



Network Department
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HEDNO TECHNICAL DESCRIPTION

ND-204/07.06.21

SUSPENSION AND PIN COMPOSITE INSULATORS

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SUSPENSION AND PIN COMPOSITE INSULATORS

1. SCOPE

The present Technical Description determines the constructional and testing requirements of suspension and pin composite insulators used in Medium Voltage (M.V.) network.

2. KEYWORDS

Overhead conductor, insulator, suspension, pin, M.V.

3. OPERATING CONDITIONS

3.1. Environmental conditions

- Maximum ambient air temperature : +40 ° C
- Maximum mean value of the ambient air temperature measured at a period of 24 hours : +35 ° C
- Minimum ambient air temperature : - 20 ° C
- Direct exposure to sun and rain : Yes
- Mean duration of sunlight : 2.800 h annually
- Maximum mean horizontal wind pressure on a flat plane : 70 kp/m²

3.2. System characteristics

The M.V. network is a three-phase, three-conductor network with grounded M.V. neutral node at the H.V./M.V. transformers via a resistor that limits the maximum fault current to earth to 1000 A. The system has nominal frequency 50 Hz and the following special characteristics:

NOMINAL VOLTAGE (kV)	MAXIMUM OPERATION VOLTAGE (kV)	LEVEL OF SYMMETRICAL THREE-PHASE FAULT (kA)
20	24	7,2
15	17,5	10

4. STANDARDS – SPECIFICATIONS

- EN 61952 : Insulators for overhead lines – Composite line post insulators for A.C. systems with a nominal voltage greater than 1000 V – Definitions, test methods and acceptance criteria.
- EN 61109 : Insulators for overhead lines – Composite suspension and tension insulators for A.C. systems with a



- nominal voltage greater than 1000 V – Definitions, test methods and acceptance criteria.
- EN 62217 : Polymeric HV insulators for indoor and outdoor use - General definitions, test methods and acceptance criteria.
 - IEC 60120 : Ball and socket couplings of string insulator units – Dimensions.
 - IEC/TR 62730 HV polymeric insulators for indoor and outdoor use tracking and erosion testing by wheel test and 5.000 h test.
 - ISO 2781 Rubber, vulcanized or thermoplastic – Determination of density.
 - Supplement to PPC Specification GR-47S/04.11.1986 : Hardware for suspension insulators.
 - Technical Specification PPC XK 11.02/10.03.88 : Hot dip galvanization process.

NOTE: The text of the present Technical Description is predominant and its requirements prevail against any other Standard or Specification.

5. **MANUFACTURING REQUIREMENTS**

5.1 **Dimensions, mechanical and electrical characteristics of insulators**

Type of insulator	Suspension	Pin
Creepage distance, minimum (mm)	900	610
Power frequency voltage withstand, wet, for 1 min (kV)	50	50
1,2/50 μ s impulse voltage withstand (kV)	145	145
Specified mechanical load (SML), minimum (kN)	120	-
Specified tensile load (STL) minimum (kN)	-	4
Specified cantilever load (SCL), minimum (kN)	-	11
Maximum design cantilever load (MDCL) (kN)	-	4
Top-end groove radius (mm)	-	19 \pm 3
Side groove radius (mm)	-	14 \pm 2
Indicative total length of insulator (mm)	440	280
Minimum polydimethylsiloxane content of silicon rubber	37 %	37 %



5.2 Construction material

The insulators shall be constructed of composite material and shall consist of two parts:

- A. The internal part (core) which shall be made of epoxy resin, reinforced with fiberglass.
- B. The external part which shall be made of High Temperature Vulcanized (HTV) silicon rubber with minimum polydimethylsiloxane content 37%. Coated insulators are not accepted.

For the construction of the external part of the insulator, materials other than silicon rubber can be accepted, which have provable satisfactory operation under conditions of high sunlight as of our country. To prove satisfactory operation, the following shall be submitted:

- Test certificates.
- Reference letters from electricity companies for satisfactory operation in their network, for at least 4 years.

EPDM is not accepted.

5.3 Construction characteristics

5.3.1 Suspension insulators shall be manufactured and tested according to EN 61109 and EN 62217. Pin insulators shall be manufactured and tested according to EN 61952 and EN 62217. The dimensions and mechanical and electrical characteristics of the insulators shall meet the requirements of par. 5.1 and drawing 1.

5.3.2 Suspension insulators shall have at their ends metallic fittings according to IEC 60120, with a diameter of $\Phi 16A$ which shall cooperate with the fittings described in the supplement of the Specification GR-47S/04.11.1986.

5.3.3 Pin insulators shall have at one end metallic fitting for conductor support and at the other end support stem for their fixation on the cross-arm. The support stem shall be 220 mm long and shall be threaded along its entire length as shown in the attached drawing 1.

