



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

EDMS 14-200-1

**TECHNICAL SPECIFICATION FOR
CABLE JOINTS FOR XLPE INSULATED
CABLES**

**18/30 (36) kV (ARMOURED AND NON
ARMOURED)**

Issue: Mar-2020 / Rev- 1

توجد بنود اختيارية (Option items) يجب تحديدها بواسطة شركة التوزيع قبل الطرح.



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

CONTENTS

1. SCOPE.....	3
2. APPLICABLE STANDARDS	3
3. DEFINITIONS	4
4. ENVIRONMENTAL CONDITIONS:	5
5. SERVICE CONDITIONS:	5
6. SYSTEM DETAILS	6
7. JOINT MATERIALS, RATING AND PERFORMANCE.....	6
8. CABLE DIMENSIONS GUIDANCE.....	11
9. MARKING AND IDENTIFICATION:	11
10. PACKING.....	12
11. INSPECTION AND TESTING	12
12. TYPE TESTING	13
13. TENDER DOCUMENTS AND SUBMITTALS	18
14. INSTALLATION INSTRUCTIONS.....	20
Annex A	22
Table A.1 FIRST BATCH OF TEST SAMPLES.	22
Table A.2 SECOND BATCH OF TEST SAMPLE.....	23
Table A.3 TESTS OF 36 KV JOINTS FOR XLPE INSULATED CABLES	23
Annex B	24
Table B.1 GUARANTEE FOR JOINTS, PRE MOULDED, ...X ... mm ² , 36 kV.....	24
Table B.2 SCHEDULE GUARANTEE (PRE MOULDED, ...X ... mm ² , 36 kV).....	26
Table B.3 GUARANTEE FOR JOINTS, HEAT SHRINKABLE, ...X mm ² 36 kV....	27
Table B.4 SCHEDULE GUARANTEE (HEAT SHRINKABLE, 36 kV).....	29

EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

1. SCOPE

This specification covers the minimum technical requirements for design, engineering, manufacture, testing, inspection, installation and performance of all kinds of straight through joints for medium voltage power cables, XLPE insulation, with the following different constructions:

- Three core and single core
- Armoured and non armoured
- Copper and aluminum conductors
- The joint for the level of 22 kV system (18/30 kV cable) should meet the requirements of the 36 kV Level.
- The Joint kits should be supplied completely with all relevant components
- Unless otherwise specified Joints should comply with all relevant standards described in table no.1

This specification does not cover

- Accessories for special applications, such as aerial cables, submarine or ship cables or hazardous situations (explosive environments, fire-resistant cables or seismic conditions).
- Transition joints connecting cables with extruded insulation to paper-insulated cables are not included in the scope of this specification

2. APPLICABLE STANDARDS

The joints components, performance and testing should be complied with latest revision of applicable following table (Table 1).

Table -1

S. No	Standard No.	Description
1.	IEC 60502-2	Cables for rated voltages from 6 kV ($U_m = 7,2$ kV) up to 30 kV ($U_m = 36$ kV)
2.	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)
3.	IEC 61442	Test methods for accessories for power cables with rated voltages from 6 kV ($U_m = 7,2$ kV) up to 30 kV ($U_m = 36$ kV)
4.	HD 629.1 S2 + A1 CENELEC	Test requirements on accessories for use on power cables rated voltage from 3.6/6(7.2) kV up to 20.8/36(42) kV - Part 1
5.	IEC 61238-1	Compression and mechanical connectors for power cables for rated voltages up to 30 kV ($U_m = 36$ kV) – Part 1: Test methods and requirements
6.	IEC 60228	Conductors of insulated cables



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

7.	DIN EN 13600	Seamless copper tube for electrical purpose
8.	DIN EN 755	Aluminum and Aluminum alloy – Extruded rod/bar, tube, and profile, Part 7 - seamless tube tolerance on dimensions and form
9.	DIN 46 267-1	non-tension proof compression joints for copper conductors (CU connectors)
10.	DIN 46 267-2	non-tension proof compression joints for Aluminum conductors (AL connectors)
11.	IEC 60060-1,2	High-voltage test techniques
12.	IEC 60230	Impulse tests on cables and their accessories
13.	IEC 60885-3	Electrical test methods for electric cables Part 3: Test methods for partial discharge measurements on lengths of extruded power cables
14.	VDE 0278	Test requirements on accessories for use on power cables of rated voltage from 3,6/6 (7,2) kV up to 20,8/36 (42) kV
15.	IEEE 404	Standards for Extruded and Laminated Dielectric shielded cable joints rated 2.5 kV to 500 kV
16.	IEC62677-1	Heat shrinkable low and medium voltage moulded shapes. General requirements
17.	IEC62677-2	Heat shrinkable low and medium voltage moulded shapes - part 2: methods of test
18.	IEC62677-3-101, 102, 103	Heat-shrinkable low and medium voltage ... Part 3: Specification for individual materials
19.	IEC 60815-3	Selection and dimensioning of high-voltage insulators intended for use in polluted conditions - Part 3: Polymer insulators for A.C. systems.

