الشركة السعودية للكهرباء
Saudi Electricity Company
طاقة مثمرة

SEC DISTRIBUTION MATERIAL SPECIFICATION

34-SDMS-02

REV.01

(JULY 30, 2018)

SPECIFICATION FOR MEDIUM-VOLTAGE AND LOW-VOLTAGE FUSES AND FUSE-LINKS

PREPARED BY:	**Engr. Edilfredo R. Tarenio**	
CERTIFIED BY:	**Engr. Mohammed A. Al-Nadhary**	
APPROVED BY:	**Engr. Saad Al-Ghamdi**	

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نعمل بإتقان من أجلكم

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SPECIFICATION FOR MEDIUM-VOLTAGE AND LOW-VOLTAGE FUSES AND FUSE-LINKS

Saudi Electricity Company

1. SCOPE

This specification defines the minimum technical requirements for design, engineering, manufacturing, testing, inspection and performance of medium-voltage and low-voltage fuses and fuse-links intended to be used in the distribution system of Saudi Electricity Company (SEC), Saudi Arabia.

2. CROSS REFERENCES TO OTHER SEC STANDARDS

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

3. APPLICABLE CODES AND STANDARDS

The latest revision 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.

Table 1: List of applicable standards

Standard #	Title
IEC 60282-1	High-Voltage Fuses – Part 1: Current-Limiting Fuses
IEC 60282-2	High-Voltage Fuses – Part 2: Expulsion Fuses
IEC 60269-1	Low-Voltage Fuses – Part 1: General Requirements
IEC 60269-2	Low-Voltage Fuses – Part 2: Supplementary Requirements for Fuses for Use by Authorized Persons (Fuses Mainly for Industrial Application) – Examples of Standardized Systems of Fuses A to K
IEEE C37.41	Design Tests for High-Voltage (>1000V) Fuses and Accessories
IEEE C37.42	Specifications for High-Voltage (>1000V) Fuses and Accessories

4. MATERIAL, DESIGN AND CONSTRUCTION REQUIREMENTS

4.1. GENERAL

4.1.1 The fuses and fuse-links shall meet or exceed the requirements of this specification in all respects and it shall be manufactured and tested in conformance with relevant international standards.

4.1.2 Manufacturer's drawing shall show the outline of the fuses and fuse-links together with all pertinent dimensions. Any variations in these dimensions due to manufacturing tolerances shall be indicated.

4.2. DESIGN CRITERIA

4.2.1 Unless otherwise specified, the fuses and fuse-links shall be manufactured and tested in conformance with applicable reference standards.

4.2.2 Fuses and fuse-links shall be suitable for operation under the service conditions specified in the latest revision of 01-SDMS-01.

4.2.3 The fuses and fuse-links shall be capable of withstanding the effects of direct solar radiation at their installed locations. The temperature of surfaces exposed to direct solar radiation shall be regarded as 75°C plus the effect of any internal heating.

4.2.4 The voltage ratings and breaking capacities of the fuses and fuse-links are as specified in Table 2:

Table 2: Voltage ratings and breaking capacities of fuses and fuse-links,

Description	Wire Expulsion (Type-K) Fuse-links		HRC MV Fuses	HRC LV Fuses
Voltage Rating	15.2kV	36kV	17.5kV	500V
Breaking Capacity	8kA	8kA	40kA	80kA

4.3. MATERIALS

4.3.1. WIRE EXPULSION FUSE-LINKS

The wire expulsion fuse-links shall be type-K as per IEC 60282-2 with current ratings as shown in Table 3:

Table 3: Current ratings of wire expulsion fuse-links

Voltage Rating	Current Ratings, (A)
15.2kV	3, 6, 8, 10, 12, 15, 20, 25, 30, 40, 50, 65, 80, 100, 140, 200
36kV	3, 6, 8, 10, 12, 15, 20, 25, 30, 40, 50, 65, 80, 100

The fuse-links shall have a speed ratio of 6 through 8.1

The fuse-links shall be suitable for use on distribution fuse-cutouts and having an inner arc-quenching tube with removable button type head as shown in Figure 1. The button head and associated contact washer shall be tin/silver plated.

