

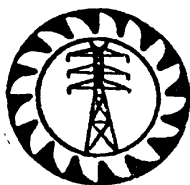
026 - 3: 1996

CEB  
STANDARD

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**COMPRESSION SOCKETS AND FERRULES  
FOR UNDERGROUND CABLES**



**CEYLON ELECTRICITY BOARD  
SRI LANKA**

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*Specification*

*for*

**COMPRESSION SOCKETS AND FERRULES  
FOR UNDERGROUND CABLES**

**CEB Standard 026 - 3 : 1996**

**CEYLON ELECTRICITY BOARD**

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## SPECIFICATION FOR COMPRESSION SOCKETS AND FERRULES FOR UNDERGROUND CABLES

### 1.0 SCOPE

This specification covers the design, manufacture and testing of compression Sockets and Ferrules for PILC, XLPE and PVC Insulated Underground Cables.

### 2.0 SYSTEM PARAMETERS

a.	Nominal Voltage	33 kV	11 kV	400/230 V
b.	System highest Voltage	36 kV	12 kV	400 V
c.	System frequency	50 Hz	50 Hz	50 Hz
d.	Method of Earthing	Non effective	Solid Earthing	Solid Earthing
e.	System fault levels	13.1 kA	13.1 kA	25 kA

### 3.0 SERVICE CONDITIONS

a.	Annual average ambient temperature	30°C
b.	Maximum ambient temperature	40°C
c.	Maximum relative humidity	90%
d.	Environmental conditions	Humid tropical climate with polluted atmosphere.
e.	Operational altitude	From M.S.L. to 1900 meters above M.S.L.

### 4.0 APPLICABLE STANDARDS

The Compression Sockets and Ferrules shall conform to the latest editions of the standards specified below and amendments thereof.

BS 3288 (1973) - Insulators and Cable fittings for O/H power lines.

BS	4579	(1976)	-	Performance of compression joints in electric cables and wire connectors
BS	1977	(1976)	-	Cu tubes for electrical purposes
BS	2871	(1972)	-	Cu and Cu alloys, tubes.
BS	1474	(1987)	-	Wrought Al and Al alloys, bars, extruded round tubes and sections

The Compression Connectors and Fittings supplied shall be used with overhead Cables and Insulated Cables manufactured to the following standards.

BS	6360			
BS	6346	(1989)	-	PVC Insulated Cables for electricity supply.
			-	XLPE Insulated Cables
			-	PILC Cables

## 5.0 MATERIAL REQUIREMENT & WORKMANSHIP

### 5.1 Material

The Copper Components of the compression Sockets and Ferrules shall be of high strength and high conductivity Copper.

In the case of Bi-metallic compression Sockets and ferrules, all Copper Components or Parts shall be high conductivity copper or high copper content alloy.

### 5.2 Oxide Inhibiting Grease/Compound

The internal faces of aluminium components shall be coated with oxide inhibiting grease/ compound to improve electrical contact and ensure maximum electrical performance of fittings.

The quantity of grease shall be sufficient to ensure the integrity of the fitting when used on smallest Cable for which it is designed and tube ends should be protectively capped to prevent spoilage and spillage of the grease.

The grease /compound shall be compatible with the grease used in the Cable to which the fittings are to be applied.

The grease / compound shall contain suspended particles to penetrate the oxide film present on aluminium surfaces and shall ensure maximum electrical performance of compression fittings.

### **5.3 Workmanship**

High quality workmanship shall be maintained in the process of manufacture of Compression Sockets and Ferrules

They shall be free from sharp edges, burs and swarf. The contact surface of the sockets and ferrules shall be uniform to provide effective contact with the Cables.

## **6.0 TECHNICAL REQUIREMENTS**

### **6.1 General**

The compression Sockets and ferrules for copper Cables shall be capable of being compressed with a hand operated mechanical crimping tool or standard hydraulic "G" type head compression tool. The "Across Flat (AF) Dimension" of the die to be used for different conductors is given in Table 1.

The Copper Sockets and Ferrules Shall be made of high strength high conductivity annealed copper and hot dip tinned to BS 219.