3. DEFINITIONS

- **Straight joint**
Accessory makes a connection between two cables and suitable for use underground or in air.
- **Branch joint**
Accessory makes a connection of a branch cable to a main cable.
- **Transition joint**
Straight or branch joint makes a connection between cables having different types of insulation, and/or conductor material, and/or conductor cross section area, and/or cable types.

EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

- Connector

A metallic device suitable to connect the cable conductors together.

مزود بعدد ٢ طبقة بلاستيك لإحكام غلق السرفيل الألومنيوم من الجانبين وللحفاظ على الشحم بداخله

- Conductor Temperature:

The joint should be suitable for use on cables having maximum conductor temperature of 90°C at normal conditions, and maximum temperature of the cable conductors under short-circuit condition of 250°C

- Rated voltage: U₀/U (U_m)

The rated voltages U₀/U(U_m) of the cable joints considered in this specification is 18/30 (36) kV.

- U₀: is the rated power frequency voltage between conductor and earth or metallic screen for which the cable is designed (phase voltage).
- U: is the rated power frequency voltage between conductors for which the cable is designed (line voltage);
- U_m: is the maximum value of the "highest system voltage" for which the equipment may be used.

4. ENVIRONMENTAL CONDITIONS:

The performance of the pre-moulded and heat-shrinkable components in the joint should be guaranteed for following environmental conditions, any differences in the guaranteed performance should be clearly set out in the offer.

Minimum ambient temperature	: -5°C.
Maximum ambient temperature	: 45°C (50 °c as option).
Maximum relative humidity	: 95%.
Maximum altitude	: 1000 m.
Soil conditions	: Exposed to sea water / sewage water

5. SERVICE CONDITIONS:

- The sunlight is very intense and the temperature of exposed 70°C.
- The maximum solar radiation intensity on a horizontal surface is 1000 w/m².
- Severe surface contamination from salt, dust, heavy industrial pollution, sandstorms, fine dust often carried in suspension in the atmosphere even on calm days, can be expected.
- Ground temperature can reach 35°C.
- Joints should be suitable for direct burial on the following conditions: -
 - a. Where the water table is very high, and the joints are thus exposed to polluted sea water / sewage water.
 - b. With laying depth of the cable up to 2.0 m



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

- c. In dry sand conditions with soil thermal resistivity as per the cable specification

- soil thermal resistivity <u>C°. Cm/watt</u>	<u>120</u>	<u>200</u>	<u>300</u>
- Derating factor	<u>1.0</u>	<u>0.80</u>	<u>0.67</u>

6. SYSTEM DETAILS

Frequency	50 Hz
Number of phases	Three
Nominal voltage	22 kV
Highest voltage	24 kV
Maximum prospective Fault level	<u>20 kA for Duration of 1 sec.</u>

7. JOINT MATERIALS, RATING AND PERFORMANCE

- 7.1 The Joints kits should be supplied completely with all relevant components including the main insulation part(s), DIN or equivalent standards ferrules (connectors) , tinned copper mesh or Braid of sufficient length, cleaning solvent, solder , armouring (as applicable) , outer jacket tubes , and/or any special accessories required.
- 7.2 For three-core armoured cable, a galvanized steel or nonferrous wrap and adhesive tape or cotton cloth tape bedding should be used for armouring the cable joints, or any other applicable solution for the armoring layer of the cable joint.
- 7.3 For single core armoured cable, a nonferrous or AL wrap and adhesive tape or cotton cloth tape bedding should be used for armouring the cable joints, or any other applicable solution for the armouring layer of the cable joint.
- 7.4 The material for bonding the cable screen , the cable armouring with the joint screen (copper braid or mesh) should be suitable for fault levels specified in clause 6
- 7.5 The cross-sectional area of the copper mesh or braid should be at least equal to the effective cross-sectional area of the cable copper screen with a minimum size as indicated in the following tables.



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

Copper Screen of joint for the Single-Phase Cable 18/30 kV

C.S.A (mm ²)	70	95	120	150	185	240	300	400	500	630
Min. total Copper weight for the 1 phases gm/m	130	130	130	200	200	200	260	315	315	315
Min. length of the copper Baird per phase cm	90	90	90	90	90	90	90	100	100	100

Copper Screen of joint for the Three Phase Cable 18/30 kV

C.S.A (mm ²)	70	150	185	240	300	400	500
Min total Copper weight for the 3 phases gm/m	390	390	390	390	480	675	675
Min. length of the copper Baird per phase cm	90	90	90	90	90	100	100

- 7.6** Each kit should be supplied with installation instructions in Arabic (and English).
- 7.7** Joints should in general be compatible with cables used byEDC
- 7.8** Testing of the joints should meet the requirements described in the relevant clause and either requirements of IEC ,or VDE tests as per (Annex A) of these specifications, or according to CENELEC.
- 7.9** The minimum guaranteed performance should be under Egypt service conditions mentioned in item (5)
- 7.10** The 36 kV joints should be suitable for use with the following type of cables :
18/30 kV, three / one core, underground power cable, Aluminum/ Copper stranded-compacted circular conductor, extruded semi-conducting layer, XLPE insulation, extruded semi-conducting layer well bonded, copper tape screening, filler, separation sheath ST2 (bedding) , double Steel/Al tape armour, black PVC over sheath, and according to the requirements of IEC 60502-2
- 7.11** The materials of the joints and the installation instructions should be compatible with the XLPE cable materials 18/30 (36) kV, hence the cable insulation , and semi-conductive screening layers are extruded type.
- 7.12** Connectors material, outer diameter , die size as per DIN 46267 part1 for copper connector and as per part 2 for alumium connectors.
- 7.13** Connectors length as per joint manufacturers design and joint type on thier own resposibilty.

EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

Connectors diameters, die size, and tolerances should be as the following tables:

TABLE 2: Aluminum Connector:

Aluminum connector for medium voltage cables			
C.S.A(mm ²)	Connector inner diameter mm	Connector outer diameter mm	Crimping die size
70	10.8	18	18
150	15.5	25	25
185	18.5	28	28
240	20	32	32
300	22.2	34	34
400	25	38	38
500	29	44	44

Note:

- * The above dimension are subjecting for a manufacturing tolerance upto +/- 0.4mm
- * The recommended die is the Hexagonal type, with hydraulic crimping tool.
- * The crimping area of the connector should not be less than 50% of the connector total length

TABLE 3: Copper Connectors

Copper connector for medium voltage cables			
C.S.A mm ²	Connector inner diameter mm	Connector outer diameter mm	Crimping die size
70	11.5	16.5	16
95	13.5	19	18
150	17	23.5	22
185	19	(25.5)	25
240	21.5	29	28
300	24.5	32	32
400	27.5	38.5	38
500	31	42	42
630	34.5	44	44



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

Note:

The above dimensions are subjecting for a manufacturing tolerance upto +/- 0.4mm.
The recommended die is the Hexagonal type, with hydraulic crimping tool
The crimping area of the connector should not be less than 50% of the connector total length.

Connectors data sheets for joints complying with this specification:

Table 4: For Aluminium Connector Data Sheet

Description	Aluminium Connectors
Application	For Stranded Aluminum Compacted Conductors Complying to IEC 60228
Material	One piece seamless tube, EN Al 1050 (AL99.5) According to DIN EN755-7
Finishing	Chemical Treatment
Identification	Manufacturer name, conductor size, die size, number of crimping, and crimping positions
Dimension and coding	As per drawing and table of dimensions
Mechanical properties	Pure and soft AL
Chemical composition	Min. AL ratio 99.5% (mass fraction)
Electrical conductivity	Min. conductivity +58% according to IACS. IACS: International annealed copper standard

Table 5: For Copper Connector Data Sheet

Description	Copper Connectors
Application	For Standard Copper Compacted Conductors Complying to IEC 60228
Material	One piece seamless tube, Electrolytic tough pitch Copper (Cu-ETP) according to DIN EN 13600:2002 (supersedes DIN 40500)
Finishing	Tinned coating not less than 3 micro m
Identification	Manufacturer name, conductor size, die size, number of crimping, and crimping positions
Dimensions and coding	As per drawing and table of dimensions
Mechanical properties	Pure Copper
Chemical composition	Min. Copper ratio 99.9% (mass fraction)
Electrical conductivity	Min. conductivity = 96.6% according to IACS. IACS: International annealed copper standard



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

7.14 ADDITIONAL ACCESORIES FOR JOINT KIT:

- 1- Cleaning solvent $\geq 100 \text{ mm}^3$
- 2- Binding tapes: -
 - A. (for Pre-moulded joints only): Two insulating tapes length $> 10 \text{ m}$ for each role with max. possible thickness (used for binding 3 cores before applying joint armouring), Or One insulating tapes $> 30 \text{ m}$ for each role with max. possible thickness.
 - B. (for heat shrinkable joints only): A Textile tape used for wrapping the ends and middle of the steel wrap.
- 3- Tin wire solder (with flux): length $> 1 \text{ m}$, or any other applicable solution
- 4- Silicon grease: (6 Packets) each of weight $\geq 5 \text{ gm}$ for three cores
- 5- Galvanized steel clamps: 2 pcs for binding steel wrap. (only applicable for Three Core cables with a Galvanized steel wrap armouring)
- 6- Stainless clamps: 2 pcs for binding steel wrap. (only for single Core cables, and only applicable when using an Aluminum wrap armouring)
- 7- Mastic tapes (pastes) of types required for sealing and filling, as applicable at least:
 - A. Over steel clamps (if exist), under the ends of jacket tubes over the cables, and between tubes at their overlap.
 - B. At connector area as void filler (for heat shrinkable joint only).
- 8- For 3 core cable 2 shrinkable tubes used for outer jacket should be marked with diameters before and after free shrink.
- 9- 3 pcs of sandpaper size 180 with length 40 cm, cloth type (non-easy cut)
- 10- 1 pcs of sandpaper size 180 with length 40 cm, cloth type (non-easy cut) (for 1 core)
- 11- 1 piece of sandpaper size 320 with length 40 cm, cloth type (non-easy cut)

EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

8. CABLE DIMENSIONS GUIDANCE

The following data for cables dimensions, joints components and dimensions should comply with these cables data:

Table 6: Data for cables dimensions

C.S.A (mm ²)	70	95	150	185	240	300	400	500	630
Average Conductor Diameter mm	9.8	11.5	14.1	16.3	18.5	20.6	23.1	26.6	30
Average diameter over insulation mm	26-28	29.3	30.5-32.8	34.1	34.5-37	36.5-39.4	39-42.5	42-45.5	45.5-50
Average overall diameter mm , for 3core armoured cables	76.5-82	81.5	89.9-93	92.9	100.6-104	110-106.2	109-114	-	-
Average overall diameter mm , for 3core non armoured cables	70.4	76	82	87.2	92.3	97.7	106	-	-
Average overall diameter mm, for 1core armoured cables	40-42	43.4	47-48	48.8	51-53	53-55	56-58	60-62	64-66
Average overall diameter mm , for 1core non armoured cables	33.8	39.3	39.2	44.3	43.8	46.4	50.2	53.4	59

N.B:

- The above data is applicable for cables with Copper or Aluminium conductor

In case of Non-compacted cables, Conductor cross section area will be provided by ...EDC in the tendering phase

9. MARKING AND IDENTIFICATION:

All components of the joint should be distinctly and clearly marked with the manufacturer's name and reference numbers. The marking should be done before packing the component. Electrically conducting components should be marked 'conducting' at the plastic packs clearly and permanently unless they are very small to accommodate respective marking.

All components should be capable of being stored without deterioration within the temperature range of -5°C to +45°C (+50 °C as option). Components or materials, if subjected to a shelf life limitation, should have the final date of use prominently and permanently shown on all packages.

The electrical relevant components of cable accessories must be marked with the following data:



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

1. Manufacturer name
2. Production indicator for traceability
3. Cross-section, diameter, or application range should be marked

Packaging as well for each cable accessory should be printed with the following information:

1. Manufacturer's name
2. Manufacturer's Type No. / catalog number
3. Purchase order number/tender
4. Cable size/diameter
5. Nominal Voltage (18/30kV) / Max. Voltage (36 kV)
6. Year of manufacture
7. Date of expiry
8. Manufacturer's batch No. or any code for tracing the quality assurance records maintained by the manufacturer.
8. Shipping Mark Guid.

* It should be possible to read all information directly

10. PACKING

- 10.1. Packing should be robust and able to withstand very rough handling during transportation. It should be protected against ingress of moisture.
- 10.2. The details of method of packing should be submitted with the offer.
- 10.3. Each kit should be supplied with a packing note stating the quantities and descriptions of components contained in the kits, and the documents described below:

The kits should include:

Joints Instructions of installation (Arabic and English) for the offered accessories which must include the steps of installation, the number of dies, detailed drawing of the connector explaining the number & sequence of crimping and the width of each crimping, (Each crimping should be hexagonal).

11. INSPECTION AND TESTING

11.1. Routine Tests

- 11.1.1. The routine tests should be done as per latest revision of applicable standards mentioned in table No. 1
- 11.1.2. Tests should be done by the manufacturer on each finished product or component of accessories in the manufacturer facility to check that each product/ component meets the specified requirements.
- 11.1.3. Routine tests for the cable joints should be like those of the cables:



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

11.1.3.1 AC dry withstand voltage test (69kV for 1 min. as per IEEE 404 or 63 kV for 5 min. as per IEC 60502-2)

11.1.3.2 Partial Discharge test (the PD at 30 kV should less than 5 pc)

11.1.4.vendor should keep records for the routine tests

11.1.5.vendor should keep records for the calibration of the instruments and testing facilities which using in the routine tests.

11.2 Sample and inspection Tests (optional)

11.2.1 Sample tests should be made by the manufacturer on samples of finished product or components taken from a finished product store, at a specified frequency, so as to verify that the finished product meets the specified requirements.

11.2.2 Inspection test should be done in the manufacturer/vendor facilities in attendance ofEDC representatives per each order before delivery..

11.2.3 Inspection tests should be conducted as per submitted/approved inspection plan during the tender stage,

11.2.4 The inspection plan should include a visual examination on each component, there should be no visual defects in the material, manufacture, workmanship and markings.

11.2.5 The Tenderer should provide free of charge all the testing facilities required at work.

11.2.6 The routine tests should be done as per applicable standards up on manufacturer choice

11.2.7 The inspection sample should be 1% of the order quantity and should not be more than 5 pcs of each joint size.

12. TYPE TESTING

12.1 Type Testing should be made to demonstrate satisfactory performance characteristics according to the latest standard to meet the intended application.

12.2 It is not necessary to repeat these tests, once successfully completed, unless changes are made in the materials, design or manufacturing process which might affect the performance characteristics

12.3 Cables used for testing should comply with IEC 60502-2 and should be of the same rated voltage as the accessories to be tested

12.4 Accessories should be assembled in the manner specified by the manufacturer's instructions.



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

12.5 Type tests should be done in certified independent and approved test laboratory

12.6 Type test for cable joints should be conducted as per IEC60502-4 table 6 or CENELEC standards.

12.7 Test method should be as per IEC 61442 or CENELEC standards.

12.8 The test values and requirements should be as per IEC60502-4 table 14 or CENELEC standards.

12.9 Type testing complying with the full requirements of CENELEC, HD 629.1 S2 or VDE standards as per Annex A in this specification are accepted

12.10 Type test certificates should be submitted with the offers (if not before submitted) to be reviewed by(...EDC), ...EDC should require its representative to assess the quality control and tests

12.11 The test program dates should be advised by the contractor in advance to permit witnessing by ...EDC.

12.12 ...EDC reserves its right to send inspector for that purpose, and ...EDC representative should sign the test certificates in case of acceptance.

