



170008222878 (2017)国认监认字(347)号



中国认可  
国际互认  
检测  
TESTING  
CNAS L1020



实验室名称: 国家电器产品质量监督检验中心

Lab Name: China National Center for Quality Supervision  
and Test of Electrical Apparatus Products

No 19XJ0632-S

## 检验 (试验) 报告 Test Report

委托单位: ZHEJIANG HAIVO ELECTRICAL CO., LTD.  
Client:

产品名称: POLYMERIC PIN TYPE INSULATOR  
Name of Product:

产品型号: FPQ-24kV/12kN  
Product Type:

检验类别: Type test  
Test Category:

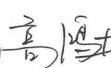


本实验室对出具的检验 (试验) 结果负责, 未经实验室书面同意, 不得部分地复制本报告。

The laboratory is responsible for the inspection (Test) results. The report shall not be reproduced except in full, written approval of the laboratory.

| China National Center for<br>Quality Supervision and Test of<br>Electrical Apparatus Products |                                                                                            | Test Report | FPQ-24kV/12kN<br>POLYMERIC PIN TYPE<br>INSULATOR |
|-----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|-------------|--------------------------------------------------|
| Contents                                                                                      |                                                                                            |             |                                                  |
| Number                                                                                        | Contents                                                                                   |             | Page                                             |
| 1                                                                                             | Cover                                                                                      |             |                                                  |
| 2                                                                                             | Contents                                                                                   |             | 1                                                |
| 3                                                                                             | General                                                                                    |             | 2                                                |
| 4                                                                                             | Photos of the specimens                                                                    |             | 3                                                |
| 5                                                                                             | Test conclusion                                                                            |             | 4                                                |
| 6                                                                                             | Visual inspection                                                                          |             | 5                                                |
| 7                                                                                             | Tensile load test                                                                          |             | 6                                                |
| 8                                                                                             | Tests on interfaces and connections of end fittings                                        |             | 7~12                                             |
| 9                                                                                             | Hardness test                                                                              |             | 13                                               |
| 10                                                                                            | Accelerated weathering test                                                                |             | 14                                               |
| 11                                                                                            | Tracking and erosion test                                                                  |             | 15                                               |
| 12                                                                                            | Flammability test                                                                          |             | 16                                               |
| 13                                                                                            | Tests on the core material                                                                 |             | 17~18                                            |
| 14                                                                                            | Assembled core load-time test (Verification of the maximum design cantilever load (MDCL) ) |             | 19                                               |
| 15                                                                                            | Assembled core load-time test ( Tensile load test )                                        |             | 20                                               |
| 16                                                                                            | Dry lightning-impulse withstand voltage test                                               |             | 21                                               |
| 17                                                                                            | Wet power-frequency withstand voltage test                                                 |             | 22                                               |
| 18                                                                                            | Cantilever failing load test                                                               |             | 23                                               |
| 19                                                                                            | Annex                                                                                      |             | 24                                               |
| 20                                                                                            | Assembly                                                                                   |             | 25                                               |
| 21                                                                                            | Oscillogram                                                                                |             | 26~36                                            |
|                                                                                               | Blank below                                                                                |             |                                                  |
|                                                                                               |                                                                                            |             |                                                  |
|                                                                                               |                                                                                            |             |                                                  |
|                                                                                               |                                                                                            |             |                                                  |
|                                                                                               |                                                                                            |             |                                                  |
|                                                                                               |                                                                                            |             |                                                  |

