

**Saudi Electricity Company**



**الشركة السعودية للكهرباء**

**SEC DISTRIBUTION MATERIALS SPECIFICATION**

**34-SDMS-02**

**DATE: 19-10-2003G**

**34-SDMS-02**

**SPECIFICATIONS**

**FOR**

**M V & L V FUSE LINKS**

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**TABLE OF CONTENTS**

1.0	SCOPE	3
2.0	CROSS REFERENCES	3
3.0	APPLICABLE CODES AND STANDARDS	3
4.0	SERVICE CONDITIONS	4
5.0	SYSTEM PARAMETE	4
6.0	DESIGN REQUIREMENTS	4
7.0	CONSTRUCTION REQUIREMENTS	5
8.0	SELECTION OF FUSE LINKS	6
9.0	TESTING	7
10.0	INSPECTION	8
11.0	MARKING	9
12.0	PACKING AND SHIPMENT	9
13.0	GUARANTEE	10
14.0	SUBMITTAL	10
15.0	TECHNICAL DATA SCHEDULE	11-15
16.0	DRAWINGS	15-17



## 1. SCOPE

This SEC distribution material specification (SDMS) describes the minimum technical requirements for design, manufacturing, testing, inspection, and performance of MV and LV fuse links to be used in distribution system of the Saudi Electricity Company (SEC).

## 2 CROSS REFERENCES

- 2.1 This specification shall be read in conjunction with the 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 SDMS.
- 2.2 This specification shall also be read in conjunction with SEC purchase orders/contracts scope of work and 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 / material covered in this specification. In case of any deviation from the below listed standards, the vendor / manufacturer may propose equipment / material conforming to an alternate codes or standards and it should be indicated in the list of deviations submitted by the supplier.

However, the provision of SEC standards shall supercede the provisions of these alternate standards in case of any difference.

### 3.1 **MV FUSE LINKS**

#### 3.1.1 **WIRE EXPULSION FUSE LINKS**

IEC 60282-2 Alternating current high voltage fuses: expulsion fuses.

ANSI C37 . 41 Design tests for high voltage fuses, Distribution enclosed Single Pole air switches, fuse disconnecting switches & accessories.

ANSI C37 . 42 Distribution Cutouts and Fuse Links.

ANSI C37 . 43 Specifications for distribution fuse links for use in distribution enclosed, open, and open - link cutouts.



NEMA SG 2 High voltage fuses.

### 3.1.2 MV CURRENT LIMITING FUSES (HRC Power Fuses)

IEC 60282-1	A.C. high voltage fuses: General test method.
DIN 43625 Part 1 & 2	HV Current Limiting Fuses Dimensions.
VDE 0670	HV Current Limiting Fuses.

### 3.2 LOW VOLTAGE HRC FUSES

IEC 60269-2	LV fuses part-2.
VDE 0636-2	LV fuses performance characteristics.
DIN 43620	LV fuses dimensions.
DIN 40003	Standard ratings for NH Fuses.

## 4. SERVICE CONDITIONS:

- 4.1 The fuse links shall be suitable for operation under the service conditions as per SEC latest revision of general specification No.01-SDMS-01.
- 4.2 The fuse links shall withstand the effects of direct solar radiation at their installed locations. The temperature of surfaces exposed to direct solar radiation shall be as 75°C excluding internal heating.

## 5. SYSTEM PARAMETERS:

The MV and LV fuses shall be suitable to operate under typical system parameters, specified in latest revision of SEC specification No. 01- SDMS-01.

## 6. DESIGN REQUIREMENTS:

Design requirements for voltage rating, and min.current breaking capacity of fuse links are given below in table - 6.1. Current ratings are given in fuse links selection tables clause-8.



Description	Expulsion type K fuses		MV Current limiting fuses (HRC)	LV fuses (HRC)
	15.2 KV	36 KV		
Voltage rating	15.2 KV	36 KV	17.5 KV	500 V
Rated breaking Capacity symm.	8 KA	8 KA	40 KA	80 KA

**Table-6.1**  
Voltage rating and breaking capacity of Fuse links

## 7 CONSTRUCTION REQUIREMENTS

### 7.1 WIRE EXPULSION TYPE K FUSE LINKS

The wire expulsion fuse links shall be removable button head type K as per IEC 60282-2 and NEMA SG2 of current ratings as given below in table 7.1 and shown in figure No.1. The fuses should be of speed ratio 6 through 8.1. The strain wire tensile strength should be much enough to withstand pull forces and any mechanical shock in excess of 4.5Kg (10 lb)min. Button head and contact washer should be Tin/Silver plated. The cable shall be corrosion resistant. Standard length of fuse links shall be 787mm (31inches).

