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CNAS L4595

# TEST REPORT

*An Independent EMC & SAFETY Test Laboratories*

# TEST REPORT

## MECHANICAL AND DIELECTRIC IN WATER TESTS

Client company : N.I.U ELECTRIC GROUP CO., LTD  
Client address : NO.166 Liuqing North Road, Liushi Town, Yueqing,  
Zhejiang, China 325604

Report on the submitted samples said to be:

Sample Name : INSUALTION PIERCING CONNECTOR  
Trade Mark : NIUELEC  
Sample model : NU-2  
Sample Receiving Date : 2016/03/01  
Testing Period : 2016/03/02 to 2016/03/09  
Results : Please refer to next page(s).

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### TEST REQUEST

NF C 33-020:2013

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

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### CONCLUSION

PASS

Signed for and on behalf of LCS

Written By:



Suez Su  
File administrators

Approved by:



## 1. INTRODUCTION

### 1.1 Subject

This report presents the mechanical and dielectric in water tests of connectors NU-2 (main 16-95mm<sup>2</sup> / Service: 4-35mm<sup>2</sup>). Tested products are of N.I.U ELECTRIC GROUP CO., LTD's manufacturer.

Test procedures are the ones of the standard NF C 33-020 dated September 2013.

For each test, there is a test sheet grouping procedures and results.

### 1.2 Tested products

Tested products are insulated piercing connectors NU-2 with sections from 16 mm<sup>2</sup> to 95 mm<sup>2</sup> for main conductor and from 4 mm<sup>2</sup> to 35 mm<sup>2</sup> for tap conductor. These products have been delivered to LCS test laboratory on 2016/03/01.

The following markings we noticed on the connectors:

CT 70A  
Main: 16-95mm<sup>2</sup>  
Service: 4-35mm<sup>2</sup>

### 1.3 Sample quantities and order of tests

The connectors are numbered from 1 to 8.

Number of samples	Tests
1 to 4	2.3.1 Checking electrical continuity, shear heads and mechanical behaviour of the connector
5 to 8	2.4 Dielectric voltage test

## 2. STANDARD DOCUMENTS REFERED TO IN THIS REPORT

### - European standard

HD 626 S1 : February 1996+Amendment A1 of March 1997+Amendment A2 of January 2002,  
«Overhead distribution cables of rated voltage U<sub>0</sub>/U(U<sub>m</sub>): 0,6/1(1,2)Kv»

### - French standards

NF C 32-321 April 1982+Amendment A1 of April 1993,  
«Insulated cables and flexible cords for installations – Cross-linked polyethylene insulated cables covered with polyvinyl chloride sheath»

NF C 33-020 September 2013,  
«Insulated cables and their accessories for power systems – Insulation piercing branch-connectors for overhead distributions and services with bundle assembled cores, of rated voltage 0,6/1 kV»

NF C 33-209 July 1996,  
«Insulated or protected cables for power systems – Bundle assembled cores for overhead systems of rated voltage 0,6/1 kV»



### 3. GENERAL CONDITIONS

#### 3.1 Temperature

Tests are carried out at the room temperature of the test laboratory between 20°C and 26°C.

#### 3.2 Conductors used

Standard	Nominal cross-sectional area (in mm <sup>2</sup> )	Number of strands and composition of core	Φ over Sheath (in mm)	Φ over insulant (in mm)	Φ over core (in mm)
HD 626 S1	95	19 strands aluminium	1	14,4	11,2
NF C 33-209	35	7 strands aluminium	1	10,1	6,8
	16	7 strands aluminium	1	7,3	4,7
NFC C 32-321	2,5(U1000 R02V)	1 strand copper	6,8	3,1	1,7

Remark: For each test, the tap core 2,5mm<sup>2</sup> is unsheathed: the sheath is removed in order to keep only the insulant.

### 4. TEST PROCEDURES

For sample no. 1 to 4:

Procedures and acceptance criteria are the ones of § 2.3.1 of standard NF C 33-020.

Before test, the connectors are prepared: the cap is stucked on the bottom body, and grease is settled on the teeth and in the cap.