The flexible tail shall be resistant to corrosion, ends are dipped in tin to avoid loosening of the strands, and having a tensile strength much enough to withstand installation pulling force and any mechanical shocks greater than 4.5kg (10 pound-force). The standard length of flexible tail is 787mm (31 inches).

4.3.2. HIGH RUPTURE CAPACITY MV CURRENT LIMITING FUSES

The high rupture capacity (HRC) medium-voltage current limiting fuses shall be Type I Airtight, equipped with striker or indicating device that is on the center-line of the fuse-link. Performance of the fuse shall conform to IEC 60282-1.

The ceramic tube shall have high mechanical and thermal strength to withstand shock and stresses.

Dimensions of the fuse, applied in 13.8kV SF_6 ring main units, shall conform to Annex D of IEC 60282-1 as shown in Figure 2.

4.3.3. HIGH RUPTURE CAPACITY LV FUSES

The high rupture capacity (HRC) low-voltage fuses with fuse-links having non-slotted silver-plated copper blade contacts, as shown in Figure 3 shall conform to the requirements of IEC 60269-2.

The fuse is intended to be replaceable by using a replacement handle complying with Figure 103 of IEC 60269-2.

The fuse is rated 200 amperes, NH size 2, equipped with an indicating device. The maximum power dissipation of the fuse-link shall not exceed 34 watts. Performance characteristics of the fuse shall be "gG" class conforming to the requirements of IEC 60269-2.

The ceramic body should withstand mechanical shocks and dynamic stress.

4.4. SELECTION OF FUSE-LINKS

Fuse-links must be large enough to withstand the combined transformer inrush and cold-load pickup currents, including the effects of high ambient temperature in accordance with its designed time-current characteristics.

4.4.1 Wire Expulsion (Type-K) Fuse-Links

The standard ratings of type-K fuse-links for use in different capacities of pole-mounted distribution transformers which are fed from overhead lines and controlled by distribution fuse-cutout are listed in Table 4:

Table 4: Ratings of wire expulsion fuse-links

Transformer Rating, (KVA)	13.8kV Fuse-link Rating	33kV Fuse-link Rating
100	12K	6K
200	25K	12K
300	30K	15K

4.4.2 HRC LV Fuses

NH size 2, 200A, class-gG, silver-plated copper blade-type contacts shall be installed on NH-Type fuse-rails mounted on the low-voltage distribution pillars (Mini-Pillar) to protect the low-voltage circuits and prevent damage on distribution transformers' secondary.

5. FABRICATION

All fuses and fuse-links shall be free of material and manufacturing defects that would prevent it from meeting the requirements of this specification.

6. MARKING

Each fuse or fuse-link specified herewith shall be marked of the following minimum information:

a. Manufacturer Name or Trademark
b. Voltage Rating
c. Type of Fuse or Fuse-Link
d. Rated Maximum Breaking Capacity
e. Year of Manufacture
f. Class of Operation for HRC Fuses

7. TESTING AND INSPECTION

The fuses and fuse-links shall be tested in conformance with the applicable clauses of the relevant standards. Supplier/manufacturer shall provide all test results for review and approval of SEC.

SEC reserves all the rights to attend and witness the tests.

7.1. ROUTINE TESTS

Routine tests in conformance with the applicable clauses of IEC 60282-2 for wire expulsion type-K fuse-links, IEC 60282-1 for HRC medium-voltage current limiting fuses, and IEC 60269-2 for HRC low-voltage fuses shall be carried out on sample population of the finished products at the manufacturing plant's test facility.

For every batch of delivery, electronic copies of the routine test reports for each fuse type and rating shall be submitted to SEC for review and approval prior to issuance of the releases.

SEC reserves the right to conduct plant visits and witness the testing of randomly selected samples of any type and rating of fuse or fuse-links specified herewith, as applicable.

