



KINGDOM OF CAMBODIA  
NATION RELIGION KING



**ELECTRICITE DU CAMBODGE**

**TECHNICAL SPECIFICATION**

**EDC-DTS-LV002**


**Electrical Accessories for LV ABC**

November 2017





## ELECTRICITE DU CAMBODGE

Version	Date	Technical Specification Name	Authorized by : (name and signature)
1.0	November, 2017	Electrical Accessories for LV ABC	 Dr. PRAING CHULASA

*[Handwritten signatures and initials]*

Version	Drafted/reviewed by	Verified by	Approved by	Date
Draft 1	AD			
Draft 2	AD			
Final	AD/EDC			
App2	AD/EDC			



[Blank]

MPV  
m-26

44-4



## Content

1	Scope .....	7
2	Standards.....	7
3	Definitions .....	8
4	Testing and Inspection .....	8
4.1	General Notes for Test.....	8
4.2	Type Tests .....	8
4.3	Routine Tests .....	9
4.4	Sampling/Acceptance Tests.....	9
4.4.1	Insulation Piercing Connectors.....	9
4.4.2	Service Connection Ends .....	9
5	Quality Management .....	9
6	Ambient Conditions.....	9
7	Electrical System.....	10
8	Insulation Piercing Connectors (IPC) .....	10
8.1	Design and Construction .....	10
8.1.1	General.....	10
8.1.2	Teeth .....	11
8.1.3	Tap.....	11
8.1.4	Water Tightness of IPC.....	11
8.1.5	Bolts and Tightening Torque .....	11
8.2	Rated Current .....	12
8.3	Type and Size of IPC.....	12
8.4	Marking.....	12
8.5	Delivery of Connectors .....	12
9	Pre-insulated Junction Sleeve and Bimetallic Lug Sets .....	13
9.1	Description.....	13
9.2	Pre-insulated Junction Sleeves .....	13
9.3	Bimetallic Terminal Lugs.....	13
9.4	Delivery.....	14
10	Junction Sets between ABC and Underground Cables.....	14
10.1	Marking.....	15
11	Insulation Cap.....	15
12	Service Connection End Braids.....	15
13	Technical Data Sheets .....	17



13.1 Insulation Piercing Connectors (IPC).....	17
13.2 Pre-insulated Junction Sleeves Sets for ABC.....	22
13.3 Pre-insulated Bimetallic Lugs Sets for ABC .....	25
13.4 Junction Sets between ABC and Underground Cables .....	28
13.5 Insulating End Caps .....	31
13.6 Service Connection End Braids .....	32

# Electrical Accessories for LV ABC

## 1 Scope

This specification covers the design, manufacturing, testing, supply, and delivery and performance requirements of electrical accessories for LV ABC to be used on the LV Power Distribution networks of Electricité Du Cambodge (EDC) with a life expectancy of 30 years minimum without any maintenance.

Those Electrical accessories are:

- LV Insulation Piercing Connectors (IPC),
- Pre-insulated Junction sleeves sets for ABC,
- Pre-insulated bi metallic terminal lugs set for ABC,
- Junction sets between ABC and underground cables,
- Insulation caps.
- Service connection end braids

## 2 Standards

EN : European Standards

EN 50483 : Test requirements for low voltage aerial bundled cable accessories.

ISO : International Standard Organization

ISO 2063 : Metallic coating-protection of iron and steel against corrosion

ISO/IEC 17025 : General requirements for the competence of testing and calibration laboratories

ISO 9001 : Quality management systems – Requirements

NF C : French Standards

NF C 33-020 : Insulated cables and their accessories for power systems – Insulation piercing branch-connectors for overhead distributions and services with bundle assembled cores, of rated voltage 0,6/1 kV

NF C 33-021 : Insulated cables and their accessories for power systems – Pre-insulated compression type connecting equipment for overhead distribution and service with bundle assembled cores, of rated voltage 0,6/1 kV

NF C 33-209 : Insulated or protected cables for power systems – Insulated cable bundle for overhead distributions, of rated voltage 0,6/1 kV.

EDF HN : Electricité de France, Technical specification

HN 33-S-82 : Service connection ends of rated voltage 0.6/1kV for insulated cables (Ed. 2 June 1998)

EDC-DTS : Electricité du Cambodge distribution technical specification





## EDC-DTS- EDC-DTS-LV001: LV Aerial Bundled Conductors and Mechanical Accessories

Unless if standard year is specified, the latest version and all amendments of the above standards apply.

The supplier may propose alternative standards, provided it is demonstrated that they give an equivalent degree of quality as the referenced standard. Acceptability of any alternative standard is at the discretion of the EDC.

### 3 Definitions

The definitions of the relevant IEC, EN, NFC and HN standards apply to this technical specification.

The designations in this specification are those of NF C 33020, NF C 33021, NF C 33-209 and HN 33-S-82.

### 4 Testing and Inspection

#### 4.1 General Notes for Test

Electrical accessories for LV ABC may be inspected at the manufacturer's factory by EDC's representatives.

The inspection and routine tests shall be carried out in accordance with the provisions of the relevant EN and NFC recommendations.

Electrical accessories for LV ABC shall be subjected to tests as specified below.

#### 4.2 Type Tests

All type tests required by the EN 50483, NF C 33020, NF C 33021 standards as well HN 33-S-82 technical specification shall be carried out.