A non-threaded length (10 mm max) of the support stem is permitted at its screwing point in the insulator. The washer of the attached drawing 1 (detail A) shall have a suitable width (4 mm min).

5.3.4 These fittings shall be made of malleable cast-iron or forged steel and shall be hot dip galvanized according to Technical Specification PPC XK 11.02 or according to relevant specifications with a minimum galvanization thickness of 86 μm . Insulators shall be delivered with all metallic fittings adapted to the insulator core. Adaptation shall be realized in such a manner that moisture ingress and loosening of the joint shall be prevented. Additionally the support stem of the pin insulator shall be steadily threaded in the respective threaded socket without the use of sticking materials and in such a manner that unscrewing from the forces applied during network installation shall not be possible.

6. TESTS

The tests are distinguished in design, type, special, sample and routine tests. For suspension insulators, design, type, sample and routine tests shall be performed according to EN 61109 and EN 62217, whereas on pin insulators according to EN 61952 and EN 62217.



6.1. DESIGN TESTS

6.1.1 Suspension insulators

Design tests for suspension insulators shall be performed according to EN 61109, paragraph 10.

6.1.1.1 Tests on interfaces and connections of end fittings according to EN 61109, paragraph 10.

6.1.1.2 Tests on shed and housing material according to EN 61109, paragraph 10.
NOTE: The duration of the tracking and erosion test according to EN 62217 paragraph 9.3.3.1 shall be 1.000 h.

6.1.1.3 Tests on the core material according to EN 61109, paragraph 10.

6.1.1.4 Assembled core load-time tests according to EN 61109:2008, paragraph 10.

6.1.2 Pin insulators

Design tests for pin insulators shall be performed according to EN 61952, paragraph 10.

6.1.2.1 Tests on interfaces and connections of end fittings according to EN 61952, paragraph 10.

6.1.2.2 Tests of shed and housing material according to EN 61952, paragraph 10.
Note: The duration of the tracking and erosion test according to EN 62217 paragraph 9.3.3.1 shall be 1.000 h.

6.1.2.3 Tests on the core material according to EN 61952, paragraph 10.

6.1.2.4 Assembled core load tests according to EN 61952, paragraph 10.

6.2. TYPE TESTS

Type tests shall be performed at the beginning of a contract and can be repeated at the definitive discretion of HEDNO, any time during contract performance it is deemed necessary.

At its definite discretion, HEDNO may accept certificates issued by a laboratory accredited by an independent private or public authority.

6.2.1 Suspension insulators

Type tests for suspension insulators shall be performed according to EN 61109, paragraph 11.

6.2.1.1 Electrical tests according to EN 61109, paragraph 11.1.

6.2.1.2 Damage limit proof test and test of the tightness of the interface between end fittings and insulator housing according to EN 61109, paragraph 11.2.



6.2.2 Pin insulators

Type tests for pin insulators shall be performed according to EN 61952, paragraph 11.

6.2.2.1 Electrical tests according to EN 61952, paragraph 11.1.

6.2.2.2 Mechanical tests according to EN 61952, paragraph 11.2

6.3. SPECIAL TESTS

These tests shall be performed at the beginning of a contract and can be repeated at the definitive discretion of HEDNO, any time during contract performance it is deemed necessary.

At its definite discretion, HEDNO may accept certificates issued by a laboratory accredited by an independent private or public authority.

6.3.1 Suspension insulators

6.3.1.1 Test on inclined level (resistance to tracking and erosion) according to standard IEC 60587, method A, Class 1 A 4,5.

6.3.1.2 Multiple stress test according to standard IEC/TR 62730. The duration of the test shall be 5.000 h.

6.3.2 Pin insulators

6.3.2.1 Test on inclined level (resistance to tracking and erosion) according to standard IEC 60587, method A, Class 1 A 4,5.

6.3.2.2 Multiple stress test according to standard IEC/TR 62730. The duration of the test shall be 5.000 h.

6.4. SAMPLE TESTS

6.4.1 Suspension insulators

Sample tests for suspension insulators shall be performed according to EN 61109, paragraph 12, IEC 62217, paragraph 9 and ISO 2781, Method B.

6.4.1.1 Verification of dimensions according to EN 61109:2008, paragraph 12.2.

6.4.1.2 Verification of the locking system according to EN 61109, paragraph 12.3.

6.4.1.3 Verification of the tightness of the interface between end fittings and insulator housing and of the specified mechanical load – SML according to EN 61109, paragraph 12.4.