7.2. TYPE TESTS

Type test shall be performed in complete conformance with the applicable standards. It shall be performed at SEC approved laboratories. Full report including the certification shall be submitted to SEC.

SEC reserves the right to attend and witness the tests.

SEC reserves the right to request the supplier/manufacturer to repeat the type test every five (5) years, or as needed should the supplied products have frequent technical complaints.

8. PACKING AND SHIPPING

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

Each fuse or fuse-link shall be packed individually in transparent polybag complete with identification marks then placed in a carton box and further packed in crates or boxes.

Packing shall protect the fuses and fuse-links against damage during shipment and site handling.

Supplier should coordinate with SEC Warehousing Department for additional packing, handling, and or shipping instructions, as applicable.

Each box shall be printed with the following information:

a. Purchase Order Number / Tender Number
b. Quantity of Fuse/Fuse-Links per Box/Crate
c. Manufacturer's Name and Country of Origin
d. Year of Manufacture
e. SEC Item Code in Bold Numerals
f. Voltage and Current Rating
g. Handling Instruction
h. Gross Weight in Kilograms
i. Additional information required per SEC shipping instructions, if applicable.

9. GUARANTEE

The supplier/manufacturer shall guarantee the products against all defects arising out of faulty design or manufacturing defects or defective materials for a period of five (5) years from the date of delivery.

10. SUBMITTALS

The following submittals shall be provided as hard copies, and in electronic formats stored in USB Flash Drive. Unless otherwise specified, e-copies of the files should be in PDF format.

10.1. SUBMITTALS REQUIRED WITH TENDER/INQUIRY

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

10.1.2. Clause-by-clause compliance with the latest revision of SEC specification 34-SDMS-02.

10.1.3. Manufacturer's Catalogue including Time-Current Curves and Cut-Off Current Characteristics

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

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

10.1.6. Filled-up technical data schedule on each of the items offered, e-copy in Excel (*.xlsx) format.

10.1.7. Manufacturer CAD drawings, e-copy in AutoCAD 2010 (*.dwg) format, for each of the items offered showing the dimensions and cross-sectional views of each cables and its associated shipping reel/drum.

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

10.2. SUBMITTALS REQUIRED FOLLOWING AWARD OF CONTRACT

10.2.1. Manufacturing and Routine Test Schedules

10.2.2. Quality Assurance Tests

10.2.3. Factory Test Reports

10.2.4. Special tests, if applicable

10.2.5. USB Flash Drive containing e-copies of all the documents mentioned above.

11. TECHNICAL DATA SCHEDULE

Table 5: Technical Data Schedule for Wire Expulsion Fuse-Links (Type-K)

SEC Inquiry No: Item No:

No	Description	SEC Specified Values (*)	Vendor Proposed Values (**)
1	**Material, Design, and Construction**	-	
1.1	Reference Manufacturing Standard	IEC 60282-2	
1.2	System Operating Voltage	13.8kV or 33kV	
1.3	Maximum Design Voltage	15.2kV or 36kV	
1.4	Rated Maximum Breaking Capacity at Rated Voltage (Symmetrical)	8kA	
1.5	Melting Current and Time, (Ampere/second)	*	
1.6	Minimum Tensile Withstand Strength	4.5kg	
1.7	Speed Ratio, 6 – 8.1	*	
1.8	Fusing Element Material	*	
1.9	Diameter of Removable Washer	*	
1.10	Diameter of Removable Head	*	
1.11	Diameter of Flexible Tail	*	
1.12	Length of Fuse-Link	787mm	
1.13	Time-Current Characteristics	*	
1.14	Product is Type Tested	Yes	
1.15	SEC Approved Laboratory	*	
1.16	Date Tested	*	
1.17	Manufacturer	*	
1.18	Country of Origin	*	
1.19	Submittals Required with Tender/Inquiry Included or Not?	*	

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

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

Table 6: Technical Data Schedule for HRC Medium-Voltage Current Limiting Fuse

SEC Inquiry No: Item No:

No	Description	SEC Specified Values (*)	Vendor Proposed Values (**)
1	**Material, Design, and Construction**	-	
1.1	Reference Manufacturing Standard	IEC 60282-1	
1.2	System Operating Voltage	13.8kV	
1.3	Maximum Design Voltage	17.5kV	
1.4	Rated Maximum Breaking Capacity at Rated Voltage (Symmetrical)	40kA	
1.5	Melting Current and Time, (Ampere/second)	*	
1.6	Rated Continuous Current	*	
1.7	Losses, (Watts)	*	
1.8	Maximum Duration of Strikers Travel	100 seconds	
1.9	Maximum Arcing Withstand Time	At least 0.1 second	
1.10	Material of Fuse-Element	*	
1.11	Dimensions, (mm)	*	
1.12	Weight, (kg)	*	
1.13	Insulating Body	Ceramic	
1.14	Time-Current Characteristics	*	
1.15	Product is Type Tested	Yes	
1.16	SEC Approved Laboratory	*	
1.17	Date Tested	*	
1.18	Manufacturer	*	
1.19	Country of Origin	*	
1.20	Submittals Required with Tender/Inquiry Included or Not?	*	

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

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

Table 7: Technical Data Schedule for HRC Low-Voltage Fuse (NH Type, Size 2)

SEC Inquiry No: Item No:

No	Description	SEC Specified Values (*)	Vendor Proposed Values (**)
1	**Material, Design, and Construction**	-	
1.1	Reference Manufacturing Standard	IEC 60269-2	
1.2	System Operating Voltage	220V / 127V 400V / 230V	
1.3	Maximum Design Voltage	500V	
1.4	Rated Max. Breaking Capacity (Symmetrical)	80kA	
1.5	Melting Current and Time, (Ampere/second)	*	
1.6	Continuous Current Capacity	200A	
1.7	Losses, (Watts)	34	
1.8	Minimum Breaking Current, (A)	*	
1.9	Type / Size / Class	NH2 - gG	
1.10	Material of Fuse-Element	**	
1.11	Copper Contacts Silver-Plated	Yes	
1.12	Indicating Device	Yes	
1.13	Insulating Body	Ceramic	
1.14	Pre-Arcing I^2t	**	
1.15	Operating I^2t	**	
1.16	Time-Current Characteristics	**	
1.17	Product is Type Tested	Yes	
1.18	SEC Approved Laboratory	*	
1.19	Date Tested	*	
1.20	Manufacturer	*	
1.21	Country of Origin	*	
1.22	Submittals Required with Tender/Inquiry Included or Not?	*	