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

**Table 7.1**  
Current ratings of type K fuse links

### 7.2 HIGH RUPTURE CAPACITY MV CURRENT LIMITING FUSES

High Rupture Capacity MV current limiting fuse shall be ferrule connection type, length 442mm, striker pin action with indicating device, in performance to conform to IEC 60282-1. The ceramic tube should be of high mechanical and thermal strength to withstand any shock and stresses. The dimensions of the fuse links, to be used in 13.8KV SF-6 ring main units, to DIN-43625 are shown in figure No. SEC/FL-2.



### 7.3 HIGH RUPTURE CAPACITY LV FUSES

High Rupture Capacity LV fuse shall be 200A knife type, NH size 2, non slotted, silver plated and copper blade contacts as shown in figure No.3. The operation indicator shall be actuated once the fuse element is blown. The fuse power losses should not be more than 34 watts. The ceramic body of the fuse should withstand mechanical shocks and dynamic stresses. The performance characteristics should be in accordance with VDE 0636-2 class of operation gL and IEC 60269-2 class of operation gI, and dimensions as per DIN 43620.

## 8. SELECTION OF FUSE LINKS

The fuse link must be large enough to withstand the combined transformer inrush and cold load pick up currents, including the effects of high ambient temperature, in accordance with its time current characteristics.

### 8.1 Wire Expulsion Type K Fuse links

The standard ratings of type K fuse links for different capacities of the pole mounted transformers which are fed from over head lines and controlled by drop out cutouts are enlisted below in table - 8.1.

Transformer capacity KVA	Fuse link rating (13.8KV)	Fuse link rating (33kv)
50	8 K	3 K
100	15 K	6 K
200	20 / 25* K	10 K
300	30 / 40* K	15 K

\*Primary HV fusing for 11KV transformers.

Table-8.1  
**Primary MV fuse link ratings for  
 Transformers controlled by dropout cutouts**



## 8.2 MV HRC Current Limiting Fuse Links

The standard ratings of MV HRC current limiting fuse links are enlisted below in table No. 8.2 as specified in SEC specification No.32-SDMS-01 of 13.8KV SF6 RMUs indoor or outdoor, for the control and protection of distribution unit / package substations and pad mounted transformers

Transformer capacity KVA	13.8KV HRC Fuse link ratings
300	31.5 A
500	50 A
1000	80/100 A
1500	125 A

Table-8.2

### 13.8 KV HRC Fuse links for unit / Package substations and pad mounted transformers controlled by SF6 RMUs

## 8.3 LV HRC Fuse links

LV fuse links knife type NH size 2 of current rating 200 amps shall be installed in distribution pillars and fuse boxes to protect low voltage circuits and prevent damage to transformer's secondary.

## 9 TESTS

### 9.1 Type (Design) Tests

Type test certificate copies of all types of fuse links be submitted in accordance with the latest standards by a benefited independent testing laboratory. The test certificate copies shall be provided with the quotation for review and acceptance by SEC. The type tests shall include but not limited to the following tests.



### 9.1.1 TYPE TESTS FOR EXPULSION TYPE K FUSES

- (a) Dielectric tests;
- (b) Temperature rise tests;
- (c) Tests for time / current characteristics;
- (d) Breaking capacity tests;

### 9.1.2. TYPE TESTS OF MV HRC CURRENT LIMITING FUSES

- (a) Dielectric test
- (b) Temperature-rise tests and power dissipation measurement
- (c) Breaking capacity tests
- (d) Tests for time current characteristics
- (f) Tests of strikers;

### 9.1.3 TYPE TESTS OF HRC LV FUSES

- (a) Temperature rise limits and power loss
- (b) Power dissipation
- (c) Tests for time / current characteristics
- (d) Breaking capacity test
- (e) Tests of indicating devices

### 9.2 SPECIAL TESTS FOR HRC FUSES

- (a) thermal shock tests ( for fuses intended to be used outdoors)
- (b) power dissipation tests (for fuses not intended for use in enclosures)
- (c) water proof test(ingress of moisture) for fuses intended to be used outdoors
- (d) pre-arcing temperature rise and arcing duration withstand tests for back up fuses for use in switch fuse combination

### 9.3 ROUTINE (PRODUCTION) TESTS:

All routine (production) tests prescribed in the relevant standards shall be performed on all fuse links. Tests for the verification of temperature rise, power dissipation and Time Current Characteristics shall be carried out by SEC as acceptance tests as per standards.

**10 INSPECTION:**

SEC may wish to witness tests or visit the factory during manufacturing of any or all items covered by this specification. Accordingly the supplier shall give SEC adequate notice of manufacturing and testing schedules. However for detailed inspection conditions refer to the latest revision of SEC general specification No 01-SDMS-01 clause 6.

