



KINGDOM OF CAMBODIA
NATION RELIGION KING



ELECTRICITE DU CAMBODGE

TECHNICAL SPECIFICATION

EDC-DTS-MV004

**Longitudinally and Radially Waterproof
22 kV Cable (Aluminium Screen) and
Connecting Accessories**

December 2017





ELECTRICITE DU CAMBODGE

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Longitudinally and Radially Waterproof 22 kV Cable (Aluminium screen) and Connecting Accessories

1 Scope

This specification covers the design, manufacturing, supply, delivery, testing and performance requirement of longitudinally and radially waterproof 24 kV cables to be installed on the 22kV network of Electricité du Cambodge.

Three types of Cable are defined:

- 24 kV underground, unarmoured XLPE insulated single core,
- 24 kV underground, unarmoured XLPE insulated three single core twisted together cables,
- 24 kV unarmoured XLPE insulated three single core twisted together cables with a messenger to be installed on poles.

Terminating and jointing accessories that are installed on all cable types are also defined.

The cable screen (whatever the cross section) and its terminating and jointing accessories shall withstand the following operating condition:

- 22 kV Neutral artificially created through Zn transformer and then grounded through a resistor at the HV/MV Substation. The fault Current is limited to 787 Amperes.

So, considering the capacitive currents, the cable screen, all accessories and especially the metallic screen/earth connection device shall withstand a Phase to earth short circuit current of 2.5 kA/1s.

The life expectancy of all version of the 24 kV cables shall not be less than 30 years.

2 Standards

IEC : International Electro-technical Commission

IEC 60038 : IEC Standard Voltage

IEC 60060-1 : High – Voltage test technique

IEC 60183 : Guide to the selection of high - voltage cables

IEC 60228 : Conductors of insulated cables

IEC 60230 : Impulse tests on cables and their accessories

IEC 60386 : Guide to the short circuit temperature limits of electric cables with a rated voltage from 1.8/3 (3.6) kV to 18/30 (36) kV

IEC 60502 : Power cables with extruded insulation and their accessories for rated voltages from 1 kV ($U_m = 1.2$ kV) up to 30 kV ($U_m = 36$ kV)



- IEC 60502-2 : Cable for rated voltages of 6 kV ($U_m = 7.2$ kV) up to 30 kV ($U_m = 36$ kV)
- IEC 60502-4 : Test requirements on accessories for cables with rated voltages from 6 kV ($U_m = 7.2$ kV) up to 30 kV ($U_m = 36$ kV)
- IEC 60811 : Common test methods for insulating and sheathing materials of electric cables.
- IEC 60885-2 : Electrical test methods for electric cables
- IEC 60949 : Calculation of thermal Permissible Short Circuit Currents, taking into account non-adiabatic effects.
- IEC 61238-1 : Compression and mechanical connectors for power cables for rated voltages up to 30 kV ($U_m = 36$ kV).

French Standards

- NFC 33-223 : Insulated cable and their accessories for power system. Cross linked polyethylene cables of rated voltage from 6/10(12) kV up to 18/30(36) kV for distribution networks.
- NFC 33-226 : Insulated cables and their accessories for power systems – Cross-linked polyethylene cables of rated voltages from 6/10(12) kV up to 18/30(36) kV with fixed gradient for distribution networks
- NFC 33-014 : Screen tape connection device for unipolar cables of rated voltage from 6/10(12) kV up to 18/30(36) kV

ISO : International Standard Organization

- ISO 48 : Rubber, vulcanized or thermoplastic. Determination of hardness (hardness between 10 IRHD and 100 IRHD).
- ISO 9001 : Quality management systems – Requirements

Unless if standard year is specified, the latest version 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 Purchaser.

3 Definitions

The definition of the relevant IEC standards applies to this technical specification.

4 Testing and Inspection

4.1 General Notes for Test

Cables and accessories 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 IEC or national recommendations.

The cable and all accessories shall be subjected to test as specified below.



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4.2 Type Tests

All type tests required by the relevant IEC (60502-2, 60502-4) shall be carried out. Type tests carried out on very similar cables and accessories may be accepted.

In addition to the type tests requested by IEC standard, the following type test shall be carried out:

- Unsticking test of the metallic screen from the outer sheath as per Annex G of NF C 33-226 standard (or equivalent).

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 10 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.

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 relevant IEC standards shall be carried out on all equipment. Routine test reports shall be sent to EDC prior the shipment for EDC acceptance.

4.4 Sample Tests

The sample tests as requested by paragraph 17 of IEC 60502-2 shall be carried out. Sample test reports shall be sent to EDC prior the shipment for EDC acceptance.

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

The underground versions of the cable will be laid directly in the ground at a depth of 800 mm to 1000mm with an average soil temperature of 25°C. The Soil Thermal Resistivity will have an Average of 1.2°K.m/W and a Maximum of 3.0°K.m/W. In some specific cases, underground cables could be installed inside plastic pipes.

The overhead version will be installed strength between poles.

The cable 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%
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 Technical Requirements

7.1 Voltage Designations and Materials

The rated voltage of the cable U_0/U (U_m) shall be 12.7/22 (24) kV

In the voltage designation of cables U_0/U (U_m):

- U_0 is the rated power frequency voltage between conductor and earth or metallic screen for which the cable is designed;
- U is the rated power frequency voltage between conductors for which the cables is designed;
- U_m is the maximum value of the highest system voltage for which the equipment may be used (IEC 60038)

The rated voltage of the cable for given application shall be suitable for the operating conditions in the system in which the cable is used.

The system belongs to category A as per IEC 60502-2:

- Category A: This category comprises those systems in which any phase conductor that comes in contact with earth or an earth conductor, is disconnected from the system within 1 minute.

7.2 Maximum Permissible Temperatures

The maximum permissible temperature are as follows:

- Conductor



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- 90°C during normal operation
- 120°C under a short time overload (a total of 24 hours a year in separate of 3 hours at the most)
- 250°C under multi-phase short-circuit conditions during 5 second,

- Screen

- 200°C under earth/phase fault conditions during 5 second.

These temperatures are based on the intrinsic properties of the insulating materials. The values can be only used for calculation permissible current rating.

8 General Characteristics

8.1 Cable types

The cable types defined in the present specification are as follows:

- **Type 1:** Single core cable to be buried in a not rocky soil or use inside MV/LV substations,
- **Type 2:** Bundle consisting of three single-core cables and to be buried in a not rocky soil,
- **Type 3:** Bundle consisting of three single-core cables assembled around a bearer intended for use strength between poles.