Type test reports shall be carried out by internationally recognized electrical testing laboratories.

Full copies of type test reports shall be submitted within the bid of the manufacturer/supplier. Type test reports older than 15 years will not be accepted.

If the manufacturer is certified by EDC, it is not necessary to submit type test reports for the considered equipment and in addition the manufacturer shall have all the facilities and bring evidence he can make the tests according to NF C33-020 and NF C 33-021.

Nevertheless, in case the testing laboratory is not internationally recognized, the testing laboratory shall be mandatorily accredited ISO/IEC 17025 by an international or national accreditation body specialized in testing laboratories accreditation/acceptance. In that case, the testing laboratory shall prove mandatorily its capability/capacity to carry out all type tests mentioned in the type tests reports by supplying: Full description of all tests the laboratory can carry out, list of testing equipment with full characteristics, drawing of testing rooms with location of testing equipment, etc., supported by pictures and copy of the ISO/IEC 17025 accreditation certificate.

Acceptability of any accredited testing laboratory is at the discretion of the EDC.



### 4.3 Routine Tests

The routine tests requested by EN 50483, NF C 33020 and NF C 33021 standards shall be carried out on all accessories. Routine test reports shall be sent to EDC prior the shipment for EDC acceptance.

### 4.4 Sampling/Acceptance Tests

#### 4.4.1 Insulation Piercing Connectors

Sampling tests as stated below shall be carry out by the manufacturer, these tests are to be carried out by the manufacturer on samples or components taken from a completed product. These tests are to be conducted by the manufacturer on samples or components taken from every production batches. It shall be carried out at the commencement of a contract before any acceptance testing can be done.

- Marking
- Dimension
- Material and construction of assemblies
- Dielectric and Water Tightness Test as per sub-clause 6.4 of NFC 33-020
- Mechanical Test (as per sub-clause 6.3.1 of NFC 33-020, connector bolt tightening test only – electrical continuity and shear head breaking value are checked at the same time at ambient temperature)
- Measurement of the thickness of the tin plating of the teeth in case of copper or copper alloy blades).
- Visual inspection of IPC cross sectional area (to verify the depth of penetration or contact made by the teeth and the teeth alignment).

Any test included under this category can be waived if the manufacturer has carried out as part of the routine tests.

#### 4.4.2 Service Connection Ends

Even the manufacturer process is ISO 9001 certified, the tests requested by annex F of HN 33-S-82 shall be carried out.

## 5 Quality Management

Design, development and production of the proposed equipment shall be ISO 9001 certified. The ISO 9001 certificate shall be submitted within the bid.

## 6 Ambient Conditions

Electrical accessories for LV ABC shall be suitable to operate in the ambient conditions described here after:





Altitude	Sea level to 1,000 meters
Climate	Tropical
Annual Rainfall	1,300 mm.140 days
Monsoon Period	June to November
Ambient Air Temperatures:	
Average	27.5°C
Minimum	13.3°C
Maximum	40.5°C
Relative Air Humidity	65-100%
Soil Thermal Resistivity:	
Average	1.20c m/W
Maximum	3.00c m/W
Solar Emissivity	0.8
Solar absorption	0.8
Wind Velocity:	
Average	37 km/h (10.3 m/s)
Maximum	72 km/h (20 m/s)

## 7 Electrical System

The accessories shall be designed for continuous operation on a 3-phase, 4 wires, 230/400 volts, +10%, -5%, 50 Hz, with a rated voltage of 0.6/1 kV, multiple neutral-earthed distribution network TT or TN systems.

## 8 Insulation Piercing Connectors (IPC)

### 8.1 Design and Construction

#### 8.1.1 General

The connectors shall be suitable for used on EDC low voltage aluminum conductor Aerial Bundle Cable conform to EDC-DTS-LV001, except stated otherwise in this specification. They shall be used also to connect copper insulated cables on tap side of connectors.

**Designation and tests shall be as per requirements of NFC 33-020 standard.**

The connectors shall be insulated and suitable for use during live line works. These connectors shall be of insulation piercing type on main and tee-off conductors. **The design shall be such that no energized**



**part of the connectors shall be accessible during and after connector installation/mounting** and they must withstand 6 kV / 50 Hz during 1 minute while immersed into water 30 cm depth (Type test)

They shall be of **simultaneous tightening type**: Connector whose design of tightening facilities involves a simultaneous connection of both main and branch conductors.

Beside the tightening bolts, the connectors shall not have detachable parts to prevent them from missing during transportations or fall apart during installation and /or while in service.

The housing shall be made entirely of mechanical, weather, UV and age resistant plastic insulation material with no metallic parts outside the housing except for the tightening system or bolt(s).

The design shall be such that no energized part of the connectors shall be accessible during and after connector installation/mounting and operation.

The connection and disconnection operations through an IPC are done without electrical load. IPC are not designed to be reused when they are disconnected from a conductor.

### 8.1.2 Teeth

The teeth shall be made of aluminum alloy or tin-plated copper alloy (thickness tolerance for the tin plating: 3  $\mu\text{m}$  to 8  $\mu\text{m}$  in the width of the middle teeth, 6 blades are tested per batch). The teeth of the contact plate shall penetrate the relevant conductor insulation to establish proper contact without the need to strip off the insulation on the main and tap conductors. The conductors' insulation thickness and physical characteristics are those requested by the NF C33-209 standard and EDC-DTS-001.