A 1 mm main core section is stretched on the mechanical tensile strength bench: the tensile strength is 42 daN for the main core 16 mm<sup>2</sup> and 246 daN for the main core 95 mm<sup>2</sup>. All the tightening process of this test is carried out by means of the tightening test machine according to the annex C of the standard NF C 33-020.

The connector is fitted on the main core and a tap core. The screw of the connector is tightened up to 0,7 times the minimal torque of the shear head: 9,4 N.m. The contact shall be established between the main and tap cores.

Then, the screw of the connector is tightened until shear head breaks.

The tightening value at the breakage is recorded. It shall be comprised between the margings given by the manufacturer: 13,5 N.m and 16,5 N.m.

The screw of the connector is then tightened up to 1,5 times the maximal torque: 24,8 N.m. The measurement uncertainty of the dynamometric equipment is ±2,5% of the torque.

No breakage of the connector or the conductors shall occur.

For sample no. 5 to 6:

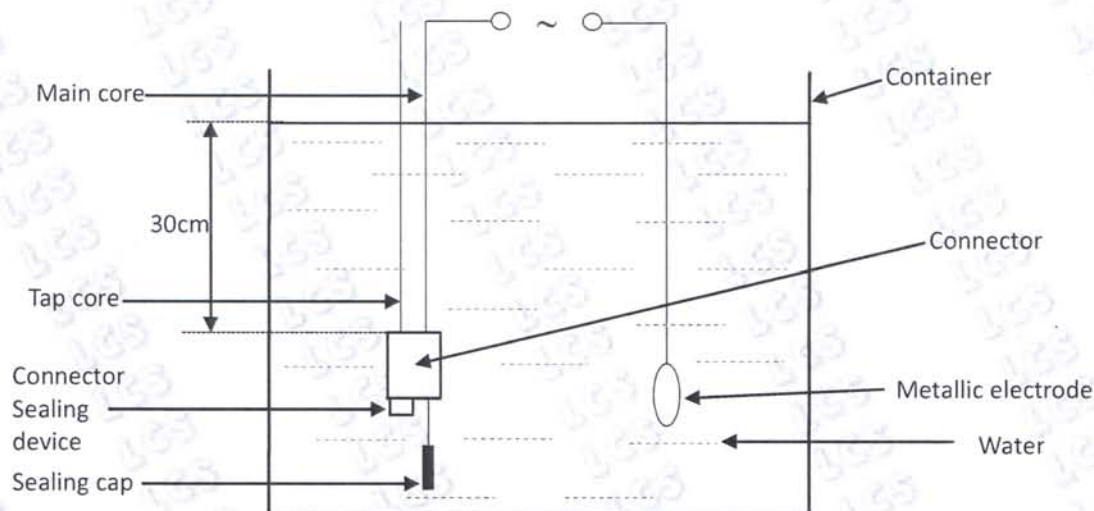
Procedures and acceptance criteria are the ones of § 2.4.1 & 2.4.2 of standard NF C 33-020.

Before test, the connector are prepared: the cap is stucked on the bottom body, and grease is settled on the teeth and in the cap.

The connector is fitted on an extreme cross-section main core and on a minimal cross-section tap core. The screw of the connector is tightened at the minimal torque, 13,5 N.m by carrying out tightening of one quarter turn in approximately 2 seconds, each tightening being spaced out by 2 seconds.

The measurement uncertainty of the dynamometric equipment is  $\pm 2,5\%$  of the torque.

The assembly connector - core is installed in water, as shown below:



The water temperature is 20°C.

Voltage generator used is regulated to release under a  $(10,0 \pm 0,5)$ mA leakage current. After 30 min under water, a dielectric test is performed on the assembly under a 6 kV voltage at an industrial frequency during one minute between cores and water. The increase of voltage is performed at a 1 kV/s speed. The measurement uncertainty of the dielectric test equipment is  $\pm 3\%$  of the voltage.

No breakage (release of voltage source) shall occur.