In a bundle, the three single-core cables may come from different batches. However, they should be equivalent with respect to their formation, to the components used and their manufacturing process.

The manufacturer shall declare the minimum and maximum values of not joining twists.

8.2 Constitution of each Single Core Cable

Each single core cable shall be constituted of:

- Conductor;
- Conductor screen;
- Insulation;
- Insulation screen;
- Device preventing any longitudinal propagation of water;
- Radial waterproofness metallic screen;
- outer sheath;

8.2.1 Conductors

The conductors shall be of class 2 (IEC 60228) compacted aluminium or copper. The cores shall be circular. The cable cross section area of the cable to be provided are:

Conductor types	Cross section (mm ²)								
	Aluminium	70	95	150	185	240	300	400	500
Copper					240	300	400	500	630



For each cross section, the manufacturer must declare the minimum and maximum diameters of the conductor. The manufacturer shall provide the average diameter of the core and shall declare, for information, the number of strands constituting the core and their diameter.

8.2.2 Conductor Screen

The conductor screen shall consist of extruded synthetic semi-conducting compound. Use of a separator on the conductor is allowed. In this case, the separator must be made of a semi-conducting material. The extruded semi-conducting compound shall be firmly bonded to the insulation.

8.2.2.1 Thickness

The thickness of the conductor screen shall not be less than 0.5 mm.

8.2.3 Insulation

Insulation shall be made of extruded cross-linked polyethylene (XLPE).

8.2.3.1 Thickness

The nominal thickness of cross-linked polyethylene (XLPE) insulation shall be 5.5 mm.

8.2.4 Insulation Screen

The insulation screen shall consist of a semi-conducting extruded directly upon the insulation and shall consist of strippable semi-conducting compound. This layer could be longitudinally grooved.

It shall be easy to remove this insulation screen by hand without any tool. The maximum effort for removing the screen shall be less than 25 N. After stripping the insulation screen, the surface of the insulation shall be free of visible semi-conductor trace.

8.2.4.1 Thickness

The nominal thickness of the insulation screen shall be 0.5 mm. In case of grooves, their deep shall be 0.5 mm.

8.2.5 Extrusion

The conductor screen, the insulation and the insulation screen shall be extruded simultaneously. Other extrusion method is not accepted.

8.2.6 Longitudinal Waterproofness Component

This cable component shall stop any longitudinal propagation of water. It shall be constituted of either:

- Hygroscopic powder. In this case the insulation screen shall be longitudinally grooved and the powder must fill all groove. The verification of the hygroscopic capacity of this powder shall be checked by the water penetration test required by Annex F of IEC 60502-2 standard. The powder shall be easily removable during cable accessories implementation.
- Hygroscopic tape(s). In this case the insulation screen is not grooved and the tapes shall not isolate the conductor screen from the metallic screen. The verification of the hygroscopic capacity of the tape (s) shall be checked by the water penetration test required by Annex F of IEC 60502-2 standard



8.2.7 Metallic Screen

The metallic layer shall be applied over the longitudinal waterproofness component.

8.2.7.1 Construction

The single core cables shall comprise a metallic screen surrounding the core.

The metallic screen shall be made of **aluminium**. In order to be the radial water barrier of the cable, the metallic screen it shall be constituted of a **tape longitudinally applied around the cable with overlap of 5 mm**. This overlap shall be glued against the tape in order to form a metallic pipe. On the outside face of the tape, a varnish shall be applied for allowing the sticking of the tape with the outer sheath during its extrusion. **The metallic screen shall be firmly bonded to the outer sheath.**

This screen shall then form a metallic pipe that shall act as a radial water barrier.

8.2.7.2 Thickness

The thickness of the aluminium tape not be less than 0.2 mm.

8.2.7.3 Electrical Requirement

The metallic screen characteristics shall allow the cable to withstand the following operating conditions:

Core cross section	Phase to earth short circuit current
70 mm ²	1.25 kA, 1 sec
95 mm ²	
150 mm ²	2.5 kA, 1 sec
240 mm ²	
300 mm ²	
400 mm ²	
500 mm ²	
630 mm ²	

The manufacturer shall provide calculations based on IEC 60949 for Phase to earth short circuit current and the cross section and thickness of the metallic screen. In addition, a short circuit test as requested by paragraph B.6.2 of the NF C 33-226 standard shall be provided.

These data and test report shall be submitted within the bid.

8.2.8 Outer Sheath

The outer sheath shall be made of PVC (ST2) or HDPE (ST7) of black, grey or red colour for Type 1 and Type 2 cable (underground) and black colour with UV ray and weather resistant protection only for type 3 cable (overhead).

This outer sheath shall be extruded.

Tests on sheath compound shall be carried out according the requirement of table 20, 21 and 22 of IEC 60502-2. Test reports shall be supplied within the offer.

Any cable with an outer sheath not proved to be made of PVC ST2 or HDPE ST7 compounds shall not be accepted.



8.2.8.1 Thickness

The nominal thickness of the outer sheath shall be the one requested by NFC 33.223:

Core cross section	Outer sheath thickness
70 mm ²	3 mm
95 mm ²	3 mm
150 mm ²	3.1 mm
240 mm ²	3.2 mm
300 mm ²	3.3 mm
400 mm ²	3.5 mm
500 mm ²	3.6 mm
630 mm ²	3.7 mm

8.3 Assembly of Single Core Cables

8.3.1 Type 2 cable (underground three cores)

For type 2 cable, three single-core cables shall be twisted together. The bundled is assembled at the factory. The direction of assembling lay shall be right and the twisting pitch shall be comprised between 35 and 45 times the minimal diameter of a single core cable.

8.3.2 Type 3 cable (overhead three cores)

For type 3 cable, the three single-core cables shall be twisted around a bearer at the factory. The characteristics of lay and twisting pitch are identical to Type 2 cable.

8.3.2.1 Bearer

The core of the bearer shall be made of stranded galvanised steel wires. The cross section shall be 50 mm² with a nominal diameter of 9 mm. The core shall be insulated with black PVC or PE. The minimal thickness of insulation shall be 1.2 mm.

The minimal breaking load of the bearer shall be 64 kN.