### 8.1.3 Tap

The tap section shall be provided with an end cap that is designed to received and avoid penetration of water inside and isolate the end of the tap insulated conductor whatever the cross-section range. It shall be made from weather, UV and age resistant elastomer materials or plastic insulating material. The life span of the end cap shall be the same, if not longer than the life span of the connector itself. This end cap shall allow positioning only one side or either left or right side of the connector. Waterproofness and insulation based on grease only is not accepted.

### 8.1.4 Water Tightness of IPC

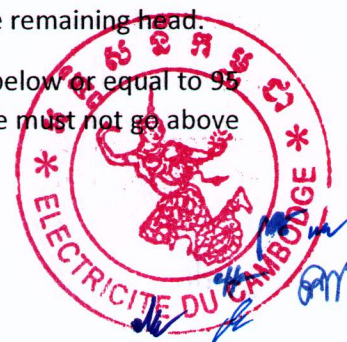
The water tightness of connectors must be ensured by appropriate elastomer materials and must not be based on the usage of grease, gel, paste, etc. only.

Nevertheless, the interior surfaces of the connectors could be filled with oxide inhibiting compound of silicon based grease.

### 8.1.5 Bolts and Tightening Torque

The bolt(s) and washer(s) (if any) shall be made of non-corrosive material which shall maintain the pressure of the connector on the cable throughout the service life of the connector. The bolt(s) shall incorporate an over-torque shear head which allows a clamping torque in conformity with the recommendation of the manufacturer without the need of any special tool. After the head is sheared off, it must remain possible to remove the connectors in using the 2nd step of the remaining head.

The maximum tightening torque shall not be higher than 20 Nm for conductors below or equal to 95 mm<sup>2</sup> for cross sections above 95 mm<sup>2</sup> and below or equal to 150 mm<sup>2</sup>, this torque must not go above 30 Nm; whatever the cross-sections involved.





In order to avoid to over-tighten the product after the head is broken, the tighten hex and loosen hex (or any other loosening feature) shall not have the same size or shape.

The shear head of the tightening bolts shall be of hexagonal size 10 mm, 13 mm or 17 mm of width across flats and can be made of metal (because by IPC design, in any case the bolt cannot be in contact with live parts) or UV and age resistant plastic.

## 8.2 Rated Current

The current rating of the connectors shall be at least equal to the current of the maximum cross section admissible on the tap conductor with main and tap cables conform to NF C 33-209 standard.

## 8.3 Type and Size of IPC

The various sizes of connectors are listed in the table below:

Designation (1)	Main Cross section (mm <sup>2</sup> )	Tap cross section (mm <sup>2</sup> )	Number of bolts	Purpose
CDRS/CT 70-70	35 to 70	35 to 70	1 or 2	Main network/Main network, Phase and neutral
CDRS/CT 150-150	50 to 150	50 to 150	1 or 2	Main network/Main network, Phase
CBS/CT 70	35 to 70	16 to 35	1	Main network/Service, Phase and neutral
CBS/CT 150	50 to 150	16 to 35	1	Main network/service Phase

(1) Designation is the designation of NF C 33-020

Nevertheless, for specific applications other cross sections may be requested.

## 8.4 Marking

IPC marking shall be in accordance with the requirement of NFC 33-020. The manufacturing standard shall be mandatorily mentioned as well as:

- Manufacturer logo or trade mark
- Reference
- Min and max cross sections
- Batch number or serial number

This marking shall be indelible and subject to the verification of indelibility marking type test as required by the relevant NF C standards.

## 8.5 Delivery of Connectors

The connectors shall be delivered in bags or card boxes containing 10 pieces.



*Handwritten signature and initials in blue ink.*

## 9 Pre-insulated Junction Sleeve and Bimetallic Lug Sets

### 9.1 Description

The joints and lugs shall be pre-insulated and strictly designed, manufactured and tested in accordance with NF C 33-021 standard.

The compression is directly made over the insulation but crimping must not deteriorate the insulation. The pre-insulated junction sleeve is dielectrically waterproofed in the same manner as the ABC and must withstand 6 kV / 50 Hz during 1 minute while immersed into water 30 cm depth.

For this purpose, ends of pre-insulated sleeve and pre-insulated lugs must be equipped with a rubber (or elastomer gasket) or additional crimping on the insulation. The pre-insulated sleeve and lugs must be pre-filled with any suitable oxide-inhibiting compound or silicone grease and the current rating of this equipment shall be equivalent to the respective cable.

For easier identification pre-insulated sleeves and lugs must have markings indicating:

- The sequence and the location of hexagonal compression indents.
- The size of the die to be used.
- Stripping length
- Cross section by color code
- Manufacturer logo
- Manufacturing batch reference or serial number

This marking shall be indelible and subject to the verification of indelibility marking type test as required by the relevant NF C standards.

Sleeves and lugs must be crimped with regular hexagonal compression indents as per NF C 33-021 requirements.

### 9.2 Pre-insulated Junction Sleeves

Mainly, those sleeves will be used on insulated neutral messenger Aerial Bundled Conductors as defined by The NF C 33209 standard. For that purpose, the breaking load of the neutral pre-insulated sleeve shall be at least equal to the neutral breaking load. The cross section of the AAA neutral messenger shall be 54,6 mm<sup>2</sup> or 70 mm<sup>2</sup>. Depending the ABC, Phase cross sections shall be 50 mm<sup>2</sup>, 70 mm<sup>2</sup> or 150 mm<sup>2</sup>.