6.4.1.4 Galvanizing test according to EN 61109, paragraph 12.5.

6.4.1.5 Hardness test according to IEC 62217:2012, paragraph 9.3.1.

6.4.1.6 Determination of density of vulcanized silicon rubber of the insulator according to ISO 2781, Method B.



4 different sample specimens shall be taken from the insulator silicone and the density shall be measured. The density of the silicone shall not be less than the minimum density declared by the manufacturer. Also, there shall be no differences in the density of the silicone at different points of the same insulator.

- 6.4.1.7 Test of the bonding of insulator housing on the core and the metal end fittings. In order to check the bonding to the core, the insulating housing (silicone rubber) of the insulator is incised with a cutter into small squares, in a stripe along the axis of the insulator and in a stripe around the insulator. In order to check the bonding at the metal fittings, stripes are incised with a cutter on the insulating housing at the points of contact with the fittings. Then with a needle-nose pliers, the insulating housing is pulled from the stripes that were incised. The insulators have passed the test if no expose of core and metal fittings is indicated.

6.4.2 Pin insulators

Sample tests for pin insulators shall be performed according to EN 61109, paragraph 12, IEC 62217, paragraph 9 and ISO 2781, Method B.

- 6.4.2.1 Verification of dimensions according to EN 61952, paragraph 12.2.
- 6.4.2.2 Galvanizing test according to EN 61952, paragraph 12.3.
- 6.4.2.3 Verification of the specified cantilever load (SCL) according to EN 61952, paragraph 12.4.
- 6.4.2.4 Hardness test according to IEC 62217:2012, paragraph 9.3.1.
- 6.4.2.5 Determination of density of vulcanized silicon rubber of the insulator according to ISO 2781, Method B
4 different sample specimens shall be taken from the insulator silicone and the density shall be measured. The density of the silicone shall not be less than the minimum density declared by the manufacturer. Also, there shall be no differences in the density of the silicone at different points of the same insulator.
- 6.4.2.6 Test of the bonding of insulator housing on the core and the metal end fittings. In order to check the bonding to the core, the insulating housing (silicone rubber) of the insulator is incised with a cutter into small squares, in a stripe along the axis of the insulator and in a stripe around the insulator. In order to check the bonding at the metal fittings, stripes are incised with a cutter on the insulating housing at the points of contact with the fittings. Then with a needle-nose pliers, the insulating housing is pulled from the stripes that were incised. The insulators have passed the test if no expose of core and metal fittings is indicated.

6.5. ROUTINE TESTS

6.5.1 Suspension insulators

- 6.5.1.1 Mechanical routine test according to EN 61109, paragraph 13.1.
- 6.5.1.2 Visual examination according to EN 61109, paragraph 13.2.



6.5.2 Pin insulators

6.5.2.1 Tensile load test according to EN 61952, paragraph 13.1.

6.5.2.2 Visual examination according to EN 61952, paragraph 13.2.

7. MARKING

7.1. Marking on the material

Each insulator shall be legibly and indelibly marked (not with stickers) with the following data:

- Manufacturer's name or trademark
- Year of manufacture
- Minimum insulator mechanical load or cantilever load for suspension or pin insulators, respectively
- Type of insulator

7.2. Marking on the packing

Each wooden crate shall have a legible label indicating at least the following:

- Manufacturer's name
- Type of insulator
- Model-type of insulator
- Number of pieces
- Gross mass in kg
- Contract number

8. PACKING

The insulators shall be packed in a plastic bag and afterwards in a heavy-duty wooden crate in such a way that they will be protected during shipment and transport. The total (gross) mass of the wooden crate shall not exceed 25 kg.

The wooden crates shall be delivered packed in EU palettes (Europalettes). The total weight of each palette shall not exceed 550 kg.

The total height of the palletized materials will not exceed 1.2 m, but will be as close as possible to this dimension. The packed wooden crates will be tied externally to the pallet with at least two (2) vertical steel plates (hoops) lengthwise and two (2) widthwise (total 4), which will pass under the wood of the pallet. Also, if required, they will be tied with two (2) horizontal plates. The above steel plates will preferably be laminated externally. Plastic sheets are not accepted due to their fast wear by sunlight.

9. ANNEXES- DRAWINGS

9.1. ANNEX 1

Data, which shall be submitted with the technical offer.

9.2. COMPLIANCE SHEET

- Table A.1: Required data by the Inquiry
- Table A.2: Test certificates



- Table A.2.1: Design tests certificates for the offered insulators
- Table A.2.2: Type tests certificates for the offered insulators
- Table A.2.3: Special tests certificates for the offered insulators
- Table B: Data required by the Technical Description ND-204
 - Table B.1: Data of the offered suspension composite insulator
 - Table B.2: Data of the offered pin composite insulator

9.3. DRAWINGS

- DRAWING 1. Indicative shape and dimensions of 24 kV composite suspension and pin type insulators.