8.4 Electrical Characteristics of Completed Cables

Type 1 and Type 2 cables				
Cross Section	Max DC resistance 20°C	Nominal current (1) (2)	Capacitance	Reactance (2)
(mm ²)	(Ω/km)	(A)	(μF/km)	(Ω/km)
Aluminium core				
70	0.443	186	0.189	0.148
95	0.320	224	0.209	0.141
150	0.206	283	0.240	0.132
240	0.125	373	0.286	0.123



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300	0.100	421	0.316	0.120
400	0.078	481	0.345	0.115
500	0.0605	542	0.380	0.111
630	0.0469	603	0.704	0.084
Copper core				
240	0.0754	478	0.286	0.123
300	0.0601	537	0.316	0.120
400	0.0470	609	0.345	0.115
500	0.0366	680	0.380	0.111
630	0.0283	735	0.704	0.084

(1) Soil temperature 30°C, soil thermal resistivity 1.2 °Km/W, and depth of laying 80 cm (load factor = 0.8). Earthing of screens is on both ends

(2) Trefoil installation for type 1 cable. Earthing of screens is on both ends

Type 3 cables (ABC)				
Cross Section	Max DC resistance	Nominal current	Capacitance	Reactance
	20°C	(1)		(2)
(mm²)	(Ω/km)	(A)	(μF/km)	(Ω/km)
Aluminium core				
70	0.443	197	0.189	0.148
95	0.320	239	0.209	0.141
150	0.206	310	0.240	0.132
240	0.125	418	0.286	0.123
Copper core				
240	0.0754	541	0.286	0.123

(1) Ambient temperature 45°C (load factor = 0.8) where cables are protected from direct solar radiation.

8.5 Marking

Each phase conductor of bundled cable shall have the range of markings listed here below, **engraved or embossed** on the outer sheath surface at one meter intervals.

- Manufacturer's identification : YY
- Supplier Name : ZZZ
- Manufacturing batch reference : XXXX



- Year of manufacture : four digits
- Cross section : for example 240 mm²
- Designation of conductor type : AL or Cu
- Rated voltage class : 12.7/22 (24) kV
- The phase number (Type 2 and 3 only) : P1, P2, P3
- Reference Standard : IEC xxxxxx

The markings shall be made in the sequence indicated above. For example if the manufacturer is YY and the cable is manufactured in 2015, the markings would be:

- YY – ZZZ - XXXX-2015-240-AL-12.7/22 (24) kV - P1 - IEC xxxxxx-

Type 1 cables does not need phase marking. Nevertheless, special orders of very long type 1 single core cable length could request a specific marking of phases.

In addition, for all type of cable, a metric length marking shall appear every meter. This metric marking shall be mentioned on only one phase of a bundle or on the bearer of Type 3 cable. This marking shall be engraved or embossed on a different face than the main cable marking.

8.6 Protection for Storage and Delivery

Each element (phase conductor or barrier) must be fitted with an individual end device preventing the penetration of water or moisture during storage and delivery. This device can be a heat shrinkable end cap.

8.7 Drums and Marking

Underground Cables shall be delivered wound on strong wooden drums treated to an approved international standard by impregnation with copper-chrome-arsenate (CCA) preservative to resist rotting and termite and fungus attacks. Steel drums shall be also accepted. Drums with an outside diameter exceeding 2.5 meters and outside width exceeding 1.4 meter shall not be used except with the Purchaser's approval. The drum shall be no returnable. The central hole of the drums shall be reinforced with a steel plate of thickness not less than 10 mm to fit an axle of size 95mm diameter.

The interior of the conductor drums shall be lined with bituminous paper to prevent the conductor being in contact with the timber. Waterproof paper and felt lining shall overlap at seams by at least 20 mm, and the seams shall be sealed.

Drums shall be adequately protected by securely fastening substantial wooden battens around the periphery. These battens shall be secured by means of steel tap bindings.

Cables shall be securely fastened around the periphery of the drum. Cables shall be supplied with both ends properly capped, and protected against damage and water penetration. Each drum shall bear a metal label detailing manufacturer's name, specified voltage, and type and length of conductor. Cable drums shall be suitable for outside storage, for a minimum period of five years in the Cambodia climate, the inner cable end attached to the drum shall be capped and sealed in such a manner that the core screening and sheath are able to be merged from the outer cable end without removing the inner end cap.

All nails and metallic parts of the inner surfaces must be countersunk so that they cannot damage the cable.



The thread of bolts used to strengthen the cable drums shall be in such a way that the nut can be tightened but cannot readily removed.

Drums shall not be treated with chemicals injurious to the conductors.

The minimal cable length per drum shall be:

Cable Type	Minimum length
Type 1 from 70 to 300 mm ² above 300 mm ²	1000 m ±5 m On EDC request
Type 2 and 3 from 70 to 300 mm ² above 300 mm ²	300 m ±5 m On EDC request

Drums shall be marked with the indelible following information:

- Manufacturer name
- Supplier name
- Month/Year of manufacture
- Batch number
- Total gross weight and Net weight
- Distributor's name
- Cable references and cross section
- Length of cable (m)

9 Accessories

9.1 General

All accessories shall be suitable for the requested 22 kV, MV cable. Accessories shall be strictly identical for all Type 1, Type 2 and Type 3 cables.

The following connecting accessories shall be supplied:

- Outdoor terminations
- Indoor terminations
- Straight joints
- Screened separable connectors.

With the exception of screened separable connectors, all connecting accessories shall be of **cold shrinkable type**. Separable connectors shall be of EPDM pre-moulded type.

All accessories shall be type tested according the requirement of IEC 60502-4.

All the equipment offered for joints, terminations and separable connectors shall conform to the following requirements:



- Connecting accessories shall be supplied in complete kit form for 3 phases with all materials and components required to complete the installation. Connectors and terminal lugs shall also be included in each kit.
- Only cold shrink method for Joint and termination Kits shall be accepted.
- All components shall be capable of being stored without damage or deterioration at temperature up to 50°C. The material expiring date shall be marked on all packages, where appropriate.
- Details of all equipment, tools and protective clothing required to complete the joint, termination and screened separable connector shall be mentioned in the accessories instruction manual.
- Each kit shall include a complete instruction manual in **English and Khmer** languages for implementing the accessory on the here above specified cable.

9.1.1 Technical Characteristics

The rated voltage of the accessories U_o/U (U_m) shall be 12.7/22 (24) kV.

Those accessories shall withstand at least the temperature conditions of the 22kV cables:

- Conductor:

- 90°C during normal operation
- 120°C under a short time overload (a total of 24 hours a year in separate of 3 hours at the most)
- 250°C under multi-phase short-circuit conditions during 5 second,

- Screen:

- 200°C under earth/phase fault conditions during 5 second.

Accessories shall be provided for the following cables cross section area:

Conductor types	Cross section (mm ²)								
	Aluminium	70	95	150	185	240	300	400	500
Copper					240	300	400	500	630

9.1.2 Components

Components shall not be adversely affected in any manner by contact with other materials normally used in the construction of cable joint, termination and separable connectors and shall not increase the rate of corrosion of any metals with which they may come into contact.