12.13 Tests described above should not release contractor from his full responsibility towards supplies, guarantee, and compliance with this specification.

12.14 Range of approval for the type test should be as per IEC 60502-4 clause 7



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

Type testing requirement for cable joints as per IEC 6050-2-4

IEC 60502-4 2010

Table: 6

Test sequences and requirements for straight or branch joints

Tests ^a	requirements	Test methods of IEC 61442	Test sequences (See figure 2)		
			2.1	2.2	2.3
1 AC and DC voltage	AC for 5 min at 4.5 U ₀ and d.c for 15 min at 4 U ₀	Clauses 4 and 5	x	x	x
2 Partial discharge ^{b c}	10 pc max. At 1.73 U ₀	Clause7	x		
3 Impulse at θ_t ^{c d}	10 impulses of each polarity	Clause6	x		
4 Heating cycles in air	30 cycles ^e vat θ_t ^{c d} and 2.5 U ₀	9.2 and9.3	x		
5 Heating cycles under water	30 cycles ^e at θ_t ^{c d} and 2.5 U ₀ . water height 1 m	9.2 and9.3			
6 Partial discharge ^{b c} at ambient temperature and θ_t ^{c d, f}	10 pc max. At 1.73 U ₀	Clause7	x		
7 Thermal short-circuit (screen) ^c	Two short -circuits at I _{SC} of the cable screen. No visible deterioration	Clause 10		x	X ^g
8 Thermal short-circuit (conductor) ^c	Two short -circuits to raise conductor to θ_{sc} of the cable . No visible deterioration	Clause 11		x	X ^g
9 Dynamic short-circuit ^h	One short -circuits at I _d . No visible deterioration	Clause12			x
10 Impulse	10 impulses of each polarity	Clause 6	x	x	x
11 AC Voltage	15min at 2.5 U ₀	Clause 4	x	x	x
12 Examination	For information only ⁱ	.....	x	x	x

a Unless otherwise specified, tests shall be carried out at ambient temperature.

b Not required for accessories installed on 3.6/6 (7.2) kv cables having unscreened insulation.

c For transition joints (extruded insulation to extruded insulation), the testing parameters are those for the lower rated cable.

d θ_t is the maximum cable conductor temperature in normal operation +5 k to 10 k.

e 8 h total with ≥ 2 h steady and ≥ 3 h cooling.

f Measurement is made at the end of heating period.

g Thermal short-circuit may be combined with the dynamic short circuit.

h Only required for single-core cable accessories designed for initial peak currents $i_p > 80$ kA and three-core accessories designed for $i_p > 63$ kA. Value of I_d shall be declared by the manufacturer.

i it is advised that the accessory be examined for sings of any the following:

- (i) cracking in the filing media and/or tape or tube components; and/or
- (ii) a moisture path across a primary seal; and/or
- (iii) corrosion and/or tracking and/or erosion; and/or
- (iv) leakage of any insulating material.



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

12.15 Extension of approval to a range wider than that given above should be achieved by carrying out the additional tests specified at IEC 60502-4 listed in Table 11 on the smallest and/or largest conductor cross sectional areas of the required range.

IEC 60502-4

Table 11

Additional tests for smaller and/or larger conductor cross-sectional areas (see 7.1)

Tests ^a	requirements	Test methods of IEC 61442	Test sequences (see figures 1, 2 and 3)		
			1.1 ^b	2.1 ^c	3.1 ^d
1 AC and DC voltage	AC for 5 min at 4.5 U ₀ and d.c for 15 min at 4 U ₀	Clauses 4 and 5	x	x	x
2 Partial discharge ^{a, e}	10 pC max. at 1.73 U ₀	Clause 7	x	x	x
3 Impulse ^a	10 impulses of each polarity	Clause 6	x	x	x
4 Heating cycles in air _f	10 cycles ^h at θ_t ^l and 2.5 U ₀	9.2 and 9.3	x	x	
5 Examination	For information only ^g	.....	x	x	x

a Unless otherwise specified, tests shall be carried out at ambient temperature.

b Terminations: test half the number of samples given in figure 1.

c Joints: test half the number of samples given in figure 2.

d Stop ends: test half the number of samples given in figure 3.

e Not required for accessories installed on 3.6/6(7.2) kv cables having unscreened insulation.

f the test is not applicable to stop ends.

g it is advised that the accessory is examined for signs of any the following:

EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

12.16 The additional tests specified at IEC60502-4 listed in Table 12 should be carried out to achieve extension of approval for different types of cable insulation semiconducting screens

IEC 60502-4

Table 12

Additional tests for different types of cables insulation semiconducting screen and approval from round to shaped conductors (not applicable to stop ends, see 7.1 and 7.3)