|                                                                                               |                                             |                                                                 |                                                  |                                                  |  |
|-----------------------------------------------------------------------------------------------|---------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------|--------------------------------------------------|--|
| China National Center for<br>Quality Supervision and Test of<br>Electrical Apparatus Products |                                             | Test Report                                                     |                                                  | FPQ-24kV/12kN<br>POLYMERIC PIN TYPE<br>INSULATOR |  |
| General                                                                                       |                                             |                                                                 |                                                  |                                                  |  |
| Test category                                                                                 |                                             | Type test                                                       |                                                  |                                                  |  |
| Type and name of specimens                                                                    |                                             | FPQ-24kV/12kN POLYMERIC PIN TYPE INSULATOR                      |                                                  |                                                  |  |
| Client                                                                                        |                                             | ZHEJIANG HAIVO ELECTRICAL CO.,LTD.                              |                                                  |                                                  |  |
| Address                                                                                       |                                             | CHONGSHI INDUSTRIAL ZONE,PANSHI,YUEQING,ZHEJIANG,CHINA          |                                                  |                                                  |  |
| Manufacturer                                                                                  |                                             | ZHEJIANG HAIVO ELECTRICAL CO.,LTD.                              |                                                  |                                                  |  |
| Address                                                                                       |                                             | CHONGSHI INDUSTRIAL ZONE,PANSHI,YUEQING,ZHEJIANG,CHINA          |                                                  |                                                  |  |
| Manufacturing date and serial number                                                          |                                             | /                                                               |                                                  |                                                  |  |
| Main technical<br>parameters of specimens                                                     | Rated voltage kV                            |                                                                 | 24                                               |                                                  |  |
|                                                                                               | lightning-impulse withstand voltage kV peak |                                                                 | Positive polarity: 150<br>Negative polarity: 200 |                                                  |  |
|                                                                                               | Wet Power-frequency withstand voltage kV    |                                                                 | 70                                               |                                                  |  |
|                                                                                               | Specified cantilever load (SCL) kN          |                                                                 | 12                                               |                                                  |  |
|                                                                                               | Specified tensile load (STL) kN             |                                                                 | 12                                               |                                                  |  |
|                                                                                               | Maximum design cantilever load (MDCL) kN    |                                                                 | 12                                               |                                                  |  |
|                                                                                               | Creepage distance (mm)                      |                                                                 | ≥ 645                                            |                                                  |  |
|                                                                                               |                                             |                                                                 |                                                  |                                                  |  |
|                                                                                               |                                             |                                                                 |                                                  |                                                  |  |
|                                                                                               |                                             |                                                                 |                                                  |                                                  |  |
|                                                                                               |                                             |                                                                 |                                                  |                                                  |  |
|                                                                                               | Technical<br>data from<br>client            | FPQ-24kV/12kN POLYMERIC PIN TYPE INSULATOR Test commission form |                                                  |                                                  |  |
| FPQ-24kV/12kN POLYMERIC PIN TYPE INSULATOR Assembly                                           |                                             |                                                                 |                                                  |                                                  |  |
|                                                                                               |                                             |                                                                 |                                                  |                                                  |  |
| Description                                                                                   | /                                           |                                                                 |                                                  |                                                  |  |
| Representative of client: Gu Guangwei                                                         |                                             |                                                                 |                                                  |                                                  |  |
| Date of specimens receiving: Aug. 8 <sup>th</sup> , 2019                                      |                                             |                                                                 |                                                  |                                                  |  |
| Test period: from Aug. 10 <sup>th</sup> , 2019 to Sep. 24 <sup>th</sup> , 2019                |                                             |                                                                 |                                                  |                                                  |  |