Components supplied with adhesive coatings shall have means to prevent the coated surfaces from adhering to each other.

Accessories shall be designed to provide a complete moisture seal, and complete re-jacketing of the individual cables. These components shall be suitable for indoor and/or outdoor installation and they shall be resistant to ultra violet radiation and chemical attack.

Electric field stress control shall be provided on the joints, terminations and screened separable connectors.



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9.1.3 Marking

Name of manufacturer as well as equipment reference shall be clearly mentioned on the equipment. In addition, the serial number of the accessory shall be permanently and clearly visible on the accessory all along its lifespan.

9.1.4 Cable Metallic Screen Connection

Joints and Terminations Accessories shall reconstitute the continuity of the metallic screens of the cable or allow the connection of the cable metallic screen to the earth.

For that purpose, all cable connexion accessories shall be supplied with a device for cable screen connection

This cable screen connection device shall withstand the following operating conditions:

- Phase to earth short circuit current: 2.5 kA, 1s
- A permanent induction current of 10 A

For outdoor terminations, Indoor terminations and separable connectors the flexible earthing braid of the cable screen connection device shall be tinned and shall be designed in order to avoid penetration of moisture inside the cable or the connection accessory. For this purpose; it could be massive tinned on 12mm. The end of the braid opposite to the cable metallic screen shall be rigid and designed to receive a 10 mm diameter bolt for connection to other braids and the earthing conductor.

For straight joints the flexible earthing braid shall be designed to avoid any penetration of water inside the cable and shall be mandatorily insulated. All 6 insulated braids shall be connected together using a specific insulated connector. This connector is included in the supply.

9.1.5 Connector and Terminal Lugs

Connectors and terminal lugs shall be conformed to the requirement of IEC 61236 (class A)

Connectors and terminals lugs shall perform without distress under normal, cyclic loading and fault conditions, and shall not limit the rating of the cables that they joint.

They shall be of **mechanical tightening type**. Bolts shall be of metric size. The range of connectors and terminals lugs offered shall be suitable for tightening with shear off screw heads. The shear head breaking off shall always occur inside the connector body (never protruding) in order to reduce electrical stress.

The ends of connectors and terminals lugs shall be suitably chamfered coned to facilitate insertion of the conductors. Connectors shall have a solid central barrier to facilitate the insertion of the conductor to the correct depth. End of splices and connectors shall be fitted with plastic cap.

Compounds or greases for improving contact between the connector or terminal and the conductor are permitted. They must, however, be chemically neutral to the connector, terminal and conductor materials and must be present in the delivered connectors and terminals lugs.

Cable connectors and terminals shall be able to accommodate typical variations in dimensions of cable supplied by different manufacturers.



The palm of outdoor termination lugs shall be suitable to be connected onto another aluminium palm with an aluminium alloy 14 mm diameter metric bolt for cross section of 240 mm² and less and 16 mm for 300 mm² and 400 mm². For bigger cross section this shall be defined a tendering stage.

The palm of indoor termination lug shall be suitable to be connected onto a copper or copper alloy pad with a copper 12 mm diameter metric bolt for cross section of 240 mm², 16 mm for 300 mm² and 400 mm². For bigger cross section this shall be defined a tendering stage.

9.2 Outdoor Terminations

The outdoor terminations shall be supplied within a complete kit for 3-phase.

It shall include all components for the complete implementation of the termination set. The Termination Kit shall include:

- End lugs for cable phases for connection on aluminium pad,
- Terminations of cold shrinkable type,
- Earthing connection for the metallic screens of the 3 single core cables,
- Galvanized steel orientable 3 x single core cable bracket for supporting terminations.

The minimum creepage distance for 24 kV outdoor termination shall be 600 mm.

The outdoor termination shall be designed in order to avoid any penetration of water or moisture inside the cable and more especially inside the metallic core.

The supporting steel bracket shall be hot dip galvanized and collars for attaching the single core cables shall be made of insulating material. The bracket shall be suitable for circular or rectangular shape concrete poles and it shall be possible to fix it on the pole either with bolts or stainless-steel straps.

9.3 Indoor Terminations

The indoor terminations shall be supplied within a complete kit for 3-phase.

It shall include all components for the complete implementation of the termination set. The Termination Kit shall include:

- End lugs for cable phases for connection on copper pad,
- Terminations of cold shrinkable type,
- Earthing connection for the metallic screens of the 3 single-core cables.

The indoor termination shall be designed in order to avoid any penetration of water or moisture inside the cable.

Indoor terminations shall be suitable for installation in MV Circuit Breaker Cubicles of HV/MV Substations and in load break switches of Ring Main Units (RMU). For this purpose, the indoor termination shall be of "short" cold shrinkable type.

9.4 Straight Joint

The straight joints shall be supplied within a complete kit for 3-phase. It shall include all components for the complete implementation of the straight set. The straight joint kit shall include:

- Connectors of mechanical tightening type
- Straight joints of cold shrinkable type
- Insulated Earthing connection for the metallic screens of the 6 single-core cables with connector



The cable route is subject to periodic flooding and sections of the cable and the cable joints may be submerged in water for long periods. The cable Joints must withstand these installation conditions. The recovered thickness of insulation over the connector of straight joints shall be uniform and equal to or greater than the cable insulation thickness as given in IEC 60502-2.

The Joint kits shall comprise all the items necessary to complete the functions including mechanical tightening splices. Joints shall provide waterproofing, mechanical and electrical protection, and they shall be completely sealed from cable jacket to cable jacket.

Cable screens continuity shall be fully insulated from the earth. The screens shall not be earthed at joint location but only connected together.

9.5 Screened Separable Connectors

The separable connectors shall be conformed to the requirement of EN 50180 and EN 50181 standards. They shall be of EPDM pre-moulded manufacturing. They shall be of screened type. The screened separable connectors shall be supplied within a complete kit for 3-phase. It shall include all components for the complete implementation. The kit shall include:

- Connectors of mechanical tightening type
- Pre-moulded body of screened separable connector
- Earthing connection for the metallic screens of the 3 single core cables

According EN 50180 and 50181, two types of screened separable connectors will be supplied:

- Interface A: to be used for connection of transformer inside MV/LV substation,
- Interface C: to be used on MV network for cable connection on RMU

Depending of the equipment to be connected, both interface type connectors can be of straight or elbow type.

Interface	Rated current	Type
A	250 A	Dead break Straight plug in / elbow plug in
C	630 A	M16 Bolted T type

For interface A screen separable connectors, the fixing bail shall be supplied within the kit.