	Tests ^a	requirements	Test methods of IEC 61442	Test sequences (see figures 1 to 5)		
				1.1 ^b	2.1 ^c	3.1 ^d
1	AC and DC voltage	AC for 5 min at 4.5 U ₀ and DC for 15 min at 4 U ₀	Clauses 4 and 5	x	x	x
2	Partial discharge ^e at ambient temperature and θ_t _{f, g}	10 pC max. at 1.73 U ₀	Clause 7	x	x	x
3	Heating cycles in air	60 cycles ^h at θ_t ^l and 2.5 U ₀	Clause 9	x	x	x
4	Partial discharge ^e at ambient temperature and θ_t _{f, g}	10 pC max. at 1.73 U ₀	Clause 7	x	x	x
5	Impulse	10 impulses of each polarity	Clause 6	x	x	x
6	AC voltage	15 min at 2.5 U ₀	Clause 4	x	x	x
7	Examination	For information only ⁱ	.....	x	x	x

- a Unless otherwise specified, tests shall be carried out at ambient temperature.
b Terminations: test half the number of samples given in figure 1.
c Joints: test half the number of samples given in figure 2.
d Separable connectors: test half the number of samples given in figure 4 and 5.
e Not applicable to accessories installed on 3.6/6(7.2) kv cables having unscreened insulation.
f θ_t is the maximum cable conductor temperature in normal operation +5 K to 10K
g Measurement is made at the end of heating period.
h 8 h total with ≥ 2 h steady and ≥ 3 h cooling.
i it is advised that the accessory is examined for signe of any the following:
(i) cracking in the filing media and/or tape or tube component, and/or
(ii) a moisture path across a primary seal: and/or



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

Summary of Tests Values and Requirements

IEC 6050-4 2010

Table 14 - Summary of test voltages and requirements (see clause9)

Test	Test Voltage	1.6/6 (7.2)	6/10 (12)	8.7/15 (17.5)	12/20 (24)	18/30 (36)	Requirements
Humidity and salt fog	1.25 U _o	4.5	7.5	11	15	22.5	No breakdown or flashover No more than three trappings No substantial damage b
Partial discharge a	1.73 U _o	6	10	15	20	30	Maximum partial discharge: 10pc
Heating cycles and a.c voltage/15 min and 500 h	2.5 U _o	9	15	22	30	45	No breakdown or flashover
AC voltage/1 min	4 U _o	14.5	24	35	48	72	No breakdown or flashover
DC voltage/15 min	4 U _o	14.5	24	35	48	72	No breakdown or flashover
AC voltage/5 min	4.5 U _o	16	27	39	54	81	No breakdown or flashover
Impulse (peak)	...	60	75	95	125	170	No breakdown or flashover

a Not required for accessories installed on 3.6/6 (7.2) kv cables having unscreened insulation.

b It is considered that substantial damage has occurred when it is evident that the performance of the accessory has been severely reduced by:

- 1 - loss of dielectric quality due to tracing, and /or
- 2 - erosion to a depth of 2 mm or 50% whichever is the smaller, of the wall thickness of the insulating materials as applied, and/or
- 3 - splitting of the materials: and/or
- 4 - puncture of the material

13. TENDER DOCUMENTS AND SUBMITTALS

The tenderer should submit with his offer a duly completed and signed package of all the required documents as:

13.1 A reference list showing that the proposed technique has been extensively used by recognized utility companies outside the manufacturer's country for 3 years (for foreign manufacturers only).

EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

13.2 Copies of recently (latest) conducted type test certificates (electrical and mechanical) or qualification reports from certified independent and approved test laboratory for the offered joints that verify all the requirements as listed at IEC 60502-4 in table (12) of this specification, or IEC, VDE or CENELEC standards.

13.3 Data sheet for the Connectors used within the accessories should include at least the following data:

13.3.1 Connector material details (alloy, conductivity, chemical composition ...)

13.3.2 assembly technique,

13.3.3 tooling, dies and necessary setting,

13.3.4 preparation of contact surfaces, if applicable,

13.3.5 type, reference number and any other identification of the connector,

13.3.6 connector details of the type test approval, the standard with which they comply (i.e. IEC 61238-1) or DIN

13.4 The Factory Acceptance Test (FAT), which carried out at manufacturer/vendor facilities on each finished product and components of accessories to check that each product and components meets the specified requirements

13.5 A detailed list of inspection tests that have been carried out at manufacturer's facilities in attendance of the ...EDC representative(s).

13.6 The name of the laboratory where tests can be conducted.

13.7 Complete technical details with dimensional drawings, showing description of material, the following data at least should be included:

13.7.1.name of manufacturer and manufacturing location.

13.7.2.type, designation, or code.

13.7.3.rated voltage,

13.7.4.minimum and maximum cable insulation diameters,

13.7.5.minimum and maximum cable cross-sections for this rated voltage

13.7.6.applicable cable construction including the material and shape of cable conductor

13.7.7.installation instructions (reference)



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

13.8 Catalogue and Instructions of installation (Arabic and English preferred) of the offered accessories. The catalogues must include the number of dies, detailed drawing of the connector explaining the number of crimping and the width of each crimping, each crimping should be hexagonal.