**11 MARKING:**

Each fuse link shall be clearly marked with the following information as minimum, in English and /or Arabic.

- (a) Rated voltage
- (b) Rated continuous current
- (c) Type of fuse link
- (d) Manufacturer's name or trade mark.
- (e) Rated Max. breaking capacity
- (f) Class of operation (HRC Fuses)

**12 PACKING AND SHIPMENT:**

12.1 Each fuse shall be individually packed in transparent plastic bag complete with identification markings. Individually packed fuses shall be packed in crates or boxes in such a manner to prevent damage during transportation and handling up to the installation site. Packing shall be designed to prevent entry of dust, ingress of moisture and other foreign materials. Each container shall have the following information stenciled on it in English and /or Arabic.

- Manufacturer's name.
- Year of manufacture
- Country of origin.
- SEC item number.
- SEC purchase order/tender number
- Weight in kilogram.
- Handling instruction.
- Voltage and current rating.
- No. of fuse links in each box/crate.



12.2 Other packing and shipping requirements shall be as given in SEC General Spec.No. 01-SDMS-01 (latest revision). The supplier shall contact material department for additional packing, handling and shipment instructions as applicable.

12.3 Packing note in Arabic and/or English shall be included in each case giving description of goods packed.

### **13 GUARANTEE:**

13.1 The manufacturer / vendor shall guarantee against all the defects arising out of faulty design, workmanship or defective material for a period of two (2) years from the date of delivery, unless and otherwise specified in tender documents.

13.2 If no exceptions are taken to this specification and no list of deviations is submitted, it shall be deemed that in every respect the offered fuse conforms to this specification. SEC interpretation of this specification shall be accepted.

### **14 SUBMITTALS**

#### **14.1 Submittals required with Tender:**

- (a) Filled in data schedule complete. In addition to the data schedule, clause by clause compliance to this specification or list of deviations.
- (b) The original catalogue marked clearly the items offered.
- (d) Copies of type and routine test certificates.
- (e) Time current characteristics curves.
- (f) Cut off current characteristics.

#### **14.2 Submittals required following award of contract:**

- (a) Details of manufacturing and test schedules.
- (b) Factory test reports



SEC DISTRIBUTION MATERIALS SPECIFICATION

34-SDMS-02

DATE: 19-10-2003G

**15.0****TECHNICAL DATA SCHEDULE**

13.8kV or 33 kV WIRE EXPULSOIN TYPE K FUSE LINKS

(Sheet 1 of 4)

SEC Inquiry No. \_\_\_\_\_

Item No. \_\_\_\_\_

S.No.	DESCRIPTION.	UNIT.	SEC SPECIFIED VALUES.	VENDOR PROPOSED VALUES.
1	System operation voltage.	kV	13.8 or 33	
2	Max design voltage.	kV	15.2 or 36	
3	Rated continuous current.	A		
4	Rated Max. breaking capacity at rated voltage (symmetrical).	kA	8	
5	Melting current & time	A/sec		
6	Tensile withstand strength min.	kg	4.5	
7	Speed ratio	6 - 8.1		
8	Fusing element material			
9	Diameter of removable washer	mm		
10	Diameter of button head cap	mm		
11	Diameter of flexible conductor	mm		
12	Overall length of fuse link	mm	787	
13	Time / current characteristics			
14	Name of manufacturer & country of origin			
15	Type tests copies furnished			

Note: Separate technical data sheet should be used for each type of fuse link.



## SEC DISTRIBUTION MATERIALS SPECIFICATION

34-SDMS-02

DATE: 19-10-2003G

15.1

TECHNICAL DATA SCHEDULE  
13.8 KV HRC CURRENT LIMITING FUSE LINKS  
(Sheet 2 of 4)

SEC Inquiry No. \_\_\_\_\_

Item No. \_\_\_\_\_

S.No.	DESCRIPTION.	UNIT.	SEC SPECIFIED VALUES.	VENDOR PROPOSED VALUES.
1	System operation voltage.	kV	13.8	
2	Max design voltage.	kV	17.5	
3	Rate Continuous current	A		
4	Rated Max. breaking capacity (symmetrical).	kA	40	
5	Melting current & time	kg		
6	Losses	watts		
7	Max. duration of strikers travel	sec	100	
8	Max. arcing withstand time	sec	At least 0.1 sec	
9	Material of fusible element			
10	Dimensions	mm		
11	Weight	kg		
12	Insulating body		ceramic	
13	Time/current characteristics			
14	Name of manufacturer & country of origin			
15	Type tests copies furnished			

Note: Separate technical data sheet should be used for each type of fuse link.