ANNEX 1

(Paragraph 9.1. of the Technical Description HEDNO ND-204)

PART C OF THE INQUIRY "TECHNICAL OFFER"

The "Technical Offer" shall be submitted signed by the bidder and shall contain the following:

- C.1. Quantity and type of the offered materials. For this purpose, bidders should fill in the Technical Offer Exemplar, according to the corresponding Annex of the Inquiry.
- C.2. Statement of compliance of the offered material with the requirements of the Technical Description and the technical notes of the Inquiry.
- C.3. Statement of the factory of manufacture of the offered material accompanied by detailed information (mailing address, , personnel employed, detailed technical report, from which it shall yield that the factory of manufacture has the facilities required for the manufacturing of the offered materials). The factory of manufacture shall have sufficient equipment for measurements and quality control.
- C.4. ISO 9001 certification for the manufacturing factory shall be submitted, covering the production field of the insulators under purchase. It is noticed that the bidder shall submit communication data with the certification body as well as any other relevant data requested during the stage of technical evaluation, which shall facilitate the verification of ISO 9001 certification validity.
Moreover, a declaration shall be submitted that the manufacturer undertakes the responsibility to take necessary actions in order to ensure the uninterrupted renewal of the ISO 9001 certificate of the manufacturing factory, throughout the duration of any Contract with HEDNO.
- C.5. Statement of the type of each of the offered insulators.
- C.6. Complete drawings of the manufacturer with the detailed designing of the offered product; fully dimensional drawing and legend with the materials (insulating, metallic) used and their treatments.
- C.7. References such as sales catalogues, recommendation letters (original or copies), copies of contracts (price units do not need to be visible) or any other data proving the ability of the manufacturer in manufacturing of insulators. The above mentioned documents shall concern the offered or similar materials.
As similar materials are considered:
 - **Pin composite insulators**
Pin insulators made of the same material, which differ from the specified only with regard to the creepage distance of the insulators and the design of individual parts.
 - **Suspension composite insulators**
Suspension insulators made of the same material, which differ from the specified with regard to the creepage distance of the insulators and the design of individual parts.

References shall refer to materials manufactured in the factory, where the offered insulators will be manufactured.

In case of relocation of the manufacturing factory, documents concerning the first location of the factory shall be accepted.



Submission of the required documents is not mandatory for manufacturers that offer composite insulators, which have been installed in the last decade on the network of HEDNO and operate in a satisfactory manner (the exemption shall also apply in case of relocation of the manufacturing factory).

- C.8. Test certificates for all required design tests described in par. 6.1 of the present Technical Description for each insulator offered, in accordance to standards EN 61109:2008 and IEC 62217:2012 for suspension insulators and standards EN 61952:2008 and IEC 62217:2012 for pin insulators.

The certificates shall refer to materials manufactured in the factory, where the offered insulators will be manufactured and they shall be issued by test laboratories accredited by an independent private or public authority with no limitation on the field of testing (Only the accreditation authority of the laboratory and the number of accreditation certificate shall be stated).

Test Certificates from the Testing Research & Standards Center (TRSC) of PPC SA Group are acceptable.

In case of relocation of the manufacturing factory, certificates of design tests concerning the first location of the factory shall be accepted.

Submission of the required certificates is not mandatory for manufacturers that offer insulators, which have been installed for the last decade on the network of HEDNO and operate in a satisfactory manner (the exemption shall also apply in case of relocation of the manufacturing factory).

Test certificates which have been issued according to previous standards editions shall be accepted according to definite discretion of HEDNO's technical evaluation department.

- C.9. Test certificates for all required type tests described in par. 6.2 of the present Technical Description for each insulator offered, in accordance to standards EN 61109:2008 and IEC 62217:2012 for suspension insulators and standards EN 61952:2008 and IEC 62217:2012 for pin insulators.

The certificates shall refer to materials manufactured in the factory, where the offered insulators will be manufactured and they shall be issued by test laboratories accredited by an independent private or public authority with no limitation on the field of testing (Only the accreditation authority of the laboratory and the number of accreditation certificate shall be stated).

Test Certificates from the Testing Research & Standards Center (TRSC) of PPC SA Group are acceptable.

Submission of the required certificates is not mandatory for manufacturers that offer insulators, which have been installed for the last decade on the network of HEDNO and operate in a satisfactory manner.

Test certificates which have been issued according to previous standards editions shall be accepted according to definite discretion of HEDNO's technical evaluation department.

- C.10. Test certificates for all required special tests, test on incline level and multiple stress test described in par. 6.3 of the present Technical Description for each insulator offered, in accordance to standard IEC 60587 and IEC/TR 62730:2012 correspondingly.