13.9 Details of storage, shelf life under Egypt service conditions mentioned in clause 6 (It must not be >30 months).

13.10 Lifetime of joint should not be less than 30 years starting from the date of operation.

13.11 One sample of complete kit will be submitted with the offer.

13.12 Details of any special tool requirement.

13.13 Schedule of guarantee duly completed and signed by the manufacturer and vendor/Agent, otherwise the tenderer should be rejected.

13.14 Kit content lists stating the quantities and descriptions of components, showing dimensions of connectors galvanized steel wrap, and tinned copper mesh or braid.

14. INSTALLATION INSTRUCTIONS

14.1 The installation instructions should be clearly assigned to the respective joint according to the application of this Technical Specification.

14.2 All necessary steps for installing the joint are to be described in an easily readable manner including images for each step.

14.3 The installation instructions must be approved by ...EDC prior to tender.

14.4 The installation instructions must contain the required designations and sheath-opening (cutback) dimensions.

14.5 The joint components, the kit content list, and the respective installation instructions must be clearly and unambiguously identifiable.

14.6 The installation instructions should be enclosed in English and Arabic Language (where applicable) and are printed in color.

14.7 Any modifications to the assembly or the material, even insignificant, which have an effect on the installation instructions, must be clearly noted on each installation instruction and packaging unit for at least half a year (e.g. with a colored sticker with exact reference to which point was changed), as agreed with ...EDC.

14.8 The revision level, the date of creation or revision must be recognizable on the installation instructions.

14.9 The final pages of each installation instructions is a full-page completely assembled cable joint in a cut-away/sectional view showing all active components of the kits.



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

14 TRAINING

The Vendor should provide a sufficient practical training wherever applicable for the installation and commissioning of the joints. (if required by ...EDC).

ملحوظة: بالنسبة لأي منتج جديد (اجنبي او محلي):

- يلزم مراجعة مواصفاته الفنية ومعاينة خطوط الإنتاج ومراحل التصنيع من قِبَل أعضاء اللجنة الدائمة لمراجعة وتحديث المواصفات الفنية لمهمات التوزيع ودعم التصنيع المحلي وبناءً على يتم اصدار تقرير من اللجنة بقبول او رفض المنتج (مع توضيح الأسباب) كشرط لدخول شبكة كهرباء مصر.
- يتم زيادة مدة الضمان لتكون ٤ سنوات من تاريخ التوريد.



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

Annex A

**For Joints x mm² XLPE cables
Table A.1 FIRST BATCH OF TEST SAMPLES.**

Test sequence	IEC 60502 – 4	
1- A.C withstand	5 min.	81 kV.
2 – Partial discharge	≤ 10 pc	30 kV.
3 – Impulse withstand.	10 impulses of each polarity at 95 - 100°C	170 kV.
4 - Heating cycle voltage in air	30 cycles (8h.total> 2h steady, > 3h cooling) at 95 – 100 oC.	45 kV.
5 - Heating cycle voltage under water	30 cycles (8h.total> 2h steady, > 3h cooling) at 95 – 100 oC.	45 kV.
6 - Partial discharge	at 95-100 °C & ambient temp. ≤ 10 pc.	30 kV.
7 - Thermal S.C (screen)	Two S.C at Is.c (no breakdown)	
8 - Thermal S.C (conductor)	two short circuit currents for 1sec test current, to rise the conductor temperature to 250°C	
9- Dynamic short circuit	One short circuit at 80 kA, (no flashover or breakdown)	
10- Impulse withstand.	10 impulses of each polarity	170 kV.
11- A.C. withstand	15 min.	45 kV.

Test sequence	VDE 0278 parts 1 – 6	
1- A.C withstand	5 min.	81 kV
2 – Partial discharge	≤ 10 pc	36 kV.
3 – Impulse withstand.	10 impulses of each polarity	170 kV
4 - Heating cycl voltage in air	63 cycles(5h heating, 3h cooling) cond.	at 95°C 45 kV
5 - Partial discharge	≤ 10 pc	36 kV
6 - Thermal S.C (screen)	two short circuit current I _{SC} (no breakdown)	
7 - Thermal S.C (conductor)	two short circuit current for 1 sec test current, to rise the conductor temperature to 250°C	
8- Heating cycle voltage in water	54 cycles as"4" above with joint in 0.25m water & oversheath removed at both ends.	
9- Partial discharge	as "5" above	
10- Impulse withstand.	as "3" above	

Note: Test "7" Can be performed with test "5". (if approved in writing).

N.B: Type test certificate acc. to CENELEC should be accepted.



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

Table A.2 SECOND BATCH OF TEST SAMPLE

Test sequence	IEC 60502-4
1 - Thermal S.C (screen) - Thermal S.C (conductor)	Two S.C _s at I _{sc} of the cable screen Two S.C _s to raise conductor of cable to 250 °C.
2 - Impulse voltage withstand	10 impulses of each polarity 170 kV.
3 - A.C. withstand	15 min 45 kV.

Test sequence	VDE 0278 parts 1 - 6
1 - Dynamic S.C	1 test with a current 80 kA (peak)
2 - Impulse voltage withstand	10 impulses of each polarity 170 kV.