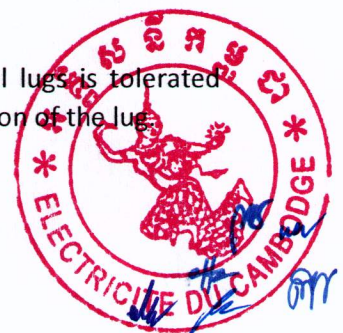
Other cross sections pre-insulated junction sleeves may be supplied as 35 mm<sup>2</sup>, 50 mm<sup>2</sup>, etc.

**They shall correspond to the MJPT or MJPB (depending of cross sections) designations of NFC 33-021 standard and tests requirements.**

### 9.3 Bimetallic Terminal Lugs

Bi metallic terminal lugs with aluminum cable and copper palm shall be used for connecting self-supported ABC as defined above onto copper terminals transformer or equipment copper bushings. Bi metallic terminal lugs cross sections shall be identical than junction sleeves.

Friction welding between aluminum and copper part of the bi-metallic terminal lugs is tolerated provided this welding being located inside a waterproof part under the pre-insulation of the lug.





For all cross sections, the copper palm of the bi-metallic lug shall be drilled with one 12.8mm diameter hole.

They shall correspond to the CPTAU designation of NFC 33-021 standard and tests requirements.

#### 9.4 Delivery

Pre-insulated junction sleeves and lugs shall be delivered in complete set in a sealed bag:

ABC neutral messenger type	Set of junction sleeve	Set of bi metallic terminal lugs
3x70 mm <sup>2</sup> + 1x 70 mm <sup>2</sup> (N)	3-phase 70 mm <sup>2</sup> junction sleeve + 1 full mechanical load 70 mm <sup>2</sup> for AAA neutral messenger	4 x 70 mm <sup>2</sup> bimetallic lugs
3x150 mm + 1x70 mm <sup>2</sup> (N)	3-phase 150 mm <sup>2</sup> junction sleeve + 1 full mechanical load 70 mm <sup>2</sup> for AAA neutral messenger	3 x 150 mm <sup>2</sup> bimetallic lugs + 1 x 70 mm <sup>2</sup> bimetallic lug
1x50 mm <sup>2</sup> + 1x54.6 mm <sup>2</sup> (N)	1-phase 50 mm <sup>2</sup> + 1 full mechanical load 54.6 mm <sup>2</sup> for AAA neutral messenger	1 x 50 mm <sup>2</sup> bimetallic lugs + 1 x 54.6 mm <sup>2</sup> bimetallic lug
3x50 mm <sup>2</sup> + 1x54.6 mm <sup>2</sup> (N)	3-phase 50 mm <sup>2</sup> + 1 full mechanical load 54.6 mm <sup>2</sup> for AAA neutral messenger	3 x 50 mm <sup>2</sup> bimetallic lugs + 1 x 54.6 mm <sup>2</sup> bimetallic lug
For all other cross sections, junction sleeves and bi metallic lugs shall be delivered in bag of 10 pieces.		

### 10 Junction Sets between ABC and Underground Cables

Those sets shall be used for connecting ABC to underground cable at substation LV feeder emergence for example.

Dielectric test voltage of the properly installed set shall be at least 3.5 kV (AC).

They shall include in one sealed bag:

- 4 x bare aluminum junction sleeves for circular conductor core to be crimped with regular hexagonal compression indents. Specifically design sleeves with bolts tightening are also allowed.
- 1 x heat shrinkable underground cable breakout (4 conductors) black coloured with compound inside,
- 4 x Heat shrinkable sheaths, compound filled of black colour for insulation of junction sleeves,
- 65 cm of Heat shrinkable sheath without internal compound for UV protection of Underground cables conductors (neutral and phases).

The sets shall be available with the following cables cross sections:

LV ABC	UNDERGROUND CABLE
3 x 70 mm <sup>2</sup> + 1x70 mm <sup>2</sup> (N)	3 x 150 mm <sup>2</sup> + 1 x 70 mm <sup>2</sup> AL with a conductor of round shape
3 x 150 mm <sup>2</sup> + 1x70 mm <sup>2</sup> (N)	3 x 240 mm <sup>2</sup> + 1 x 120 mm <sup>2</sup> AL with a conductor of round shape



## 10.1 Marking

Bare aluminum junction sleeves shall be marked as follow:

- Location of hexagonal compression indents.
- The size of the die to be used.
- Stripping length
- Cross sections
- Manufacturer logo
- Manufacturing batch reference or serial number

This marking shall be indelible and subject to the verification of indelibility marking type test as required by the relevant NF C standards.

## 11 Insulation Cap

Insulating cap shall be used at the terminations of the twisted insulated cable to avoid exposure and isolate conductors' ends. The cap shall be of black colour and be of cold or heat shrinkable type. All caps should be naturally waterproof without the need of an additional component (grease, etc.).

The dielectric strength of this equipment shall be at least equal to 6 kV AC (type test).