The flexible earthing braid of the cable screen connection device shall be tinned and shall be designed in order to avoid penetration of moisture inside the cable or the screen separable connector. For this purpose; it could be massive tinned on 12 mm.

The end of the braid opposite to the Pin plate shall be rigid and designed to receive a 10 mm diameter bolt for connection to other braids and the earthing conductor.

9.6 Accessories Packing/Marking

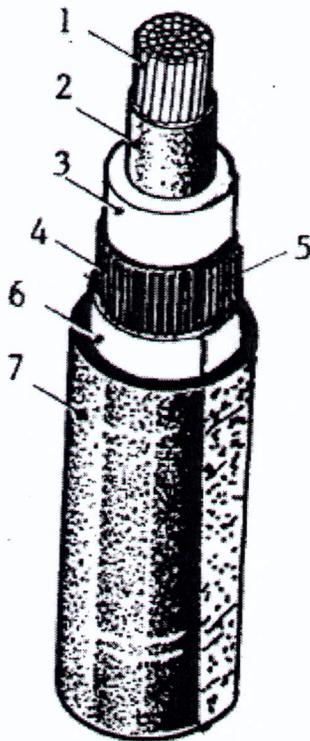
All connecting accessories kit shall be delivered individually packed in strong card box and card box properly stored on a pallet.

Each card box shall be clearly marked with:

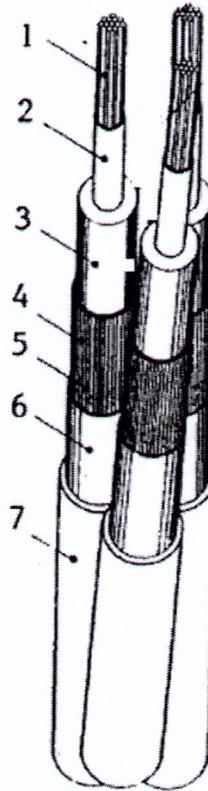


- Name / Logo of the Manufacturer
- The type of accessory
- The Cross section
- Packing date
- Distributor's name
- Expiring date (if appropriate)

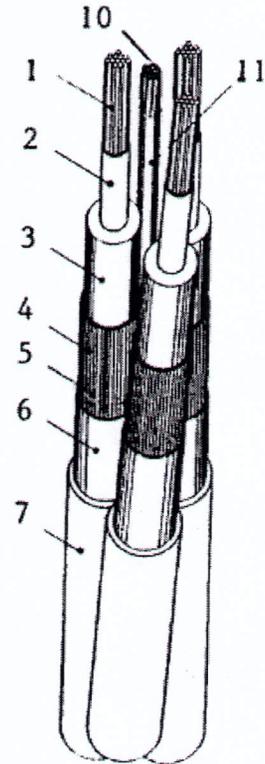
10 Drawings



Type 1



Type 2



Type 3

- 1 : Conductor
- 2 : Conductor Screen
- 3 : Insulation
- 4 : Insulation Screen
- 5 : Longitudinal Waterproofness Component
- 6 : Aluminum tape longitudinally applied around the cable with overlap of 5 mm. and firmly bonded to the outer sheath
- 7 : outer sheath PVC (ST2) or HDPE (ST7)

10 : galvanized steel core of messenger (50 mm²)

11 : Messenger insulation sheath (PVC or PE), 1.2 mm



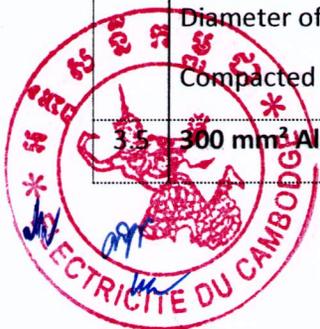
11 Technical Data Sheets

11.1 22 kV Cable

No.	Description	Unit	Requirement	Supplier's Offer
1	Country		to be specified	
2	Manufacturer		to be specified	
3	Manufacturer's reference		to be specified	
4	Standard		IEC 60502-2	
5	Type test reports as per § 4.2 and IEC 60502		To be provided	
6	ISO 9001 for design, development and production		Yes. Certificate to be provided	
General				
1	Available Type: -Type 1: single core -Type 2: bundle consisting of three single-core cables -Type 3: bundle consisting of three single-core cables assembled around a bearer		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
2	Life expectancy	Year	≥ 30	
3	Withstand the soil and ambient conditions required in §6		Yes	
4	U _o /U (U _m)	kV	12.7/22 (24)	
5	Impulse Withstand Voltage 1.2/50 μs	kV	125	
6	Category A cable as per IEC 60502-2		Yes	
Construction and physical characteristics				
1	Maximum permissible temperature of conductor: During normal operation short time overload (a total of 24 hours a year in separate of 3 hours at the most) multi-phase short-circuit (5 second)	°C	90 120 250	



2	Maximum permissible temperature of metallic screen: earth/phase fault (5 second).	°C	200	
3	Conductors class 2 (IEC 60228) Cross sections		Yes	
3.1	70 mm² Aluminum		<input type="checkbox"/>	
	Min diameter	mm	To be mentioned	
	Max diameter	mm	To be mentioned	
	Number of strands		To be mentioned	
	Diameter of strands	mm	To be mentioned	
	Compacted core		Yes	
3.2	95 mm² Aluminum		<input type="checkbox"/>	
	Min diameter	mm	To be mentioned	
	Max diameter	mm	To be mentioned	
	Number of strands		To be mentioned	
	Diameter of strands	mm	To be mentioned	
	Compacted core		Yes	
3.3	150 mm² Aluminum		<input type="checkbox"/>	
	Min diameter	mm	To be mentioned	
	Max diameter	mm	To be mentioned	
	Number of strands		To be mentioned	
	Diameter of strands	mm	To be mentioned	
	Compacted core		Yes	
3.4	240 mm² Aluminum		<input type="checkbox"/>	
	Min diameter	mm	To be mentioned	
	Max diameter	mm	To be mentioned	
	Number of strands		To be mentioned	
	Diameter of strands	mm	To be mentioned	
	Compacted core		Yes	
3.5	300 mm² Aluminum		<input type="checkbox"/>	