The inside of each aluminium ferrule and the internal faces of the aluminium sockets shall be coated with oxide inhibiting grease to improve electrical contact as stipulated in Clause 5.2.

The design of Bimetallic Fittings shall be such as to eliminate any effect arising from galvanic corrosion that impairs the performance of the fittings.

Tubular fitting shall have an internal chamfer to facilitate easy entry of the Cable.

### **6.2 Compression Socket Connectors for Copper Cables**

The Compression Sockets shall comply with the relevant Standards specified and shall be suitable for terminating cable operating at a temperature of 75 °C.

The Copper Cable type, size and "Across Flat Dimension" of the Die to be used is given in Table 1. (Annex - A)

It shall correctly accommodate the compacted/non-compactd Cables as indicated in the schedule of prices.

A hole shall be Provided in the barrel of the socket to permit quick visual inspection for proper insertion of cable before crimping and the palm shall be provided with single hole .

The area of the barrel and the palm shall be such that the current carrying capacity of the Socket shall not be less than that of the Cable.

The temperature rise of the socket shall not be more than that of the Cable.

The minimum Number of Crimps shall be two.

### **6.3 Compression Socket Connectors for Aluminium Cable**

The Compression Sockets shall comply with the relevant Standards specified and shall be suitable for terminating Aluminium Cable operating at a temperature of 75°C.

The Aluminium Cable type, size and "Across Flat Dimension" of the Die to be used is given in Table 1. (Annex - A)

Provision shall be made in the socket to ensure the correct insertion of Cable. before crimping.

It shall correctly accommodate the compacted/non - compacted Cables as indicated in the schedule of prices.

The area of the barrel and the palm shall be such that the current carrying capacity of the Socket shall not be less than that of the Cable.

The temperature rise of the socket shall not be more than that of the Cable.

The minimum Number of Crimps shall be two.

### **6.4 Compression Bi-metallic Socket Connectors for Aluminium Cables**

The compression Bi-metallic Sockets shall comply with the relevant Standards specified and shall be suitable for use with Aluminium Cables operating at a temperature of 75°C. The Aluminium Barrel and the Copper palm shall be friction welded.

The Aluminium Cable type, size and "Across Flat Dimension" of the Die to be used is given in Table 1. (Annex - A)

It shall correctly accommodate the compacted/un-compacted Aluminium Cables as indicated in the schedule of prices.

The area of the barrel and the palm shall be such that the current carrying capacity of the Bi-metallic Socket shall not be less than that of the Cable.

The temperature rise of the Bi-metallic Socket shall not be more than that of the Cable.

The minimum Number of Crimps shall be two.

### **6.5 Compression ferrules for Copper Cables**

Compression ferrules shall be suitable for jointing two Copper Cables.

It shall correctly accommodate the compacted/non compacted Copper Cables of equal/unequal sizes as indicated in the schedule of prices.

It shall be provided with a centre stop "indent" for correct positioning of Cable before compression.

Ferrules for voltage application greater than 1000 V shall be provided with tapered or rounded ends.

The current carrying capacity of the Ferrules shall not be less than that of the main Cable.

The temperature rise of the socket shall not be more than that of the main Cable.

The minimum Number of Crimps shall be four.

## **6.6 Compression Ferrules for Aluminium Cables.**

Compression ferrules shall be suitable for jointing two Aluminium Cables.

It shall correctly accommodate the compacted / non - compacted Aluminium Cables of equal/unequal sizes as indicated in the schedule of prices.

It shall be provided with a centre stop "indent" for correct positioning of Cable before compression.

Ferrules for voltage application greater than 1000 V shall be provided with tapered or rounded ends.

The current carrying capacity of the Ferrules shall not be less than that of the main Cable.

The temperature rise of the socket shall not be more than that of the main Cable.

The minimum Number of Crimps shall be four.

## **7.0 QUALITY CONTROL**

Quality Assurance System conforming to ISO 9001 shall be followed in the process of manufacture of Compression Sockets and Ferrules for PILC, XLPE and PVC insulated Underground Cables. Bidders shall furnish documentary evidence in proof of this.

