

**Saudi Electricity Company**



**الشركة السعودية للكهرباء**

**SEC DISTRIBUTION MATERIALS SPECIFICATION**

**12-SDMS-02, Rev. 02**

**DATE: 10-03-2007G**

**12-SDMS-02**

**REV. 02**

**SPECIFICATIONS**

**FOR**

**LUGS AND CONNECTORS FOR MV/LV  
DISTRIBUTION SYSTEM**

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subject to change or modification without any notice**

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**1.0 SCOPE:**

This SEC Distribution Materials Specification (SDMS) specifies the minimum technical requirements for design, engineering, manufacture, testing, inspection and performance of cable/conductors lugs and connectors for connection and jointing of cables/conductors up to 36 kV in the distribution system of Saudi Electricity Company (SEC) in Saudi Arabia

**2.0 CROSS REFERENCES:**

This specification shall always be read in conjunction with the SEC General Specification No. 01-SDMS-01 (latest revision) titled "General Requirements for all Equipments/ 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, the scope of work and technical specifications for project, as applicable.

The latest revision of the following specifications shall be applicable for reference to the cables/conductors.

- 2.1 11-SDMS-01 Specifications for 1000V Rating, XLPE Insulated, Unarmored Power Cables.
- 2.2 11-SDMS-03 Specifications for XLPE Insulated Power Cables for Rated Voltages 15 KV up To 36 KV (Um).
- 2.3 10-SDMS-01 Specifications for 13.8 & 33 KV Overhead Line Conductors (ACSR / AW Type)
- 2.4 10-SDMS-02 Specification for bare copper conductors.
- 2.5 11-SDMS-02 Specifications for LV Overhead Line Conductor Type Quadruplex.

**3.0 APPLICABLE CODES & STANDARDS:**

The latest revision of the following codes and standards shall be applicable for the equipment/material covered in this SDMS. In case of any conflict, the manufacturer/ vendor may propose equipment/material conforming to one group of codes and standards quoted hereunder without jeopardizing the requirements of this SDMS.

- 3.1 IEC-60228 Conductors of insulated cables.



3.2 DIN-46235	Cable lugs for Compression Connections for Copper Conductors.
3.3 DIN-46267-T1	Non Tension Proof Compression joints for copper Conductors.
3.4 DIN-46267-T2	Non Tension Proof Compression joints for Aluminum Conductors.
3.5 DIN-46329	Cable lugs for Compression Connections for Aluminum Conductors.
3.6 ANSI-C-119.4	Copper and aluminum conductor connectors.
3.7 IEC-61238-1	Compression & Mechanical Connectors for Power Cables up to 36KV – Test Methods & Requirements.

#### **4.0 MATERIAL, DESIGN & CONSTRUCTION REQUIREMENTS:**

##### **4.1 General:**

- 4.1.1 All cable/conductor lugs and connectors shall be of class A, which intended for electricity distribution or industrial networks in which they can be subjected to short-circuit of relatively high intensity and duration.
- 4.1.2 Cable/conductor lugs and connectors shall meet or exceed the performance of conductor in all respect.
- 4.1.3 All cable/conductor lugs shall be compression type, and without inspection hole based on lug drawing. Connectors shall be with middle stopper camber.
- 4.1.4 Cable/conductor lugs and connectors shall be suitable for cable sizes listed in Table-1 and Table-2.
- 4.1.5 Manufacturer's drawings shall show the outline of the lugs and connectors together with all pertinent dimensions. Any variation in these dimensions due to manufacturing tolerances shall be indicated.

##### **4.2 Material:**

- 4.2.1 Cable/conductor lugs and connectors shall be made from copper or aluminum or from both metals as specified in the technical data schedule.



4.2.2 All copper lugs and connectors shall be made of E-copper as per DIN-40500 with tin plated surface of thickness not less than 5 microns.

4.2.3 All aluminum lugs and connectors shall be made of aluminum 99.5%, it shall be tin plated of thickness not less than 7 microns, filled with proper conductive oxide inhibiting compound and capped.

4.2.4 Bimetallic lugs shall consist of aluminum barrel and copper palm jointed together through friction welding. The barrel shall be filled with contact grease and sealed with a plastic cover.