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	Min diameter	mm	To be mentioned	
	Max diameter	mm	To be mentioned	
	Number of strands		To be mentioned	
	Diameter of strands	mm	To be mentioned	
	Compacted core		Yes	
3.6	400 mm² Aluminum		<input type="checkbox"/>	
	Min diameter	mm	To be mentioned	
	Max diameter	mm	To be mentioned	
	Number of strands		To be mentioned	
	Diameter of strands	mm	To be mentioned	
	Compacted core		Yes	
3.7	500 mm² Aluminum		<input type="checkbox"/>	
	Min diameter	mm	To be mentioned	
	Max diameter	mm	To be mentioned	
	Number of strands		To be mentioned	
	Diameter of strands	mm	To be mentioned	
	Compacted core		Yes	
3.8	630 mm² Aluminum		<input type="checkbox"/>	
	Min diameter	mm	To be mentioned	
	Max diameter	mm	To be mentioned	
	Number of strands		To be mentioned	
	Diameter of strands	mm	To be mentioned	
	Compacted core		Yes	
3.9	240 mm² Copper		<input type="checkbox"/>	
	Min diameter	mm	To be mentioned	
	Max diameter	mm	To be mentioned	
	Number of strands		To be mentioned	
	Diameter of strands	mm	To be mentioned	
	Compacted core		Yes	
3.10	300 mm² Copper		<input type="checkbox"/>	



	Min diameter	mm	To be mentioned	
	Max diameter	mm	To be mentioned	
	Number of strands		To be mentioned	
	Diameter of strands	mm	To be mentioned	
	Compacted core		Yes	
3.11	400 mm² Copper		<input type="checkbox"/>	
	Min diameter	mm	To be mentioned	
	Max diameter	mm	To be mentioned	
	Number of strands		To be mentioned	
	Diameter of strands	mm	To be mentioned	
	Compacted core		Yes	
3.12	500 mm² Copper		<input type="checkbox"/>	
	Min diameter	mm	To be mentioned	
	Max diameter	mm	To be mentioned	
	Number of strands		To be mentioned	
	Diameter of strands	mm	To be mentioned	
	Compacted core		Yes	
3.13	630 mm² Copper		<input type="checkbox"/>	
	Min diameter	mm	To be mentioned	
	Max diameter	mm	To be mentioned	
	Number of strands		To be mentioned	
	Diameter of strands	mm	To be mentioned	
	Compacted core		Yes	
4	<u>Conductor screen</u>			
	Extruded synthetic semi-conducting compound		Yes	
	Separator between core and screen		To be mentioned	
	Separator material (if any)		To be mentioned	
	Firmly bonded to the insulation		Yes	
	Thickness	mm	≥ 0.5	
	<u>Insulation</u>			



	-Cross linked polyethylene (XLPE) -Thickness -Dimeter over insulation: 70 mm ² 95 mm ² 150 mm ² 240 mm ² 300 mm ² 400 mm ² 500 mm ² 630 mm ²	mm mm mm mm mm mm mm mm mm	Yes 5.5 To be mentioned To be mentioned To be mentioned To be mentioned To be mentioned To be mentioned To be mentioned	
6	<u>Insulation screen</u> semi-conducting extruded directly upon the insulation strippable maximum effort for removing the screen insulation free of visible semi-conductor trace after stripping Grooves Nominal thickness of screen Nominal thickness of grooves (if any)	 N mm mm	 Yes Yes 25 Yes Yes or not 0.5 0.5	
7	<u>Extrusion</u> Simultaneous extrusion of conductor screen, insulation and the insulation screen		Yes	
8a	Description of process		To be provided	
8	<u>Longitudinal waterproofness component</u> Stop any longitudinal propagation of water Hygroscopic powder Hygroscopic tape(s) water penetration test as per Annex F of IEC 60502-2 standard		Yes Yes or No Yes or No To be provided	
9	<u>Metallic Screen</u>			



	<p>Applied over the longitudinal waterproofness component</p> <p>Made of aluminum</p> <p>tape longitudinally applied around the cable with overlap of 5 mm</p> <p>overlap glued against the tape</p> <p>The metallic screen is firmly bonded to the outer sheath</p> <p>aluminum tape thickness</p> <p>Phase to earth short circuit current metallic screen withstand (1 second):</p> <p>70 mm² - 95 mm² cables</p> <p>150 mm² and more</p> <p>Calculations based on IEC 60949</p> <p>short circuit test as per paragraph B.6.2 of the NF C 33-226</p>		<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>mm</p> <p>≥ 0.2</p> <p>kA/1s</p> <p>1.25</p> <p>kA/1s</p> <p>2.5</p> <p>To be provided</p> <p>To be provided</p>	
10	<p>Outer sheath</p> <p>-Made of PVC (ST2) HDPE (ST7)</p> <p>-Proof of ST2 or ST7</p> <p>-Black, grey or red color for Type 1 and Type 2 cable</p> <p>-Black color with UV ray protection for type 3 cable (overhead).</p> <p>-The outer sheath is extruded.</p> <p>-Nominal thickness as per NFC 33-223:</p> <p>70 mm²</p> <p>95 mm²</p> <p>150 mm²</p> <p>240 mm²</p> <p>300 mm²</p> <p>400 mm²</p> <p>500 mm²</p> <p>630 mm²</p>		<p>To be mentioned</p> <p>To be provided</p> <p>To be mentioned</p> <p>To be mentioned</p> <p>To be mentioned</p> <p>mm</p> <p>3</p> <p>mm</p> <p>3.1</p> <p>mm</p> <p>3.1</p> <p>mm</p> <p>3.2</p> <p>mm</p> <p>3.3</p> <p>mm</p> <p>3.5</p> <p>mm</p> <p>3.6</p> <p>mm</p> <p>3.7</p>	



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11	<p align="center">Diameter of completed core</p> <p>70 mm² AL</p> <p>95 mm² AL</p> <p>150 mm² AL</p> <p>240 mm² AL</p> <p>300 mm² AL</p> <p>400 mm² AL</p> <p>500 mm² AL</p> <p>630 mm² AL</p> <p>240 mm² Cu</p> <p>300 mm² Cu</p> <p>400 mm² Cu</p> <p>500 mm² Cu</p> <p>630 mm² Cu</p>	mm	To be specified	
12	<p align="center">Assembly of single core Cables</p> <p align="center">Type 2 cable (underground)</p> <p>Three single-core cables twisted together</p> <p>Assembled at the factory</p> <p>Right direction of assembling lay</p> <p>Twisting pitch comprised between 35 and 45 times the minimal diameter of a single-core</p> <p>Twisting pitch:</p> <p>70 mm² AL</p> <p>95 mm² AL</p> <p>150 mm² AL</p> <p>240 mm² AL</p> <p>300 mm² AL</p> <p>400 mm² AL</p> <p>500 mm² AL</p> <p>630 mm² AL</p>		<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>To be mentioned</p>	