The certificates shall refer to materials manufactured in the factory, where the offered insulators will be manufactured and they shall be issued by test laboratories accredited by an independent private or public authority with no limitation on the field of testing (Only the accreditation authority of the laboratory and the number of accreditation certificate shall be stated).

Test Certificates from the Testing Research & Standards Center (TRSC) of PPC SA Group are acceptable.

In case of relocation of the manufacturing factory, certificates of special tests concerning the first location of the factory shall be accepted.



Submission of the required certificates is not mandatory for manufacturers that offer insulators, which have been installed for the last decade on the network of HEDNO and operate in a satisfactory manner (the exemption shall also apply in case of relocation of the manufacturing factory)

Alternatively, it is possible to submit certificate of equivalent test according to International, European or National Specification (the Specification shall be submitted as well). Documentation of the equivalence of the tests lies with the supplier. The acceptance of the above test report remains in HEDNO's judgment.

- C.11. Detailed data about the materials of manufacture of the core, the sheds, the end fittings as well as about their treatment.
- C.12. Installation, operation and maintenance instructions for the offered insulators. Statement that one copy of the above mentioned instructions, in the Greek language, shall be delivered with each packing crate.
- C.13. Statement of the bidder that provides a guarantee of the materials for a period of *three (3) years* after the date of their delivery at HEDNO's warehouses.
- C.14. Bill of lading of sample of each offered material.
- C.15. Completed the Table for the implementation of the REACH Regulation of the EU or a declaration that the materials offered do not fall under the provisions of the REACH Regulation in accordance with the corresponding ANNEX of the Inquiry.
- C.16. Any further technical data, at the discretion of the bidder.
- C.17. The below Compliance Sheet filled in for the offered materials. In addition to the filled in Compliance Sheet, the bidder shall submit for the Table B, documents (technical brochures, test certificates, declarations or drawings) that prove the stated technical characteristics.



COMPLIANCE SHEET

It is noted that filling in all data in the tables below is mandatory and all required information shall be provided.

Table A.1: Documents required by the Inquiry

No	Paragraph of the Inquiry concerning the required documents	Required document to be submitted with the Technical Offer	Submitted document with the Technical Offer	Location in the Technical Offer, where the required document is found
1	C.2	Statement of compliance with the requirements of the Technical Description ND-204		
2	C.3	Statement of the manufacturing factory of the offered insulators		
3	C.3	Detailed information of the manufacturing factory <ul style="list-style-type: none"> • mailing address, • personnel employed • detailed technical report showing that the manufacturing factory has the facilities required to produce the offered insulators 		
4	C.3	Description of measuring equipment and quality control		
5	C.4	ISO 9001 certificate of the manufacturing factory of the offered materials		
6	C.4	ISO 9001 certificate shall cover the production field of the offered materials		
7	C.4	Data for the verification of ISO 9001		
8	C.4	Statement of uninterrupted update of ISO 9001 throughout the duration of any Contract with HEDNO S.A.		
9	C.5	Statement of the type of each of the offered insulators <ul style="list-style-type: none"> a) pin insulators b) suspension insulators 		
10	C.6	Complete drawings of the manufacturer with the detailed designing of the offered product: <ul style="list-style-type: none"> • fully dimensional drawing • legend with the materials (insulating, metal) used and • their treatments 		
11	C.7	References for the offered materials <ul style="list-style-type: none"> • sales catalogues, • reference letters, • copies of contracts or • any other data 		
12	C.7	Documents verifying the manufacturing factory's experience for similar materials		
13	C.7	Data that prove that the documents refer to similar materials		
14	C.7	Statement that the documents refer to materials manufactured in the manufacturing factory		



15	C.7	In case of relocation, documents concerning the first location of the manufacturing factory		
16	C.7	Contacts with HEDNO in case of exemption from submission of experience documents		
17	C.11	<ul style="list-style-type: none">• Detailed data about the materials of manufacture of:• the core,• the sheds,• the end fittings• about their treatment.		
18	C.12	Installation, operation and maintenance instructions		
19	C.12	Statement that one copy of the above mentioned instructions, in the Greek language, shall be delivered with each packing crate		
20	C.13	Statement of the bidder that provides a guarantee of the materials for a period of three (3) years		
21	C.14	Bill of lading of sample to the Network Department		
22	C.15	Completed the Table for the implementation of the REACH Regulation of the EU or a declaration that the materials offered do not fall under the provisions of the REACH Regulation		
23	C.15	Safety Data Sheet (SDS) under the provisions of the REACH Regulation or statement certifying that this Regulation does not require the submission of SDS for the material as well as for its components		
24	C.16	Any further technical data		