#### 4.3 Construction:

4.3.1 The construction details and dimensions are given in the attached drawings which form part of this specification.

4.3.2 A summary of cables and conductors for which the lugs and connectors shall be used is given in Table-1 and Table-2.

**Table-1**

#### **LV Cable, OH & Earthing Conductor Sizes**

<b>Cable/Conductor Size (mm<sup>2</sup>)</b>	<b>Material</b>	<b>Design/Shape</b>
35, 70, 120, 185, 630	Copper	1-core/round
50, 120 , 67.44, 170.5	Aluminum	1-core/round
70, 185, 300	Aluminum	4-core/sector

**Table-2****MV Cable Sizes**

<b>Cable Size (mm<sup>2</sup>)</b>	<b>Material</b>	<b>Design/Shape</b>
1x500/35	Copper	1-core, unarmored/round
3x240/35	Copper	3-core, armored/round
3x185/35	Copper	3-core, armored/round
3x185/35	Copper	3-core, unarmored/round
3x300/35	Copper	3-core, armored/round
3x300/35	Aluminum	3-core, armored/round
3x70/16	Aluminum	3-core, armored/round
1x50/16	Copper	1-core, unarmored/round

**5.0 TESTING AND INSPECTION:**

All lugs and connectors shall be tested in accordance with the latest standard IEC61238-1.

**5.1 Routine Tests:**

These tests shall be carried out in accordance with the requirements of standard to which the lugs and connectors are offered and shall be carried out at the factory.

**5.2 Type Tests:****5.2.1 Electrical and Mechanical Tests:**

The vendor shall provide certified copies of independent laboratory electrical and mechanical type test reports with the bid for the materials offered as per relevant specification.

5.2.2 When the design of a lugs or connector meets the requirement of this standard, then it is expected that during its service:

- a) The resistance of connection will remain stable.



- b) The temperature of the connector will be of the same order or less than that of the conductor.
- c) The mechanical strength will be fit for the purpose.
- d) Application of short-circuit currents must not affect (a) and (b).

5.2.3 Although the electrical and mechanical tests specified in this standard are to prove the suitability of connectors for most operating conditions, they do not necessarily apply to situations where a connector may be raised to a high temperature by virtue of connection to highly rated plant, or where the connector is subjected to excessive mechanical vibration or shock or to corrosive conditions. In these instances, the tests in this standard may need to be supplemented by special tests agreed between supplier and purchaser.

## **6.0 PACKING AND SHIPPING:**

6.1 Packing and shipping shall generally be as per SEC General Requirements 01-SDMS-01, latest revision.

### **6.2 Marking:**

6.2.1 All components of lugs and connectors shall be clearly marked with the manufacturer's name, die number, cable/conductors size, number of crimps and position.

6.2.2 Each hard box shall be printed with the following information:

- a) Purchase order number/tender
- b) Lugs/Connectors catalogue number
- c) Manufacturer's name
- d) Year of manufacture
- e) SEC item number

6.2.3 Each wooden box shall be fixed with an aluminum plate bearing the following information:

- a) Purchase order number/tender
- b) Manufacturer's name
- c) Year of manufacture
- d) Lugs/Connectors catalogue number
- e) Gross weight in kilograms (pounds)



f) Position of slinging points and other relevant handling instructions.

#### **7.0 GUARANTEE:**

The supplier shall guarantee the product against all defects arising out of faulty design or workmanship or defective material for a period of two (2) years from the date of delivery.

#### **8.0 SUBMITTALS:**

##### **8.1 Submittals Required with Tender/Inquiry:**

Two (2) copies or one set of reproducible of the following shall be supplied along with the tender. Additionally CD for complete technical specifications pertaining exactly to the items shall be submitted before purchase order is issued.

##### **8.2 Certified Independent Test Reports:**

- a) To show that the material offered meet the electrical type tests as per applicable standard.
- b) To show that the material offered meet the mechanical and physical type tests as per the applicable standards.