	240 mm ² Cu	mm	To be mentioned	
	300 mm ² Cu	mm	To be mentioned	
	400 mm ² Cu	mm	To be mentioned	
	500 mm ² Cu	mm	To be mentioned	
	630 mm ² Cu			
12.b	Type 3 cable (overhead)		Yes	
	Three single core cables twisted around a bearer		Yes	
	Assembled at the factory		Yes	
	Right direction of assembling lay		Yes	
	Twisting pitch comprised between 35 and 45 times the minimal diameter of a single core			
	Twisting pitch:			
	70 mm ² AL	mm	To be mentioned	
	95 mm ² AL	mm	To be mentioned	
	150 mm ² AL	mm	To be mentioned	
	240 mm ² AL	mm	To be mentioned	
	300 mm ² AL	mm	To be mentioned	
	400 mm ² AL	mm	To be mentioned	
	500 mm ² AL	mm	To be mentioned	
	630 mm ² AL	mm	To be mentioned	
	240 mm ² Cu	mm	To be mentioned	
	300 mm ² Cu	mm	To be mentioned	
	400 mm ² Cu	mm	To be mentioned	
	500 mm ² Cu	mm	To be mentioned	
	630 mm ² Cu	mm	To be mentioned	
12.c	Messenger			
	Core made of stranded galvanized steel wires		Yes	
	Cross section	mm ²	50	
	Nominal diameter	mm	9	



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	Black PVC or PE thickness of insulation	mm	To be mentioned ≥ 1.2	
	Minimal breaking load	kN	64	
13	Electrical characteristics of completed cables Type 1 in trefoil formation and Type 2			
13.a	DC resistance 20°C	Ω/km		
	70 mm ² AL		0.443	
	95 mm ² AL		0.320	
	150 mm ² AL		0.206	
	240 mm ² AL		0.125	
	300 mm ² AL		0.100	
	400 mm ² AL		0.078	
	500 mm ² AL		0.0605	
	630 mm ² AL		0.0469	
	240 mm ² Cu		0.0754	
	300 mm ² Cu		0.0601	
	400 mm ² Cu		0.0470	
	500 mm ² Cu		0.0366	
	630 mm ² Cu		0.0283	
13.b	Nominal current type 1 and Type 2 cable Soil temperature 30°C, soil thermal resistivity 1.2 °Km/W, and depth of laying 80 cm (load factor = 0.8). Earthing of screens is on both ends	A		
	70 mm ² AL		186	
	95 mm ² AL		224	
	150 mm ² AL		283	
	240 mm ² AL		373	
	300 mm ² AL		421	
	400 mm ² AL		481	
	500 mm ² AL		542	



	630 mm ² AL		603	
	240 mm ² Cu		478	
	300 mm ² Cu		537	
	400 mm ² Cu		609	
	500 mm ² Cu		680	
	630 mm ² Cu		735	
13.c	Nominal current Type 3 cable Ambient temperature 45°C (load factor = 0.8) where cables are protected from direct solar radiation.	A		
	70 mm ² AL		478	
	95 mm ² AL		537	
	150 mm ² AL		609	
	240 mm ² AL		680	
	240 mm ² Cu		735	
13.d	Capacitance	μF/km		
	70 mm ² AL		0.189	
	95 mm ² AL		0.209	
	150 mm ² AL		0.240	
	240 mm ² AL		0.286	
	300 mm ² AL		0.316	
	400 mm ² AL		0.345	
	500 mm ² AL		0.380	
	630 mm ² AL		0.704	
	240 mm ² Cu		0.286	
	300 mm ² Cu		0.316	
	400 mm ² Cu		0.345	
	500 mm ² Cu		0.380	
	630 mm ² Cu		0.704	
13.e	Resistance Trefoil installation for type 1 cable. Earthing of screens is on both ends	Ω/km		



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	70 mm ² AL		0.148	
	95 mm ² AL		0.141	
	150 mm ² AL		0.132	
	240 mm ² AL		0.123	
	300 mm ² AL		0.120	
	400 mm ² AL		0.115	
	500 mm ² AL		0.111	
	630 mm ² AL		0.084	
	240 mm ² Cu		0.123	
	300 mm ² Cu		0.120	
	400 mm ² Cu		0.115	
	500 mm ² Cu		0.111	
	630 mm ² Cu		0.084	
14	Core marking			
	Marking on each core of bundle		Yes	
	Marking embossed or engraved		Yes	
	One meter interval		Yes	
	Manufacturer's identification : YY		Yes	
	Manufacturing batch reference : XXXX		Yes	
	Year of manufacture : four digits		Yes	
	Cross section : for example 240 mm ²		Yes	
	Designation of conductor type : AL or Cu		Yes	
	Rated voltage class : 12.7/22 (24) kV		Yes	
	The phase number (Type 2 and 3 only) : P1, P2, P3		Yes	
14.a	Reference Standard : (IEC xxxxxx)		Yes	
	Sequence marking			
	- YY – XXXX-2015-240-AL-12.7/22 (24) kV - P1 - IEC xxxxxx-		Yes	
14.b	Metric length marking			
	Appear every meter		Yes	



	Mentioned on only one phase of a bundle (type 2 cable) or on the bearer of Type 3 cable.		Yes	
	Engraved, embossed or printed on a different face than the main cable marking		Yes	
15	Protection for storage and delivery Each element (phase conductor or barrier) is fitted with an individual end device preventing the penetration of water or moisture during storage and delivery Description of the device		Yes To be mentioned	
16	Drums and Marking in accordance with requirement of paragraph 8.6 (any difference must be clearly mentioned)		Yes	

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:

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11.2 22 kV Cable Accessories

No.	Description	Unit	Requirement	Supplier's Offer
1	Country		to be specified	
2	Manufacturer		to be specified	
3	Manufacturer's references		to be specified	
4	Standard		IEC 60502-4	
5	Type test reports as per § 4.2 and IEC 60502-4		To be provided	
6	ISO 9001 for design, development and production		Yes. Certificate to be provided	
General				
1	All accessories are suitable for the requested 22 kV MV cable		Yes	
2	Accessories are strictly identical for all Type 1, Type 2 and Type 3 cables		Yes	
3	- Outdoor terminations - Indoor terminations - Straight joints - Screened separable connectors		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
4	Cold shrinkable technology for: - Outdoor terminations - Indoor terminations - Straight joints		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
5	EPDM pre-molded type for screened separable connectors		Yes	
6	Life expectancy	Year	≥ 30	
7	Type tests according the requirement of IEC 60502-4		To be provided	
8	Supplied in complete kit form for 3 phases with all materials and components required to complete the installation		Yes	
9	Connectors and terminal lugs included with each kit		Yes	