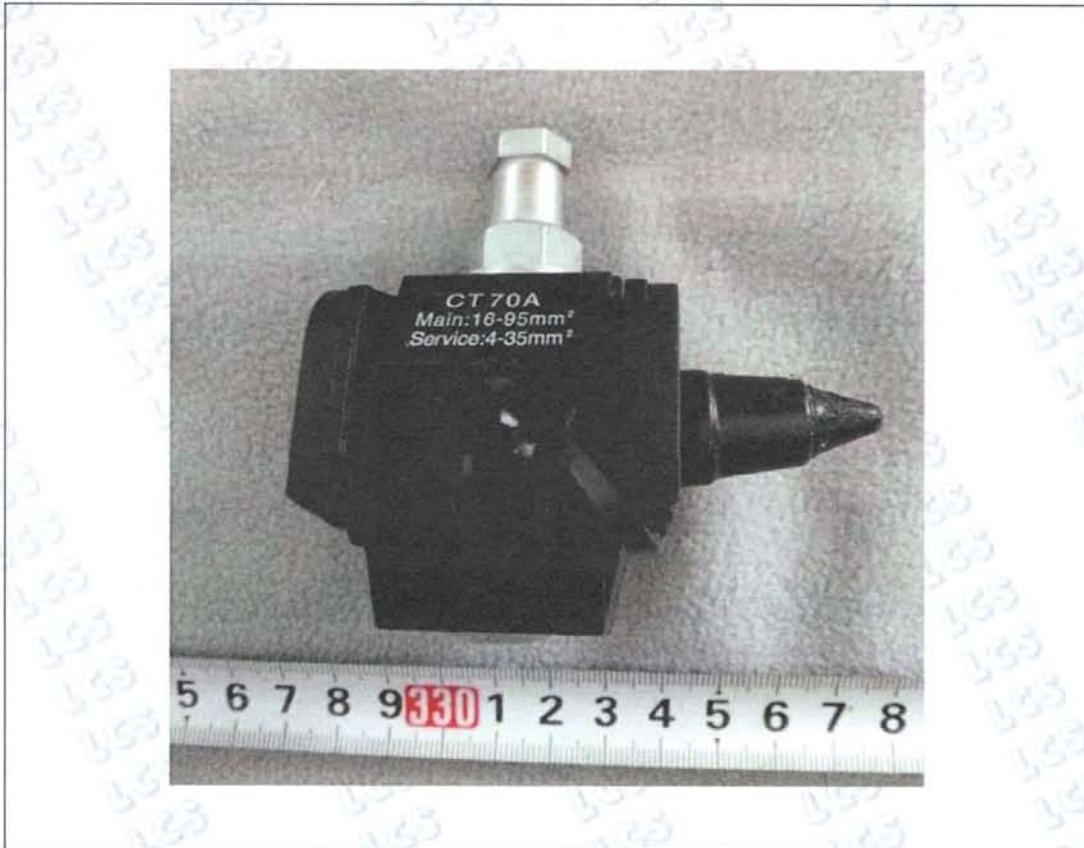
**5. TEST RESULTS**

See table below.

Sample No.	Section of cores (in mm <sup>2</sup> )		Electrical continuity: Comments after tightening up to 0,7 times the minimal torque (9,4N.m)	Minimal tightening torque of the shear head (in N.m)	Shear head breakage torque (in N.m)	Maximal tightening torque of the shear head (in N.m)	Mechanical behaviour: Comments after tightening up to 1,5 times the maximal torque (24,8N.m)
	Main	Tap					
1	16 Aluminium	35 Aluminium	Satisfactory Continuity established	13,5	16,7	16,5	Satisfactory No breakage
2	16 Aluminium	35 Aluminium	Satisfactory Continuity established	13,5	16,1	16,5	Satisfactory No breakage
3	95 Aluminium	35 Aluminium	Satisfactory Continuity established	13,5	16,4	16,5	Satisfactory No breakage
4	95 Aluminium	35 Aluminium	Satisfactory Continuity established	13,5	16,2	16,5	Satisfactory No breakage

Sample No.	Section of cores (in mm <sup>2</sup> )		Tightening torque ((in N.m))	Comments after 1 min under 6kV
	Main	Tap		
5	16 Aluminium	2,5 Copper	13,5	Satisfactory No breakage
6	16 Aluminium	2,5 Copper	13,5	Satisfactory No breakage
7	95 Aluminium	2,5 Copper	13,5	Satisfactory No breakage
8	95 Aluminium	2,5 Copper	13,5	Satisfactory No breakage

**APPENDIX – SAMPLE PHOTO**



\*\*\*\*\* THE END \*\*\*\*\*