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

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

Fuse and Fuse-Link

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		

12. DRAWINGS

Figure 1: Wire Expulsion Fuse-Links

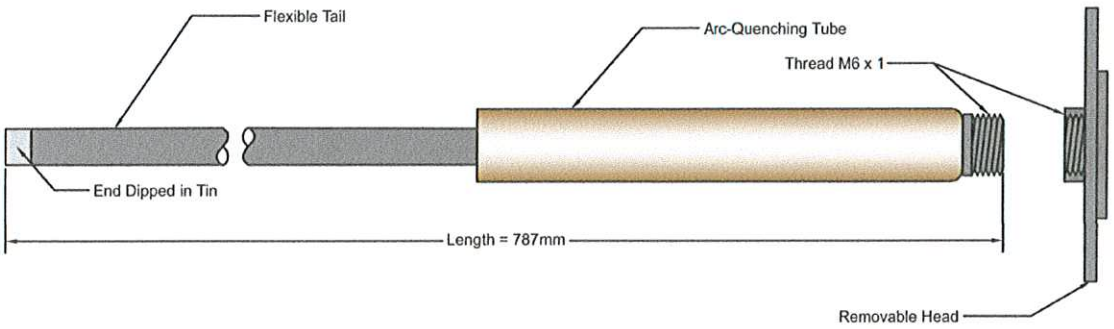
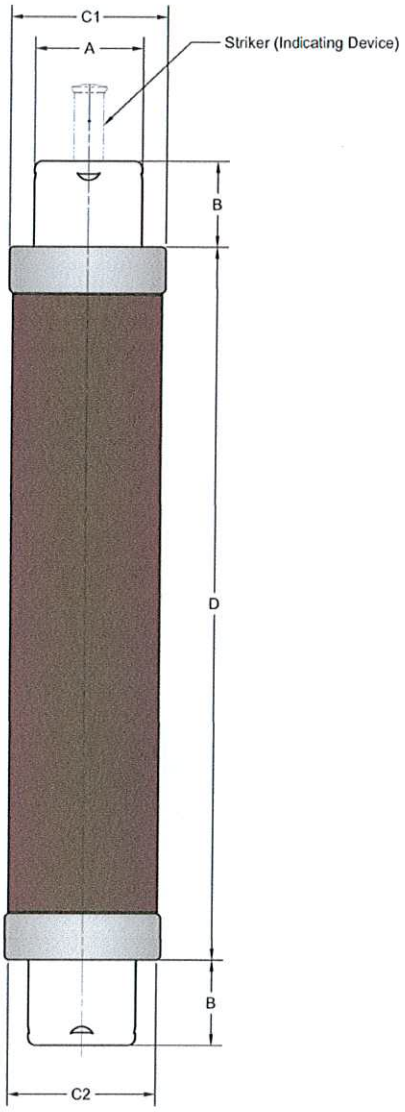
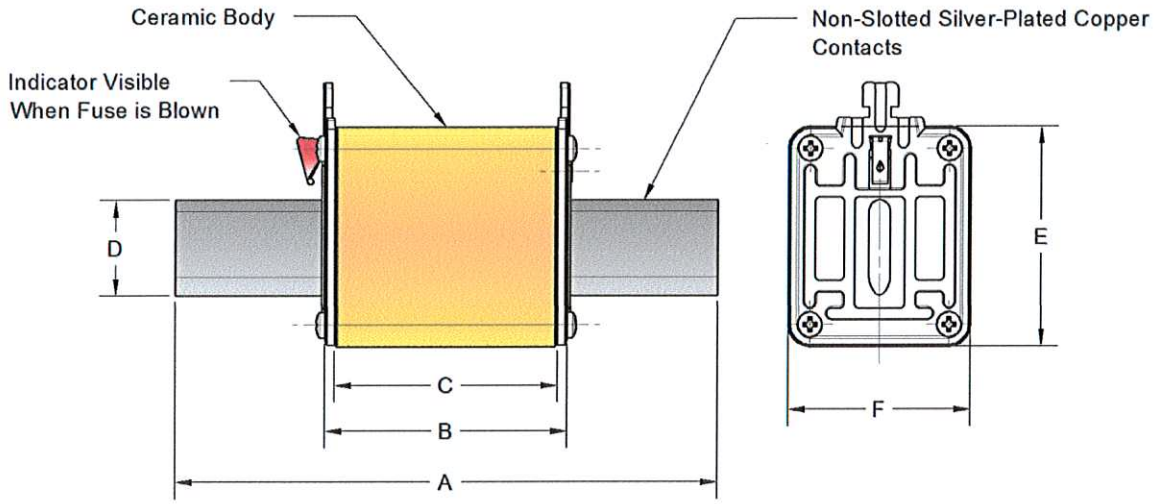


Figure 2: HRC Medium-Voltage Current Limiting Fuse



Fuse Type	ØA (mm)	B (mm)	ØC1 (Max.) (mm)	ØC2 (Max.) (mm)	D (mm)
Type I - Airtight	45	33	88	88	442

Figure 3: HRC Low-Voltage Fuse (NH Type, Size 2)



Type / Size / Class	Rating (Ampere)	A (mm)	B (mm)	C (Max.) (mm)	D (Max.) (mm)	E (Max.) (mm)	F (Max.) (mm)
NH2 - gG	200A	150	74	68	20	61	60