## SEC DISTRIBUTION MATERIALS SPECIFICATION

34-SDMS-02

DATE: 19-10-2003G

15.2

## TECHNICAL DATA SCHEDULE

## LV FUSE LINKS

(Sheet 3 Of 4)

SEC Inquiry No. \_\_\_\_\_

Item No. \_\_\_\_\_

S.No.	DESCRIPTION.	UNIT.	SEC SPECIFIED VALUES.	VENDOR PROPOSED VALUES.
1	System operating voltage.	V	220/127 380/220	
2	Max design voltage.	V	500	
3	Continuous current capacity.	A	200	
4	Rated Max. breaking capacity (symmetrical).	kA	80	
5	Melting current & time	A/sec		
6	Min. breaking current	A		
7	Type / Size/ Class		NH2 - gl /gL	
8	Fuseble element material.			
9	Losses	Watts	34	
10	Pre-arcing I <sup>2</sup> t			
11	Operating I <sup>2</sup> t			
12	Insulating body		ceramic	
13	Time current characteristics			
14	Copper contacts tin/silver plated			
15	Outline Dimensions	mm		
16	Weight	kg		
17	Packing			
18	Manufacturer / country of origin			
19	Type tests certificates furnished			



SEC DISTRIBUTION MATERIALS SPECIFICATION

34-SDMS-02

DATE: 19-10-2003G

15.3

## TECHNICAL DATA SCHEDULE

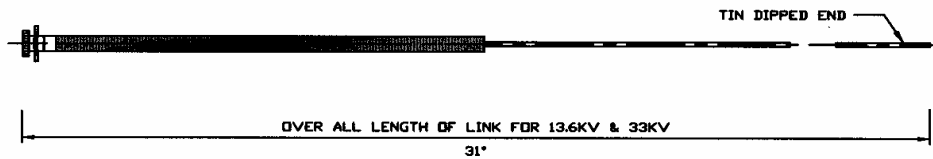
FUSE LINKS

(Sheet 4 of 4)

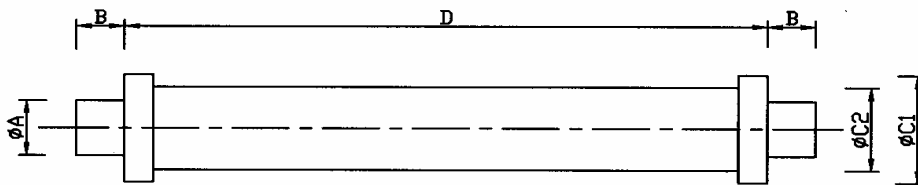
SEC Inquiry No. \_\_\_\_\_ Item No. \_\_\_\_\_

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

DESCRIPTION	MANUFACTURER OF MATERIALS/ QUIPMENT	VENDOR/SUPPLIER
Name of company		
Location and office Address		
Name, signature and Stamp of Authorized Representative & date		



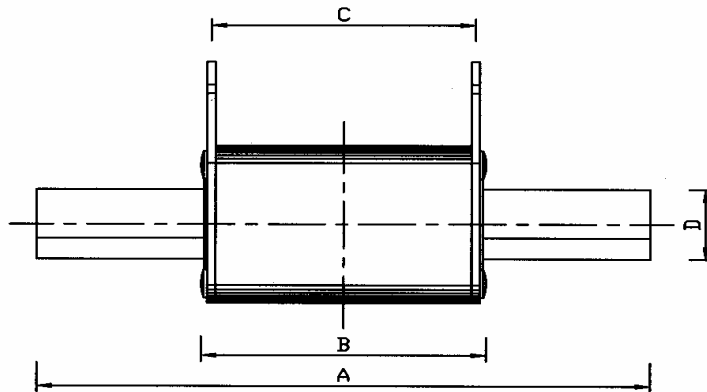
DWG NO: SEC/FL-1 EXPULSION FUSE LINK WITH  
REMOVABLE BUTTON HEAD



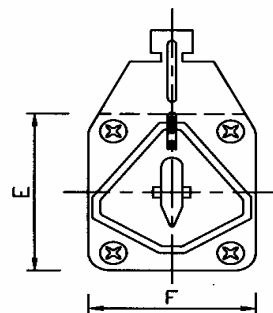
TYPE 1

	$\phi A$	B	$\phi C1$ MAX	$\phi C2$ MAX	D
TYPE-1 AIRTIGHT	45	33	88	88	442

DWG NO: SEC/FL-2 CURENT LIMITING FUSE LINK



FRONT VIEW



SIDE VIEW

TYPE/SIZE	RATING (AMP.)	A	B	C MAX	D MAX	E MAX	F MAX
NH2	200A	150	74	68	20	61	60

DWG NO: SEC/FL-3 NON-SLOTTED TAG-FUSE LINK