## 12 Service Connection End Braids

This equipment shall be used for connecting service connection ABC cable to a metering equipment with terminals made of copper or copper alloy. It shall be strictly manufactured and **tested according EDF HN 33-S-82 requirements and shall be of EBCPAU type as defined in this technical specification.**

**All type tests reports required by the EDF HN 33-S-82 standard shall be provided within the offer.**

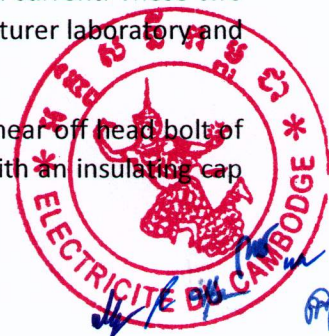
The service connection end braids shall withstand a dielectric test of 4kV as requested by the Chapter 5.4 of EDF HN 33-S-82 standard.

This equipment shall consist of a not dismountable assembly of:

- One insulation piercing connecting device for ABC conductor from 16 mm<sup>2</sup> to 35 mm<sup>2</sup> Aluminum insulated service ABC,
- One very flexible insulated copper braid of 25 mm<sup>2</sup> cross section with a length Lf (as per table B1 of annex B of HN 33-S-82) of 25 cm connected to the piercing connector by crimping or similar system. The other end of the flexible braid shall be tinned massive and compressed or fitted with a compressed ferrule in order to reach the section S requested in annex B of HN 33-S-82.
- One fully insulated body over insulation piercing connecting device and connection between IPC and insulated copper braid.

The permanent carrying capacity of the equipment shall be at least 90 Amperes and the temperature of the equipment shall not exceed 90°C during a permanent service with a 90 A current. These two requirements shall be supported by type test reports carried out by the manufacturer laboratory and provided within the bid.

The insulation piercing connecting device shall be fitted with a torque limiting shear off head bolt of 10 mm or 13 mm (hexagonal). When broken the bolt head shall be insulated with an insulating cap





(case metallic bolt) or naturally insulated if made of insulating material. The maximum tightening torque of the bolt shall be less than 15 kN.

The colour of the braid shall be blue colour for neutral and black for phases. Nevertheless, other colours may be required.

As this equipment is to be installed in meter boxes, it shall be of small volume.

The service connection end braid shall be marked as follow:

- Manufacturer trade mark or logo
- Date of manufacturing or batch number as well as factory reference.
- Cross section range
- EPCPAU

This marking shall be indelible and tested as per HN 33-S-82.

They shall be delivered in bags or card boxes containing 100 pcs of only one colour service connection ends.



*Handwritten signature/initials in blue ink.*

## 13 Technical Data Sheets

### 13.1 Insulation Piercing Connectors (IPC)

No.	Description	Unit	Requirements	Supplier's Offer
1	Country		to be specified	
2	Manufacturer		to be specified	
3	Manufacturer's Reference		to be specified	
4	Applicable Standards		NF C 33-020 and EN 50483	
5	Type tests reports		To be provided	
6	Minimum IPC life expectancy	Year	30	
7	Suitable for LV ABC conform to		NFC 33-209 and EDC-DTS-LV001	
8	Suitable for connect		Aluminium and copper cable	
9	Fully insulated and suitable for LV live line works		Yes	
10	Insulation piercing type on main and tee-off		Yes	
11	Simultaneous piercing of main and tap		Yes	
12	No energized part of the connectors accessible during installation and all along lifespan by design and type tests		Yes (Mandatory)	
13	No detachable parts to prevent them from missing during transportations or fall apart during installation and /or while in service		Yes (Mandatory)	
14	housing entirely made of mechanical, weather, UV and age resistant plastic insulation material		Yes (Mandatory)	




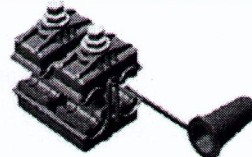
15	Housing fire retardant / Self extinguishable		Yes	
16	no metallic parts outside the housing except for the tightening system or bolt(s)		Yes (Mandatory)	
17	UV protected and weather resistant		Yes	
18	Ambient temperature	°C	40.5	
19	Relative humidity	%	95	
<b>20. Teeth</b>				
20.1	Made of non-magnetic metal		aluminum alloy or tin-plated copper alloy	
20.2	Insulation piercing thickness (NFC 33-209 and EDC-DTS-LV001ABC) min/max	mm	1.2/3	
<b>21. Water tightness</b>				
21.1	Ensured by appropriate elastomer materials and must not be based on the usage of grease, gel paste etc. only		Yes (Mandatory)	
21.2	the interior surfaces of the connectors could be filled with oxide inhibiting compound of silicon based grease		To be specified	
21.3	IPC voltage withstands during 1 minute when immersed under 30 cm of water	kV	6.0	
<b>22. Bolts and tightening torque</b>				
22.1	The bolt(s) and washer(s) (if any) made of non-corrosive material		Yes	
22.2	Bolts maintain the pressure of the connector on the cable throughout the service life of the connector		Yes	
22.3	Number of bolts			
	GBRS/CT 70-70		1 or 2	