8.3 Full details of the proposed quality assurance procedures, sampling, routine tests and special tests.

##### **8.4 Drawings, Catalogues & Technical Data Schedules:**

8.4.1 Actual drawings for lugs and connectors shall be submitted.

8.4.2 Catalogue for all the components used. Catalogue numbers for the offered items shall be high-lighted.

8.4.3 Duly completed attached technical data schedule for each offered item.

##### **8.5 Submittals Required following Award of Contract:**

###### **8.5.1 Factory Test Reports:**

- a) Quality Assurance Tests
- b) Routine and Special Tests
- c) Manufacturing/Test Schedules



9.0

**TECHNICAL DATA SCHEDULE:**

**Cable/conductor lugs and Connectors**  
(Sheet 1 of 2)

SEC Inquiry No: \_\_\_\_\_ Item No: \_\_\_\_\_

SEC REF.	DESCRIPTION	SEC SPECIFIED VALUES (*)	VENDOR OFFERED VALUES/REFERENCE
4	<b>MATERIAL DESIGN AND CONSTRUCTION REQUIREMENTS</b>		
1	<b>Lugs</b>		
1.2	<b>Material</b>	Al/Cu/Bimetallic	
1.3	<b>Conductor Size</b>		
1.4	<b>Bolt Size</b>		
2	<b>Connectors</b>		
2.1	<b>Material</b>	Al/Cu/Bimetallic	
2.2	<b>Cu/Cu Conductor Sizes</b>		
	<b>Tin plating thickness (Cu)</b>	5 microns Min	
2.3	<b>Al/Al Conductor Sizes</b>		
	<b>Tin plating thickness (Al)</b>	7 microns Min	
2.4	<b>Al/Cu Conductor Sizes</b>		
6.2.3	<b>b Name of Manufacturer</b>		
	<b>d Manufacturer Catalogue Number</b>		
	<b>Country of Origin</b>		
8	<b>Submittals Required as part of Tender/Inquiry included or not?</b>		



9.0

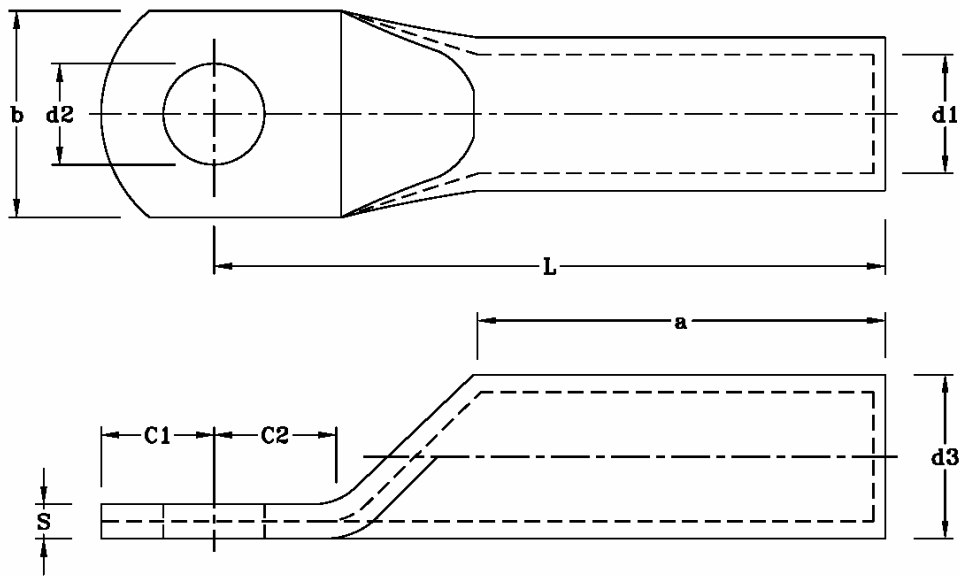
**TECHNICAL DATA SCHEDULE:****Cable/conductor lugs and Connectors**

(Sheet 2 of 2)

SEC Inquiry No: \_\_\_\_\_ Item No: \_\_\_\_\_

- A) Additional technical informations or features specified by SEC.
- B) Additional supplementary data or features proposed by bidder/ vendor/ supplier.
- C) Other particulars to be filled-up by the bidder/vendor/supplier.
- D) List of deviations and clauses to which exception is taken by the bidder/ vendor/ supplier.  
(Use separate sheet, if necessary).