## **8.0 ADDITIONAL REQUIREMENTS**

### **8.1 Identification**

All Sockets, Ferrules and Fittings shall be identified with the manufacturer's identification marks and fitting references.

This marking shall also be applied to any component of the fitting where the component is separate from the fitting when despatched by the manufacturer.



## **8.2 Markings**

All Compression Sockets and Ferrules shall be marked with the following information.

- i) The limit of compression and individual compression positions.
- ii) The end at which the compression shall be commenced.
- iii) The Cable type and size to be compressed.
- iv) The Die reference (Code reference of the Die)

These information shall be engraved or embossed on the out side surface of each fitting.

## **8.3 Packing**

All Items shall be individually or collectively packed as appropriate.

The method adopted shall provide mechanical and corrosion protection to contact surfaces in transit and storage.

All packages shall be marked with the batch number or code of fitting(s) therein.

## **9.0 SAMPLE STUDY**

At least two samples of each item offered shall accompany the bid to facilitate analysis and evaluation.

## **10.0 INFORMATION TO BE SUPPLIED WITH THE OFFER**

The following shall be supplied with the offer.

- a) The catalogues describing the items and indicating the Model/Reference number, Code Name/AF dimension of the relevant die to be used for Compression, Cable Sizes and other relevant details.
- b) Constructional features material used for components and relevant technical literature.T
- c) Certification for Quality Assurance conforming to ISO 9001.
- d) Schedule of Particulars (Annex - B)
- e) Dimensional Drawings of all items.

f) **Type Test Reports**

The following type test reports from a **Recognized Independent Testing Authority acceptable to the Purchaser** pertaining to recently manufactured items of the same Model/Type offered shall be furnished.

1. Resistance Measurement
2. Heating-cycle Test
3. Mechanical Strength Test

- g) Full details of the type of Oxide inhibiting grease/compound used in the Aluminium Components, and documents in proof of tests carried out for compatibility shall be furnished.

**Failure to furnish the above details will result in the offer being rejected.**

## **11.0 TECHNICAL LITERATURE AND DRAWINGS**

- a) Booklets / leaflets indicating the following for all items supplied shall be furnished with the items;
- b) Technical Literature including Code/Ref. Numbers of all items
- c) Details of current carrying capacity.
- d) Conductor sizes applicable and other relevant details.
- e) The standards to which the items are manufactured
- f) Dimensional Drawings.
- g) Operational instructions
- h) Routine Test Certificates

## **12.0 INSPECTION & TESTING**

### **12.1 Inspection**

The selected Bidder shall make necessary arrangements for inspection by an Engineer appointed by the Purchaser and also to carry out in his presence necessary routine/sample tests on the materials offered.

## **12.2 Testing ( Sample /Acceptance Tests)**

The following Sample tests (as per BS 3288 Part 1) shall be witnessed by the Purchaser.

1. Verification of Dimensions
2. Mechanical Test
3. Electrical Tests

## **13.0 ANNEX**

- A - Table 1
- B - Schedule of Particulars

**ANNEX - A****Table - 1**

Nominal Cross Sectional Area of the Cable (Aluminium/Copper)  (mm <sup>2</sup> )	Across Flat Dimension of the Die to be used  (mm)	
	Copper	Aluminium
16	6.6	9.0
25	7.6	9.0
35	9.0	10.0
50	10.0	12.0
70	12.0	14.0
95	14.0	17.0
150	17.0	21.5
185	19.0	21.5
240	21.5	28.0
300	23.0	28.0

**ANNEX - B**

**SCHEDULE OF PARTICULARS**  
(To be filled by the Bidder for each item offered)

- a) Name of Item
- b) Name of Manufacturer
- c) Country of Manufacture
- d) Applicable Standards
- e) Current carrying capacity
- f) Temperature rise at rated current.
- g) Whether the following Reports are furnished.
  - i) Type Test
  - ii) Quality Assurance Certification conforming to ISO 9001.
- h) Marking details(cable sizes, No. Crimps etc.)
- i) Method of fusion (for bi-metallic fitting only)

**SEAL AND SIGNATURE OF THE BIDDER**

**DATE**