	CDRS/CT 150-150		1 or 2			
	CBS/CT 70		1			
	CBS/CT 150		1			
22.4	The bolt(s) incorporate an over-torque shear off head		Yes			
22.5	Material of shear off head		Metal or UV and age resistant plastic			
22.6	Size of the shear off head:					
	CDRS/CT 70-70	mm	10mm, 13mm or 17mm			
	CDRS/CT 150-150	mm	10mm, 13mm or 17mm			
	CBS/CT 70	mm	10mm, 13mm or 17mm			
	CBS/CT 150	mm	10mm, 13mm or 17mm			
22.7	Size and shape of the second head after breaking of shear off head		shall not have the same size or shape than shear off head			
	CDRS/CT 70-70					
	CDRS/CT 150-150					
	CBS/CT 70					
	CBS/CT 150					
22.8	Manufacturer recommended nominal tightening torque					
	CDRS/CT 70-70	N.m	20 maximum			
	CDRS/CT 150-150	N.m	30 maximum			
	CBS/CT 70	N.m	20 maximum			
	CBS/CT 150	N.m	30 maximum			
22.9	Cross sections		Main	Tap	Main	Tap
	CDRS/CT 70-70	mm <sup>2</sup>	35 to 70	35 to 70		
	CDRS/CT 150-150	mm <sup>2</sup>	50 to 150	50 to 150		
	CBS/CT 70	mm <sup>2</sup>	35 to 70	16 to 35		
	CBS/CT 150	mm <sup>2</sup>	50 to 150	16 to 35		



23. Electrical characteristics				
23.1	System Voltage		230/400 V, 50Hz	
23.2	Rated Voltage	kV	0.6/1.0	
23.3	Dielectric withstand	kV	6.0	
23.4	Minimum current transit (30°C)			
	CDRS/CT 70-70	A	250	
	CDRS/CT 150-150	A	350	
	CBS/CT 70	A	160	
	CBS/CT 150	A	160	
24. Marking				
24.1	Marking in accordance with the requirement of:		NFC 33-020	
24.2	Standard marking		Yes	
	Manufacturer logo or trade mark		Yes	
	Min and max cross sections		Yes	
	Batch number or serial number		Yes	
24.3	Marking		indelible	
24.4	Packing by bag or card box of:	pcs	10	
FOR SAMPLE ONLY				
Supplier's offer column must be properly filled with the right figures. "Compliant, Yes, ", V , etc..." are not accepted.				



Deviation from the technical specification:

The bidder shall list point after point and explain here in after all deviation from the requested technical specification.

1/

2/

3/

x/

**Full technical information shall be supplied within the bid. If not the offer shall not be considered**

Bidder signature:





## 13.2 Pre-insulated Junction Sleeves Sets for ABC

No.	Description	Unit	Requirements	Supplier's Offer
1	Country		to be specified	
2	Manufacturer		to be specified	
3	Manufacturer's Reference		to be specified	
4	Applicable Standards		NF C 33-021 EN 50483	
5	Type tests reports		To be provided	
6	Minimum life expectancy	Year	30	
7	Suitable for LV ABC conform to		NFC 33-209 and EDC-DTS-LV001	
8	Correspond to MJPT and MJPB designations of NFC 33-021		Yes	
9	Pre-insulated type		Yes	
10	Compression is directly made over the insulation		Yes	
11	Ends of pre-insulated sleeve equipped with a rubber or elastomer gasket		Yes	
12	Withstand AC voltage during 1 minute while immersed into water 30 cm depth.	kV	6.0	
13	Pre-filled with any suitable oxide-inhibiting compound or silicone grease		Yes	
14	Crimped with regular hexagonal compression indents as per NF C 33-021 requirements.		Yes	
15	Die sizes are:			
	35 mm <sup>2</sup> (phase and neutral)		173	
	50 mm <sup>2</sup> (phase)		173	
	54.6 mm <sup>2</sup> (neutral messenger)		173	



Handwritten signature and initials in blue ink.

	70 mm <sup>2</sup> (phase)		173	
	70 mm <sup>2</sup> (neutral messenger)		173	
	150 mm <sup>2</sup> (phase)		215	
16	54.6 N and 70 N junctions of		Full tension type	
17	breaking load neutral pre-insulated sleeve at least equal to the neutral breaking load	daN	54.6 mm <sup>2</sup> N: 1660	
			70 mm <sup>2</sup> N: 2050	
18. Electrical Characteristics				
18.1	System Voltage		230/400 V, 50Hz	
18.2	Rated Voltage	kV	0.6/1.0	
18.3	Dielectric withstand	kV	6.0	
18.4	Minimum transit current (30°C)			
	MJPB 35 mm <sup>2</sup>	A	140	
	MJPT 50 mm <sup>2</sup>	A	170	
	MJPT 54.6 mm <sup>2</sup> (N)	A	170	
	MJPT 70 mm <sup>2</sup>	A	220	
	MJPT 70 mm <sup>2</sup> (N)	A	220	
	MJPT 150 mm <sup>2</sup>	A	350	
19. Marking				
19.1	Manufacturer logo		To be mentioned	
19.2	Manufacturing batch reference or serial number			
19.3	Stripping length			
19.4	The size of the die to be used.			
19.5	The sequence and the location of hexagonal compression indents			
19.6	Cross section by colour code			
20. Delivery				
20.1	MJPB 35: bag of	pcs	10	
20.2	MJPT 50: bag of	pcs	10	
20.3	MJPT 54.6N bag of	pcs	10	