Description	Manufacturer of Material	Vendor/ Supplier
Name of Company		
Location and Office Address		
Name & Signature of Authorized Representative with date		
Official Seal / Stamp		

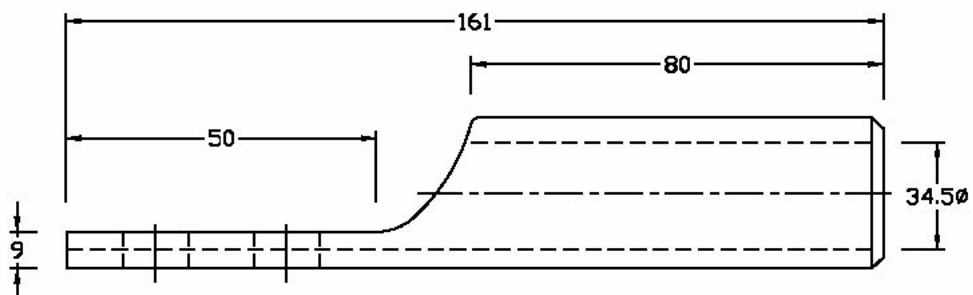
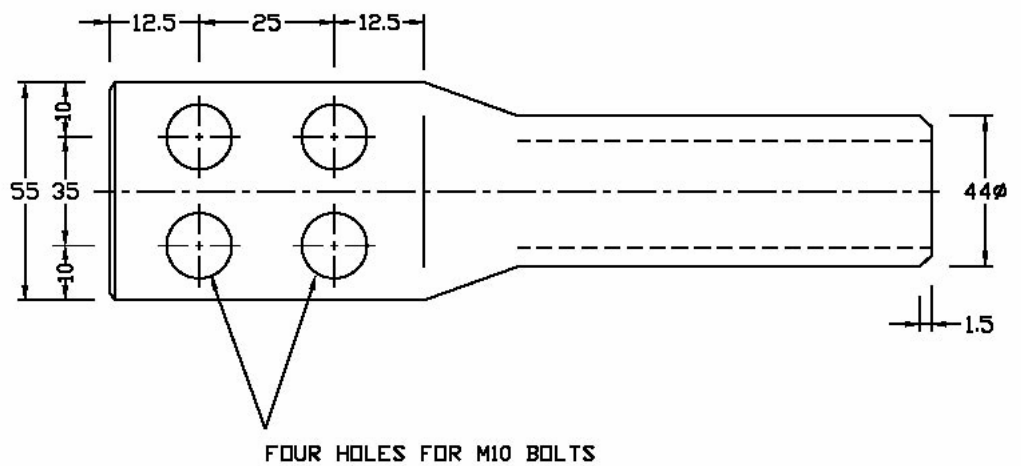


CONDUCTOR SIZE - mm <sup>2</sup>	BOLT SIZE	NOMINAL DIMENSIONS mm								
		a	b	C1	C2	d1	d2	d3	L	S
16mm <sup>2</sup>	M10	20	17	15	12	5.5	10.5	8.5	36	2.5
35mm <sup>2</sup>	M10	20	19	15	12	8.2	10.5	12.5	42	2.5
35mm <sup>2</sup>	M12	20	21	16	13	8.2	13	12.5	42	2.5
50mm <sup>2</sup>	M12	28	24	16	13	10	13	14.5	52	4.0
70mm <sup>2</sup>	M12	28	24	16	13	11.5	13	16.5	55	4.5
120mm <sup>2</sup>	M12	35	32	16	13	15.5	13	21	70	5.5
185mm <sup>2</sup>	M16	40	37	19	16	19	17	25.5	82	6.0
240mm <sup>2</sup>	M16	40	42	19	16	21.5	17	29	92	6.5
300mm <sup>2</sup>	M16	50	48	19	16	24.5	17	32	100	7.0
500mm <sup>2</sup>	M20	70	60	25	20	31	21	42	125	10

