature Coefficient of Resistance at 20 °C		*	
	Guaranteed steady State Hotspot Temperature Rise (20 °C)		*	

6.0 TECHNICAL DATA SCHEDULE

(NEUTRAL GROUNDING REISISTOR 11 kV THROUGH 34.5 kV)
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SEC Enquiry No. _____ Item No. _____

SEC Ref.	Description	Unit	SEC Specified Values	Vendor Pro-posed Values
	Dimensions: Enclosure with HV Cable Box: Height (mm) Width (mm) Depth (mm) Enclosure without HV Cable Box: Height (mm) Width (mm) Depth (mm) Minimum Height of Neutral Bushing Above ground level (mounted on tope cover)		 * * * * * *	

***** **values to be proposed by vendors**

6.0 TECHNICAL DATA SCHEDULE

(NEUTRAL GROUNDING REISISTOR 11 kV THROUGH 34.5 kV)

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SEC Enquiry No: _____ Item No: _____

A) Additional technical information or features specified by SEC.

B) Additional supplementary data or features proposed by Vendor/Supplier.

C) Other particulars to be filled up by Vendor/Supplier.
(Use separate sheet if needed).

Address	Manufacturer	Vendor/Supplier
Name of the Company		
Location & Office Address		
Authorized Name & Signature		
Date		
Official Seal / Stamp		