20.4	3x MJPT 70 + 1x MJPT 70N	set	1 bag including one set	
20.5	3xMJPT 150 + 1x MJPT 70N	set	1 bag including one set	
FOR SAMPLE ONLY		 		
Supplier's offer column must be properly filled with the right figures. "Compliant, Yes, ", V , etc..." are not accepted.				
<p align="center"><b>Deviation from the technical specification:</b></p> <p>The bidder shall list point after point and explain here in after all deviation from the requested technical specification.</p> <p>1/</p> <p>2/</p> <p>3/</p> <p>x/</p> <p align="center"><b>Full technical information shall be supplied within the bid. If not the offer shall not be considered</b></p> <p align="center">Bidder signature:</p>				






### 13.3 Pre-insulated Bimetallic Lugs Sets for ABC

No.	Description	Unit	Requirements	Supplier's Offer
1	Country		to be specified	
2	Manufacturer		to be specified	
3	Manufacturer's Reference		to be specified	
4	Applicable Standards		NF C 33-021 EN 50483	
5	Type tests reports		To be provided	
6	Minimum life expectancy	Year	30	
7	Suitable for LV ABC conform to		NFC 33-209 and EDC-DTS-LV001	
8	Correspond to CPTAU designations of NFC 33-021		Yes	
9	Pre-insulated type		Yes	
10	Compression is directly made over the insulation		Yes	
11	Ends of pre-insulated sleeve equipped with a rubber or elastomer gasket		Yes	
12	Pre-filled with any suitable oxide-inhibiting compound or silicone grease		Yes	
13	Crimped with regular hexagonal compression indents as per NF C 33-021 requirements.		Yes	
14	Diameter of copper palm hole	mm	12.8	
15	Die sizes are:			
	50 mm <sup>2</sup> (phase)		173	
	54.6 mm <sup>2</sup> (neutral messenger)		173	
	70 mm <sup>2</sup> (phase)		173	
	70 mm <sup>2</sup> (neutral messenger)		173	





	150 mm <sup>2</sup> (phase)		215	
<b>16. Electrical Characteristics</b>				
16.1	System Voltage		230/400 V, 50Hz	
16.2	Rated Voltage	kV	0.6/1.0	
16.3	Minimum transit current (30°C)			
	CPTAU 50 mm <sup>2</sup>	A	170	
	CPTAU 54.6 mm <sup>2</sup> (N)	A	170	
	CPTAU 70 mm <sup>2</sup>	A	220	
	CPTAU 70 mm <sup>2</sup> (N)	A	220	
	CPTAU 150 mm <sup>2</sup>	A	350	
<b>17. Marking</b>				
17.1	Manufacturer logo		To be mentioned	
17.2	Manufacturing batch reference or serial number		To be mentioned	
17.3	Stripping length		To be mentioned	
17.4	The size of the die to be used.		To be mentioned	
17.5	The sequence and the location of hexagonal compression indents		To be mentioned	
17.6	Cross section by colour code		To be mentioned	
<b>18. Delivery</b>				
18.1	CPTAU 50: bag of	pcs	10	
18.2	CPTAU 54.6 bag of	pcs	10	
18.3	3x CPTAU 70 + 1xCPTAU 70 (N)	set	1 bag including one set	
18.4	3xCPTAU 150 + 1xCPTAU 70(N)	set	1 bag including one set	
FOR SAMPLE ONLY				
Supplier's offer column must be properly filled with the right figures. "Compliant, Yes, ", V , etc..." are not accepted.				



**Deviation from the technical specification:**

The bidder shall list point after point and explain here in after all deviation from the requested technical specification.

1/

2/

3/

x/

**Full technical information shall be supplied within the bid. If not the offer shall not be considered**

Bidder signature:



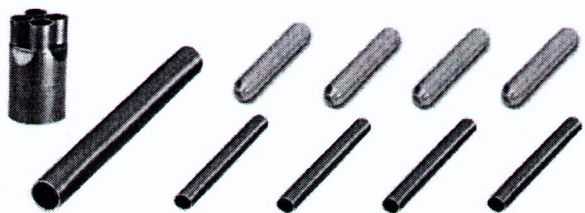
### 13.4 Junction Sets between ABC and Underground Cables

No.	Description	Unit	Requirements	Supplier's Offer
1	Country		to be specified	
2	Manufacturer		to be specified	
3	Manufacturer's Reference		to be specified	
4	Applicable Standards		NF C 33-021 EN 50483	
5	Type tests reports		To be provided	
6	Minimum life expectancy	Year	25	
7	Suitable for LV ABC conform to		NFC 33-209 and EDC-DTS-LV001	
8	Used for connecting ABC to underground cable		Yes	
9	Comprises:			
9.1	4 x bare aluminium junction sleeve for circular conductor core to be crimped with regular hexagonal compression indents. Specifically design sleeves with bolts tightening are also allowed.		Yes	
9.2	1 x heat shrinkable underground cable breakout (4 conductors) with compound inside,		Yes	
9.3	4 x Heat shrinkable sheaths, compound filled for insulation of junction sleeves		Yes	
9.4	65 cm of Heat shrinkable sheath without internal compound for UV protection of Underground cables conductors (neutral and phases).		Yes	
10	Bare sleeves compressed with		Regular hexagonal indent	



Handwritten signature and initials in blue ink.