10	components shall be capable of being stored without damage or deterioration at a temperature up to 50°C		Yes	
11	Expiring date marked on all packages, where appropriate.		Yes	
12	Details of all equipment, tools and protective clothing required to complete the accessory is included with each kit		Yes	
13	Each kit includes a complete instruction manual in English and Khmer languages for implementing the accessory on the here above specified cable		Yes	
Technical characteristics				
1	Uo/U (Um) Power Frequency withstands voltage, 1mn	kV kV	12.7/22 (24) 125	
2	Minimum permissible temperature of accessories: During normal operation short time overload (a total of 24 hours a year in separate of 3 hours at the most) Multi-phase short-circuit (5 second)	°C	90 120 250	
3	Available for : 70 mm ² AL cable 150 mm ² AL cable 185 mm ² AL cable 240 mm ² AL cable 300 mm ² AL cable 400 mm ² AL cable 500 mm AL cable 630 mm ² AL cable 240 mm ² Cu cable 300 mm ² Cu cable 400 mm ² Cu cable 500 mm Cu cable		<input type="checkbox"/> <input type="checkbox"/>	



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	<p>diameter bolt. (terminations and separable connector only)</p> <p>The flexible earthing braid of straight joints shall be designed to avoid any penetration of water inside the cable and shall be mandatorily insulated. All 6 insulated braids shall be connected together using a specific insulated connector. This connector is included in the supply</p> <p>Description of the Design</p>		<p>Yes</p> <p>To be mentioned</p>	
<p>10</p>	<p>Connector and Terminal lugs</p> <ul style="list-style-type: none"> -Connectors and terminal lugs are conform to the requirement of IEC 61236 (class A) -Connectors and terminals lugs perform without distress under normal, cyclic loading and fault conditions -They are not limiting the rating of the cables that they joint. -Mechanical tightening type. -Bolts of metric size. -The range of connectors and -Shear off screw heads. -The shear head breaking off always occur inside the connector body -The ends of connectors and terminals lugs are suitably chamfered -Connectors have a solid central barrier to facilitate the insertion of the conductor to the correct depth. -End of splices and connectors are fitted with plastic cap. -Compounds or greases -Description of compound or grease if any Connectors and terminals are able to accommodate typical variations in core dimensions -The palm of outdoor termination lugs is suitable to be connected onto another 		<p><input type="checkbox"/></p> <p>Yes</p>	



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	<p>aluminum palm with an aluminum alloy 14 mm diameter metric bolt for cross section of 240mm² and less and 16 mm for 300 mm² and 400 mm².</p> <p>-The palm of indoor termination lug is suitable to be connected onto a copper or copper alloy pad with a copper 12 mm diameter metric bolt for cross section of 240 mm², 16 mm for 300 mm² and 400 mm²</p>		<p>Yes</p> <p>Yes</p>	
11	<p>Outdoor terminations</p> <p>-Supplied within a complete kit for 3-phase.</p> <p>-Include all components for the complete implementation of the termination set:</p> <p>-End lugs for cable phases for connection on aluminum pad,</p> <p>-Terminations of cold shrinkable type,</p> <p>-Earthing connection for the metallic screens of the 3 single core cables,</p> <p>-Galvanized steel orientable 3 x single core cable bracket for supporting terminations.</p> <p>-Minimum creepage distance</p> <p>-Designed in order to avoid any penetration of water or moisture inside the cable and inside the metallic core</p> <p>-Hot dip galvanized supporting steel bracket</p> <p>-Suitable for circular or rectangular shape concrete poles</p> <p>-Possible to fix it on the pole either with bolts or stainless-steel straps.</p> <p>-Collars for attaching the single core cables made of insulating material.</p>	mm	<p><input type="checkbox"/></p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>600</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>	
12	<p>Indoor terminations</p> <p>-Supplied within a complete kit for 3-phase.</p> <p>-include all components for the complete implementation of the termination set:</p> <p>-End lugs for cable phases for connection on copper pad,</p>		<p><input type="checkbox"/></p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>	



	<ul style="list-style-type: none"> -Terminations of cold shrinkable type, -Earthing connection for the metallic screens of the 3 single core cables. -Designed in order to avoid any penetration of water or moisture inside the cable. -Indoor terminations are suitable for installation in MV Circuit Breaker Cubicles of HV/MV Substations and in load break switches of Ring Main Units (RMU). -Are of "short" cold shrinkable type. 		<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>	
13	<p style="text-align: center;">Straight joint</p> <ul style="list-style-type: none"> -Supplied within a complete kit for 3-phase. -Include all components for the complete implementation of the straight set: -Connectors of mechanical tightening type -Straight joints of cold shrinkable type -Earthing connection for the metallic screens of the 6 single core cables -The Cable Joints can be submerged in water for long periods. -The recovered thickness of insulation over the connector of straight joints is uniform and equal to or greater than the cable insulation thickness as given in IEC 60502-2. -Joints provide waterproofing, mechanical and electrical protection, and they are completely sealed from cable jacket to cable jacket. -Cable screens continuity is fully insulated from the earth. The screens are not earthed at joint location. 		<p><input type="checkbox"/></p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>	
14	<p style="text-align: center;">Screened Separable Connectors</p> <ul style="list-style-type: none"> -Conform to the requirement of EN 50180 and EN 50181 standards. -EPDM pre-molded manufacturing. Screened type. 		<p><input type="checkbox"/></p> <p>Yes</p> <p>Yes</p> <p>Yes</p>	



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	-Supplied within a complete kit for 3-phase. Connectors of mechanical tightening type		Yes	
	-Pre-molded body of screened separable connector		Yes	
	-Earthing connection for the metallic screens of the 3 single core cables above		Yes	
	-Interface A: for connection of transformer inside MV/LV substation, Dead break Straight plug in / elbow plug in		Yes	
	-Interface C: MV network for cable connection on RMU, M16 Bolted T type		Yes	
	-interface A screen separable connectors, the fixing bail is supplied within the kit		Yes	
15	Packing list		Provided within the bid	
16	Accessories packing/marking			
	-All connecting accessories kit shall be delivered individually packed in strong card box and card box properly stored on a pallet.		Yes	
	-Each card box shall be clearly marked with:			
	-Name / Logo of the Manufacturer		Yes	
	-The type of accessory		Yes	
	-Type of MV cables		Yes	
	-The Cross section		Yes	
	-Packing date		Yes	
	-Distributor's name		Yes	
	-Expiring date (if appropriate)		Yes	
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:



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