Table A.2: Test certificates

No	Paragraph of the Inquiry concerning the required documents of the Technical Offer	Required document to be submitted with the Technical Offer	Submitted document with the Technical Offer	Location in the Technical Offer, where the required document is found
1	C.8, C.9 και C.10	Test certificates for each offered composite insulator <ul style="list-style-type: none"> • Design Tests • Type tests • Special Tests 		
1.1	C.8, C.9 και C.10	The test certificates shall refer to materials manufactured in the factory, where the offered insulators will be manufactured		
	C.8 και C.10	In case of relocation, factory location relating to design test certificates and special tests (initial site certificates accepted)		
1.2	C.8, C.9 και C.10	The relevant certificates shall be issued by test laboratories accredited by an independent private or public authority with no limitation on the field of testing Shall be declared: <ul style="list-style-type: none"> • the accreditation authority of the laboratory • the number of accreditation certificate 		
1.3	C.8, C.9 και C.10	Contracts with HEDNO for the last decade in case of exemption from submission of test certificates		



Table A.2.1: Design tests for the offered insulators

No	Paragraph of the Technical Description ND-204/ concerning the required data of the technical offer	Required test certificate to be submitted	Number and issue date of the test certificate / Name of test laboratory that issued the test certificate	Manufacturing factory name and material type subjected to the test (as mentioned on the test certificate)	Location (paragraph) of test certificate, where the test procedure is described	Data that prove that the test laboratory that issued the certificate is accredited by an independent private or public authority
1	6.1.1	Suspension insulators				
1.1	6.1.1.1	<ul style="list-style-type: none"> • Tests on interfaces and connections of end fittings <ul style="list-style-type: none"> ○ a. pre-stressing Sudden load release pre-stressing thermal - mechanical pre-stressing ○ b. water immersion pre-stressing ○ c. Verification tests <ul style="list-style-type: none"> ○ c1. Visual examination ○ c2. Steep-front impulse voltage test ○ c3. Dry power frequency voltage test 				
1.2	6.1.1.2	<ul style="list-style-type: none"> • Tests on shed and housing material <ul style="list-style-type: none"> ○ a. Hardness test ○ b. Accelerated weathering test ○ c. Tracking and erosion test: 1,000 h ○ d. Flammability test 				
1.3	6.1.1.3	<ul style="list-style-type: none"> • Tests on the core material <ul style="list-style-type: none"> ○ a. Dye penetration test ○ b. Water diffusion test 				
1.1.4	6.1.1.4	<ul style="list-style-type: none"> • Assembled core load-time tests <ul style="list-style-type: none"> ○ a. Determination of the average failing load of the core of the assembled insulator ○ b. Verification of the 96h withstand load 				
12	6.1.2	Pin insulators				
2.1	6.1.2.1	<ul style="list-style-type: none"> • Tests on interfaces and connections of end fittings <ul style="list-style-type: none"> ○ a. pre-stressing (thermal - mechanical) ○ b. water immersion pre-stressing ○ c. Verification tests <ul style="list-style-type: none"> ○ c1. Visual examination ○ c2. Steep-front impulse voltage test 				



		o c3. Dry power frequency voltage test				
2.2	6.1.2.2	•Tests of shed and housing material				
		o a. Hardness test				
		o b. Accelerated weathering test				
		o c. Tracking and erosion test: 1,000 h				
		o d. Flammability test				
2.3	6.1.2.3	•Tests on the core material				
		o a. Dye penetration test				
		o b. Water diffusion test				
2.4	6.1.2.4	•Assembled core load tests				
		o a. Verification of the maximum design cantilever load (MDCL)				
		o b. Tensile load test				



Table A.2.2: Type tests for the offered insulators

No	Paragraph of the Technical Description ND-204/ concerning the required data of the Technical Offer	Required test certificate to be submitted	Number and issue date of the test certificate / Name of test laboratory that issued the test certificate	Manufacturing factory name and material type subjected to the test (as mentioned on the test certificate)	Location (paragraph) of test certificate, where the test procedure is described	Data that prove that the test laboratory that issued the certificate is accredited by an independent private or public authority
1	6.2.1	Suspension insulators				
1.1	6.2.1.1	<ul style="list-style-type: none"> •Electrical tests <ul style="list-style-type: none"> ○ a. Dry lightning impulse voltage test. ○ b. Wet power-frequency voltage test. 				
1.2	6.2.1.2	<ul style="list-style-type: none"> •Damage limit proof test and test of the tightness of the interface between end fittings and insulator housing 				
2	6.2.2	Pin insulators				
2.1	6.2.2.1	<ul style="list-style-type: none"> •Electrical tests <ul style="list-style-type: none"> ○ a. Dry lightning impulse voltage test. ○ b. Wet power-frequency voltage test. 				
2.2	6.2.2.2	<ul style="list-style-type: none"> •Mechanical tests <ul style="list-style-type: none"> ○ Cantilever failing load test 				