DIN-46-235

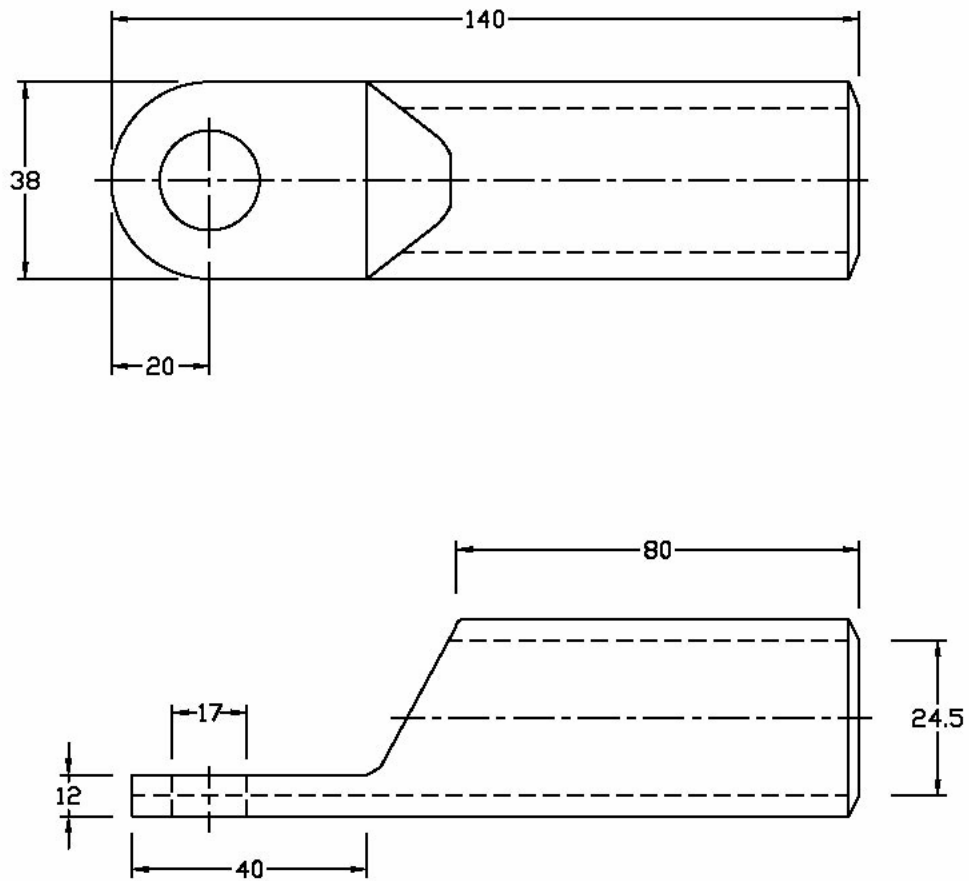
FIG 1: TERMINAL LUG – COMPRESSION TYPE FOR COPPER CONDUCTORS

All dimensions are in mm



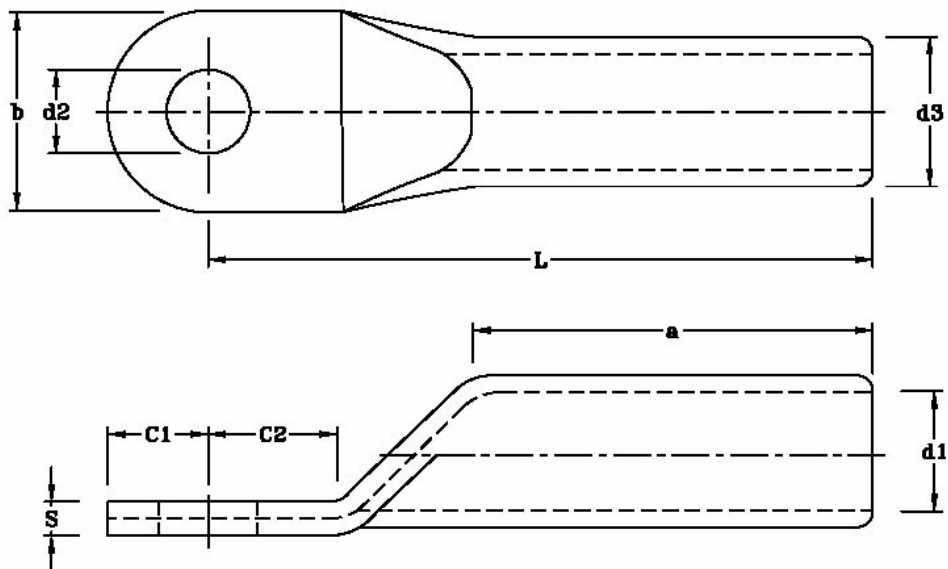
**FIG 2: TERMINAL LUG – COMPRESSION TYPE FOUR HOLES FOR 630 mm<sup>2</sup> COPPER CONDUCTOR**