11	Set for ABC 3x70+70 (N) /UGC 3X150+70 circular		<input type="checkbox"/>	
12	Set for ABC 3x150+70 (N)/UGC 3X240+120 circular		<input type="checkbox"/>	
13	Die sizes are:			
	ABC 70/UGC 150		215	
	ABC 70N/UGC 70		173	
	ABC 150/UGC 240		280	
	ABC 70N/UGC 120		173 or 215	
<b>14. Sleeves marking</b>				
14.1	Location of hexagonal compression indents		Yes	
14.2	The size of the die to be used		Yes	
14.3	Stripping length		Yes	
14.4	Cross sections		Yes	
14.5	Manufacturer logo		Yes	
14.6	Manufacturing batch reference or serial number on sleeves		Yes	
14.7	This marking shall be		engraved	
FOR SAMPLE ONLY				
Supplier's offer column must be properly filled with the right figures. "Compliant, Yes, ", V , etc..." are not accepted.				



Deviation from the technical specification:

The bidder shall list point after point and explain here in after all deviation from the requested technical specification.

1/

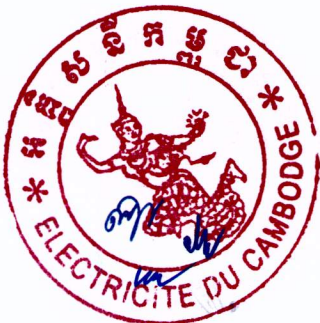
2/

3/

x/

**Full technical information shall be supplied within the bid. If not the offer shall not be considered**

Bidder signature:



*Handwritten signature in blue ink.*

**13.5 Insulating End Caps**

No.	Description	Unit	Requirements	Supplier's Offer
1	Country		to be specified	
2	Manufacturer		to be specified	
3	Manufacturer's Reference		to be specified	
4	Applicable Standards		To be specified	
5	Minimum life expectancy	Year	25	
6	Suitable for LV ABC conform to		NFC 33-209 and EDC-DTS-LV001	
7	to avoid exposure and isolate conductors' ends		Yes	
8	Colour		Black	
9	Type		cold or heat shrinkable	
10	naturally waterproof without the need of an additional component		Yes	
11	Marking		To be specified	

Supplier's offer column must be properly filled with the right figures. "Compliant, Yes, ", V , etc..." are not accepted.

**Deviation from the technical specification:**

The bidder shall list point after point and explain here in after all deviation from the requested technical specification.

1/  
2/  
3/  
x/

**Full technical information shall be supplied within the bid. If not the offer shall not be considered**

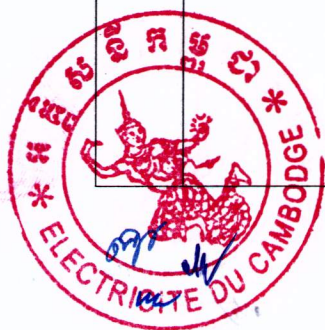
Bidder signature:






## 13.6 Service Connection End Braids

No.	Description	Unit	Requirements	Supplier's Offer
1	Country		to be specified	
2	Manufacturer		to be specified	
3	Manufacturer's Reference		to be specified	
4	Applicable Standards		EDF HN 33-S-82	
5	Type tests reports		To be provided	
6	Dielectric withstand in metallic balls (type test)	kV	4.0	
7	Minimum life expectancy	Year	30	
8	Suitable for 16 mm <sup>2</sup> to 35 mm <sup>2</sup> service LV ABC conform to		NFC 33-209 and EDC-DTS-LV001	
9	For connection ABC cable to a metering equipment with terminals made of copper or copper alloy		Yes	
10	Consist of a not dismountable assembly of:		One insulation piercing connecting device for ABC conductor from 16 mm <sup>2</sup> to 35 mm <sup>2</sup> Aluminium insulated service ABC	
			One very flexible insulated copper braid of 25 mm <sup>2</sup> cross section with a length Lf (as per table B1 of annex B of HN 33-S-82) of 25 cm connected to the piercing connector by crimping or similar system. The other end of the flexible braid shall be tinned massive and compressed or fitted with a compressed ferrule in order to reach the section S requested in annex B of HN 33-S-82	
			One fully insulated body over insulation piercing connecting device and connection between IPC and insulated copper braid.	



off  
M



11	Permanent carrying capacity of at least	A	90	
12	Max temperature with 90 A permanently	°C	90	
13	fitted with a torque limiting shear off head bolt		Yes	
14	Minimum/maximum tightening torque		To be specified	
15	When broken the bolt head shall be insulated with an insulating cap (case metallic bolt) or naturally insulated if made of insulating material		Yes	
16. Marking				
16.1	Manufacturer trade mark or logo		To be specified	
16.2	Date of manufacturing or batch number as well as factory reference		To be specified	
16.3	Cross section range	mm <sup>2</sup>	16 to 35	
16.4	EPCPAU		Yes	
16.5	Marking		indelible	
17. Delivery				
17.1	Black EBCPAU in bag of	pcs	100	
17.2	Blue EPCPAU in bag of	pcs	100	
FOR SAMPLE ONLY				
Supplier's offer column must be properly filled with the right figures. "Compliant, Yes, ", V , etc..." are not accepted.				



**Deviation from the technical specification:**

The bidder shall list point after point and explain here in after all deviation from the requested technical specification.

1/

2/

3/

x/

**Full technical information shall be supplied within the bid. If not the offer shall not be considered**

**Bidder signature:**



*Handwritten signature and initials in blue ink.*