Table A.2.3: Special tests for the offered insulators

No	Paragraph of the Technical Description ND-204/ concerning the required data of the Technical Offer	Required test certificate to be submitted	Number and issue date of the test certificate / Name of test laboratory that issued the test certificate	Manufacturing factory name and material type subjected to the test (as mentioned on the test certificate)	Location (paragraph) of test certificate, where the test procedure is described	Data that prove that the test laboratory that issued the certificate is accredited by an independent private or public authority
1	6.3.1	Suspension insulators				
	6.3.1.1	<ul style="list-style-type: none"> • Test on inclined level (resistance to tracking and erosion) according to IEC 60587, method A Class 1 A 4,5 				
	6.3.1.2	<ul style="list-style-type: none"> • Multiple stress test according to IEC/TR 62730. The duration of test shall be 5.000 h 				
2	6.3.2	Pin insulators				
	6.3.2.1	<ul style="list-style-type: none"> • Test on inclined level (resistance to tracking and erosion) according to IEC 60587, method A Class 1 A 4,5 				
	6.3.2.2	<ul style="list-style-type: none"> • Multiple stress test according to IEC/TR 62730. The duration of test shall be 5.000 h 				



Table B: Data required by the Technical Description ND-204

Table B.1: Data of the offered composite suspension insulator

Type of suspension composite insulator:

No	Technical characteristic or required data	Paragraph of the Technical Description ND-204	Specified value of technical characteristic or technical requirement	Technical characteristic of offered material	Submitted document proving the correspondent technical characteristic	Location in the Technical Offer, where the required document is found
1	Creepage distance, minimum (mm)	5.1	900			
2	Power frequency voltage withstand, wet, for 1 min (kV)	5.1	50			
3	1,2/50 μ s impulse voltage withstand (kV)	5.1	145			
4	Specified tensile load (SML) (kN)	5.1	120			
5	Indicative total length of insulator (mm)	5.1	440			
6	Core diameter (mm)		To be fulfilled			
7	Distance between sheds (mm)		To be fulfilled			
8	Number of sheds		To be fulfilled			
9	Shed diameter (mm)		To be fulfilled			
10	Insulator mass (kg)		To be fulfilled			
11	Material of the internal part (core) of the insulator	5.2	epoxy resin, reinforced with fiberglass.			
12	Material of the external part of the insulator	5.2	High Temperature Vulcanized – HTV – silicon rubber			
13	Minimum polydimethylsiloxane content of silicon rubber	5.2	37 %			
14	Minimum density of silicon rubber (gr/cm ³)		To be declared			
15	Metallic fittings of suspension insulator	5.3.2	According to IEC 60120, with a diameter of Φ 16A			
16	Fittings of insulators	5.3.4				
	a. Material	5.3.4	Malleable cast-iron or forged steel			
	b. galvanization thickness	5.3.4	86 μ m min			
17	Marking on the material	7.1	<ul style="list-style-type: none"> • Manufacturer's name or trademark • Year of manufacture • Minimum insulator mechanical load 			
18	Marking on the packing	7.2	<ul style="list-style-type: none"> • Manufacturer's name • Type of insulator 			



			<ul style="list-style-type: none">• Model-type of insulator• Number of pieces• Gross mass (kg)• Contract number			
19	Packing	8	<ul style="list-style-type: none">• plastic bag• heavy-duty wooden crate of which the total (gross) mass shall not exceed 25 kg• Wooden crates in EU palletes of total weight \leq 550 kg			



Table B.2: Data of the offered composite pin insulator

Type of pin composite insulator:

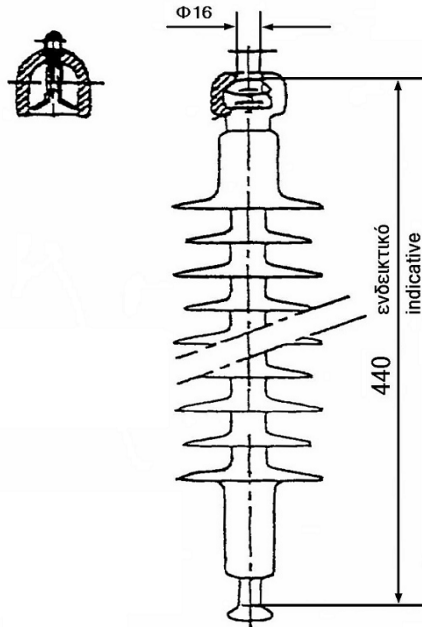
No	Technical characteristic or required data	Paragraph of the Technical Description ND-204/20.11.08 or the Sheet 1 of technical notes of the Inquiry	Specified value of technical characteristic or technical requirement	Technical characteristic of offered material	Submitted document proving the correspondent technical characteristic	Location in the Technical Offer, where the required document is found
1	Creepage distance, minimum (mm)	5.1	610			
2	Power frequency voltage withstand, wet, for 1 min (kV)	5.1	50			
3	1,2/50 μ s impulse voltage withstand (kV)	5.1	145			
4	Minimum specified tensile load (STL) (kN)	5.1	4			
5	Minimum specified cantilever load (SCL) (kN)	5.1	11			
6	Maximum design cantilever load (MDCL) (kN)	5.1	4			
7	Top-end groove radius (mm)	5.1	19 \pm 3			
8	Side groove radius (mm)	5.1	14 \pm 2			
9	Total length of insulator (mm)		To be fulfilled			
10	Core diameter (mm)		To be fulfilled			
11	Distance between sheds (mm)		To be fulfilled			
12	Number of sheds		To be fulfilled			
13	Shed diameter (mm)		To be fulfilled			
14	Insulator mass (kg)		To be fulfilled			
15	Material of the internal part (core) of the insulator	5.2	Epoxy resin, reinforced with fiberglass			
16	Material of the external part of the insulator	5.2	High Temperature Vulcanized – HTV – silicon rubber			
17	Minimum polydimethylsiloxane content of silicon rubber	5.2	37 %			
18	Minimum density of silicon rubber (gr/cm ³)		To be declared			
19	Support stem of the pin insulator	5.3.3				
20	Length of the support stem	5.3.3	220 mm			
21	Threading of the support stem	5.3.3	It shall be threaded along its entire length. A non-threaded length (10 mm max) of the support stem at its screw point in the insulator is permitted			



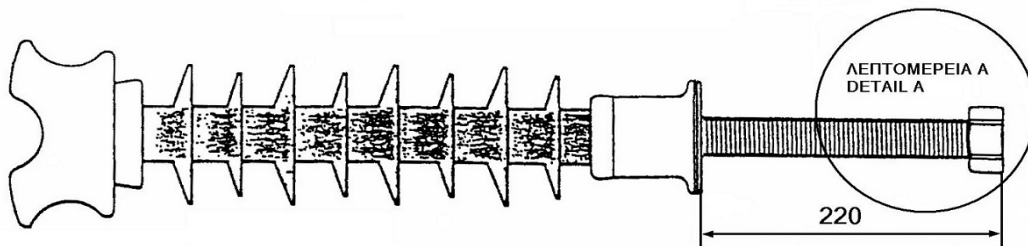
22	Washer of the attached drawing 1 (detail A)	5.3.3	Suitable width (4 mm min)			
23	Adaptation of the support stem in the respective threaded socket of the pin insulator	5.3.3	The support stem shall be steadily threaded without the use of sticking materials and in such a manner that unscrewing from the forces applied during network installation shall not be possible			
24	Description of the mounting method of the support stem	5.3.3	To be described			
25	Fittings of insulators	5.3.4				
	a. Material	5.3.4	Malleable cast-iron or forged steel			
	b. galvanization thickness	5.3.4	86 µm min			
26	Marking on the material	7.1	<ul style="list-style-type: none"> • Manufacturer's name or trademark • Year of manufacture • Minimum cantilever load 			
27	Marking on the packing	7.2	<ul style="list-style-type: none"> • Manufacturer's name • Type of insulator • Model-type of insulator • Number of pieces • Gross mass (kg) • Contract number 			
28	Packing	8	<ul style="list-style-type: none"> • plastic bag • heavy-duty wooden crate of which the total (gross) mass shall not exceed 25 kg • Wooden crates in EU pallettes of total weight ≤ 550 kg 			



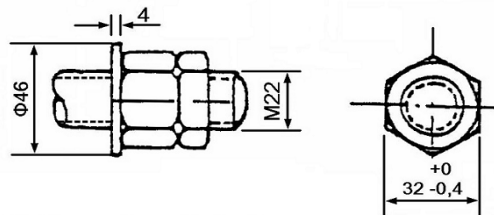
HEDNO TECHNICAL DESCRIPTION ND-204



Σχήμα 1.1: Μονωτήρες Ανάρτησης
Figure 1.1: Suspension Insulators



ΛΕΠΤΟΜΕΡΕΙΑ Α
DETAIL A



Διαστάσεις σε mm
Dimensions in mm

Σχήμα 1.2: Μονωτήρες Στήριξης
Figure 1.2: Pin Insulators

DRAWING TITLE	DRAWING No.
INDICATIVE SHAPE AND DIMENSIONS OF 24 kV COMPOSITE SUSPENSION AND PIN TYPE INSULATORS	1