All dimensions are in mm



**FIG 3: TERMINAL LUG – COMPRESSION TYPE  
FOR 300 mm<sup>2</sup> ALUMINUM CONDUCTOR**

All dimensions are in mm



CONDUCTOR SIZE-mm <sup>2</sup>	BOLT SIZE	NOMINAL DIMENSIONS mm								
		a	b	C1	C2	d1	d2	d3	L	S
300mm <sup>2</sup>	M12	70	38	19	24	23.3	13	34	103	13
185mm <sup>2</sup>	M12	60	30	15	20	18.3	13	28.5	91	8
120mm <sup>2</sup>	M12	56	30	15	20	14.7	13	23	80	7.5
70mm <sup>2</sup>	M12	52	25	12.5	15.5	11.2	13	18.5	72	5.5
MERLIN/AW170.5mm <sup>2</sup>	M12	--	41	--	--	20	13	--	108	--
QUAIL/AW87.44mm <sup>2</sup>	M12	--	34	--	--	13.5	13	--	80	--

DIN-46-329

FIG 4: TERMINAL LUG – COMPRESSION TYPE FOR ALUMINUM CONDUCTORS

All dimensions are in mm

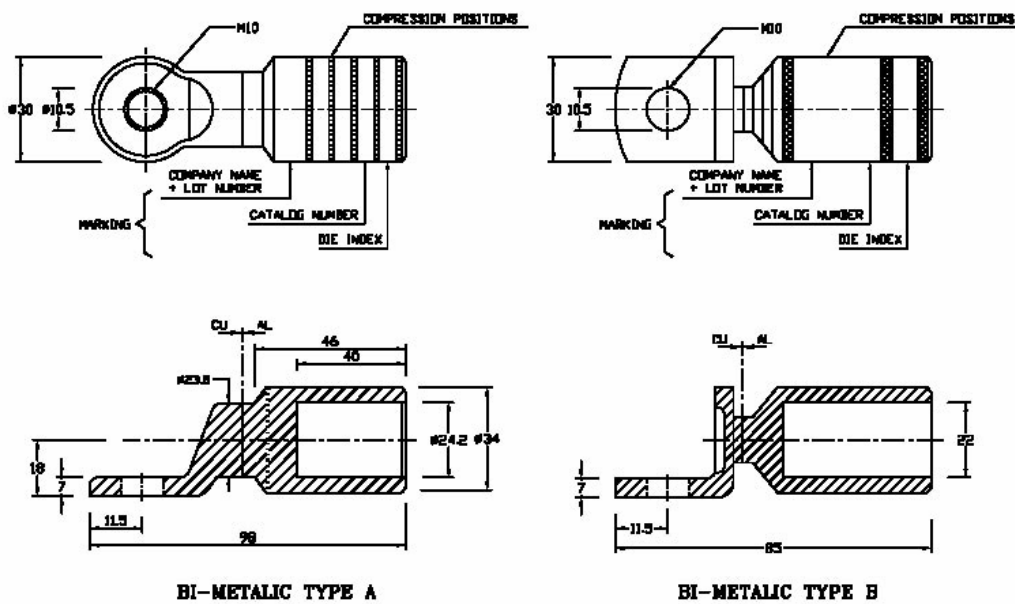
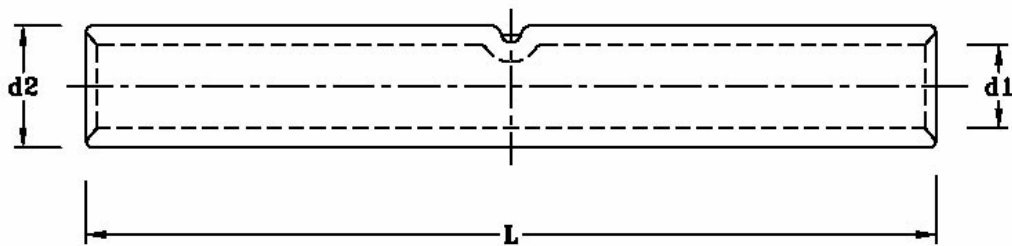