N.B: Type test certificate acc. to CENELEC should be accepted.

Table A.3 TESTS OF 36 KV JOINTS FOR XLPE INSULATED CABLES

Test sequence	Values	Test voltage in kV (phases to ground)	Results
1- A.C voltage withstand	5 min	81	no breakdown. no flashover
2- Partial discharge		22.5 36	≤ 5 pc ≤ 20 pc.
3- Impulse voltag withstand between each conductor & grounded screen.	1.2/50 μs impulse 10 +ve & 10 - ve	170	no breakdown. no flashover
4- Load cycling No. of cycles No. of heating hours No of cooling hours Conductor tempr.	3 5 3 95°C	45	no breakdown. no flashover
5- Thermal S.C (if possible to be done)		Two for 1 sec. test currents to raise cable conductor to 250 °C	
6- Repeat of "4" with joint submerged in 1m water, over sheath removed.		45	no breakdown. no flashover
7- Partial discharge repeat of "2"		22.5 36	≤ 5 pc ≤ 20 pc
8- A.C voltage withstand 4 h		54	no breakdown no flashover
9- Impulse voltage	10 impulses of each polarity	170	no breakdown no flashover

N.B: Type test certificate acc. to CENELEC should be accepted.



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

12	Binding tapes : A-Two PVC tapes:- Length / thickness---- m./mm	----- -----
13	Mastic pastes : - A – 1 st type: type / number/ weight. each B – 2 nd type: type / number/ weight. each	----- ----- -----
14	Any other tape : type , length -----	
15	Attach details on rated short circuit current capacity : - a) Copper mesh or BRAID b) Armour c) Bonded mesh or BRAID with armour	
16	Copy of works routine test reports and if requested by.....EDC also batch / type test reports on the kits being supplied should be cleared by .....EDC prior to shipment confirm compliance.	Yes / No
17	Confirm that visual inspection and routine tests should be carried out on each kit -----	Yes / No
18	Confirm compliance to the appropriate requirements of table 2-----	Yes / No
19	Marking and packing:- a) Marking should be to clause 4.4 ----- b) Packing should be to clause 4.5 ----- c) Each kit with components should be complete in itself and separately packed ----- d) Submit detailed method of packing	Yes / No Yes / No Yes / No Submitted / not subm.
20	Guarantee confirm compliance to clause 6.3 ----	Yes / No
21	For direct technical clarification from the manufacturer submit the details mentioned below of the persons responsible : - Name :----- Designation : ----- Address : ----- Telephone : ----- FAX : -----	

We guarantee above mentioned data for our offered material forEDC

Vendor / Agent

Important:

- Each tenderer should submit with his offer the above tender " specifications for cable joints x ... mm² 36 kV. With each page signed by the tenderer.



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

- 2 This signature means that tenderer confirms verification of his offer for these specifications.
- 3 Tenders not accompanied with signed specifications should not be considered.

Table B.2 SCHEDULE GUARANTEE (PRE MOULDED, ...X mm², 36 kV)

Schedule of deviations from -----

Technical specification

This schedule be filled and signed by every tenderer. If there are no deviations or reservations.

This should be explicitly stated in this schedule.

Item Number on tender	Precise details of minor deviations included in the offer.

(Manufacturer):

Signature-----



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

13	Mastic pastes : - A - First type : type / number/ weight. each B - 2 nd type : type / number/ weight. each	----- ----- -----
14	Any other tape : type , length -----	
15	Attach details on rated short circuit current capacity: - a) Copper braid b) Armour c) Bonded braid with armour	
16	Copy of works routine test reports and if requested by .....EDC also Batch / type test reports on the kits being supplied should be cleared by.....EDC prior to shipment confirm compliance ----- ----- yes / no	
17	Confirm that visual inspection and routine tests should be carried out on each kit ----- yes / no	
18	Confirm compliance to the appropriate requirements of Table 2----- ----- yes/no	
19	Marking and packing a) Marking should be to clause 4.4 -----yes / no b) Packing should be to clause 4.5 -----yes / no c) Each kit with components should be complete in itself and separately packed ----- yes / no d)Submit detailed method of packing -----ubmitted / not subm.	
20	Guarantee confirm compliance to clause 6.3 ----- yes / no	
21	For direct technical clarification from the manufacturer submit the details mentioned below of the persons responsible : - Name :----- Designation : ----- Address : ----- Telephone : ----- Telex : -----	

We guarantee above mentioned data for our offered material forEDC

Vendor / Agent

Important:

- 1 Each tenderer should submit with his offer the above tender " specifications for cable joints x ... mm² 36 kV. With each page signed by the tenderer.
- 2 This signature means that tenderer confirms verification of his offer for these specifications.



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 14 - 200 - 1

Date: 09-03-2020

3 Tenders not accompanied with signed specifications should not be considered.

Table B.4 SCHEDULE GUARANTEE (HEAT SHRINKABLE, 36 kV)

Schedule of deviations from -----

Technical specification

This schedule should be filled and signed by every tenderer. If there are no deviations or reservations, this should be explicitly stated in this schedule.

Item Number on tender	Precise details of minor deviations included in the offer.

(Manufacturer):

Signature -----