FIG 5: TYPICAL BIMETALLIC LUG FOR 300 mm<sup>2</sup> ALUMINUM CABLE

All dimensions are in mm

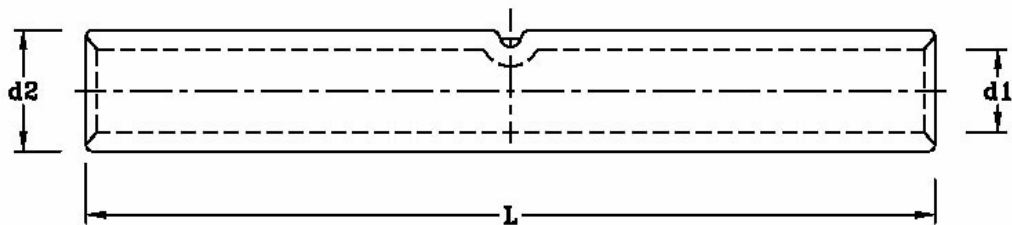


SECTION mm <sup>2</sup>		NOMINAL DIMENSIONS mm		
ALUMINUM	ALUMINUM	d1	d2	L
300	300	23.3	34	145
185	185	16.3	28.5	125
70	70	11.2	16.5	105
35	35	8	14	85

DIN-46-267 (Teil 2)

FIG 6: CONNECTOR FOR ALUMINUM/ALUMINUM CABLES

All dimensions are in mm

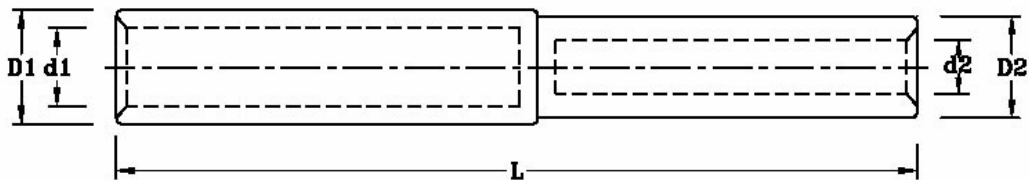


SECTION mm <sup>2</sup>		NOMINAL DIMENSIONS mm		
COPPER	COPPER	d1	d2	L
300	300	24.5	32	100
185	185	19	25.5	85
35	35	8.2	12.5	50

DIN-46-267 (Teil 1)

FIG 7: CONNECTOR FOR COPPER/COPPER CABLE MV

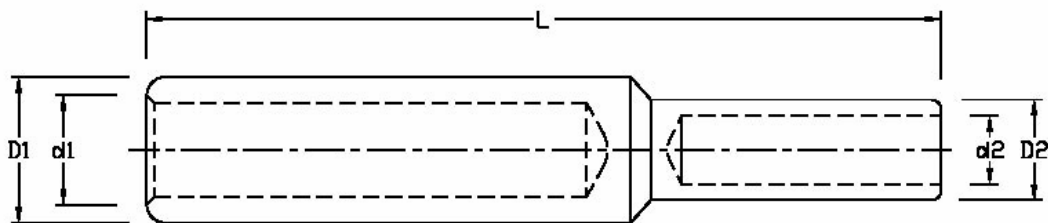
All dimensions are in mm



SECTION mm <sup>2</sup>		NOMINAL DIMENSIONS mm				
ALUMINUM	ALUMINUM	D1	d1	D2	d2	L
500	300	38	29	30	23.3	218
300	150	38	23.3	25	16.3	155
185	120	30	18.3	25	14.7	130
165	95	30	16.3	25	13.2	130
95	70	20	13.2	20	11.2	110

FIG 8: REDUCTION CONNECTORS FOR AL/AL CABLES

All dimensions are in mm



SECTION mm <sup>2</sup>		NOMINAL DIMENSIONS mm				
ALUMINUM	COPPER	D1	d1	D2	d2	L
300	185	36	23.5	26	18.5	138
300	120	36	23.5	21	15	119
185	120	30	18.5	21	15	108
150	95	25	15.5	21	14	108
120	70	25	13.7	21	12.5	108
95	70	20	12.5	21	12.5	90
70	35	20	11	12.2	8.5	90
50	35	20	9	12.2	8.5	90
35	18	18	8	12.2	8.3	90

FIG 9: BIMETALLIC AL/CU REDUCTION CONNECTORS L.V

All dimensions are in mm