|                                                                                                  |                                                                                                                                                                                                                                                                                                                                                     |                                                                                                  |                                                                                                    |
|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| China National Center for<br>Quality Supervision and Test of<br>Electrical Apparatus Products    | Test Report                                                                                                                                                                                                                                                                                                                                         | FPQ-24kV/12kN<br>POLYMERIC PIN TYPE<br>INSULATOR                                                 |                                                                                                    |
| Test conclusion                                                                                  |                                                                                                                                                                                                                                                                                                                                                     |                                                                                                  |                                                                                                    |
| Client                                                                                           | ZHEJIANG HAIVO ELECTRICAL CO.,LTD.                                                                                                                                                                                                                                                                                                                  |                                                                                                  |                                                                                                    |
| Type of specimens                                                                                | FPQ-24kV/12kN                                                                                                                                                                                                                                                                                                                                       |                                                                                                  |                                                                                                    |
| Name of specimens                                                                                | POLYMERIC PIN TYPE INSULATOR                                                                                                                                                                                                                                                                                                                        |                                                                                                  |                                                                                                    |
| Manufacturer                                                                                     | ZHEJIANG HAIVO ELECTRICAL CO.,LTD.                                                                                                                                                                                                                                                                                                                  |                                                                                                  |                                                                                                    |
| Test items and<br>results                                                                        | Visual examination                                                                                                                                                                                                                                                                                                                                  | PASS                                                                                             |                                                                                                    |
|                                                                                                  | Tensile load test[STL:12kN]                                                                                                                                                                                                                                                                                                                         | PASS                                                                                             |                                                                                                    |
|                                                                                                  | Tests on interfaces and connections of end fittings (thermal-mechanical pre-stressing)                                                                                                                                                                                                                                                              | PASS                                                                                             |                                                                                                    |
|                                                                                                  | Tests on interfaces and connections of end fittings (thermal-mechanical pre-stressing)                                                                                                                                                                                                                                                              |                                                                                                  |                                                                                                    |
|                                                                                                  | Tests on interfaces and connections of end fittings (visual examination)                                                                                                                                                                                                                                                                            |                                                                                                  |                                                                                                    |
|                                                                                                  | Tests on interfaces and connections of end fittings (steep-front impulse voltage test)                                                                                                                                                                                                                                                              |                                                                                                  |                                                                                                    |
|                                                                                                  | Tests on interfaces and connections of end fittings (dry power-frequency voltage test)                                                                                                                                                                                                                                                              |                                                                                                  |                                                                                                    |
|                                                                                                  | Hardness test                                                                                                                                                                                                                                                                                                                                       | PASS                                                                                             |                                                                                                    |
|                                                                                                  | Accelerated weathering test                                                                                                                                                                                                                                                                                                                         | PASS                                                                                             |                                                                                                    |
|                                                                                                  | Tracking and erosion test[1000h]                                                                                                                                                                                                                                                                                                                    | PASS                                                                                             |                                                                                                    |
|                                                                                                  | Flammability test[class V-0]                                                                                                                                                                                                                                                                                                                        | PASS                                                                                             |                                                                                                    |
|                                                                                                  | Tests on the core material                                                                                                                                                                                                                                                                                                                          | PASS                                                                                             |                                                                                                    |
|                                                                                                  | Assembled core load-time test (Verification of the maximum design cantilever load (MDCL) ) [MDCL:12kN]                                                                                                                                                                                                                                              | PASS                                                                                             |                                                                                                    |
|                                                                                                  | Assembled core load-time test ( Tensile load test) [STL:12kN]                                                                                                                                                                                                                                                                                       | PASS                                                                                             |                                                                                                    |
|                                                                                                  | Dry lightning impulse withstand voltage test [between upper and lower end surfaces: Positive polarity: 150; Negative polarity: 200 peak]                                                                                                                                                                                                            | PASS                                                                                             |                                                                                                    |
|                                                                                                  | Wet power-frequency withstand voltage test [between upper and lower end surfaces: 70kV/1min]                                                                                                                                                                                                                                                        | PASS                                                                                             |                                                                                                    |
|                                                                                                  | Cantilever failing load test[SCL:12kN]                                                                                                                                                                                                                                                                                                              | PASS                                                                                             |                                                                                                    |
| Test standard                                                                                    | IEC 61952:2008 Insulators for overhead lines – Composite line post insulators for A.C. systems with a nominal voltage greater than 1 000 V – Definitions, test methods and acceptance criteria Clauses 13.1、13.2、10.3.1、10.4.1、10.4.2、11.1、11.2                                                                                                     |                                                                                                  |                                                                                                    |
|                                                                                                  | IEC 62217:2012 Polymeric HV insulators for indoor and outdoor use – General definitions, test methods and acceptance criteria Clauses 9.2.4、9.2.6、9.2.7.2、9.2.7.3、9.2.7.4、9.3.1、9.3.2、9.3.3、9.3.4、9.4                                                                                                                                               |                                                                                                  |                                                                                                    |
| Conclusion                                                                                       | <p>The tests are carried out on FPQ-24kV/12kN POLYMERIC PIN TYPE INSULATOR by ZHEJIANG HAIVO ELECTRICAL CO., LTD., and the test items meet the relevant clauses of above test standards and technical specification, and the specimens have passed the tests.</p> <p>Note: the conclusion is valid only for the inspected and tested specimens.</p> |                                                                                                  |                                                                                                    |
| Compiled by:  | Proofread by:                                                                                                                                                                                                                                                    | Checked by:  | Approved by:  |
| Date: 2019-11-12                                                                                 | Date: 2019-11-12                                                                                                                                                                                                                                                                                                                                    | Date: 2019-11-12                                                                                 | Date: 2019-11-12                                                                                   |

|                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                  |
|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| China National Center for<br>Quality Supervision and Test of<br>Electrical Apparatus Products | Test Report                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | FPQ-24kV/12kN<br>POLYMERIC PIN TYPE<br>INSULATOR |
| Visual examination                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                  |
| Test date: 2019-08-10                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                  |
| 1. Test result                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                  |
| No. of the specimens                                                                          | Appearance inspection standard of test specimen                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Test result                                      |
| 19XJ0632-S-#01~#18                                                                            | <p>Each insulator shall be examined. The mounting of metallic parts on the insulator assembly shall be in accordance with the drawings. The colour of the insulator shall approximately be as specified in the drawing.</p> <p>The following defects are not permitted:</p> <p>Superficial defects of an area greater than 25 mm<sup>2</sup> (the total defective area not to exceed 0,2 % of the total insulator surface) or depth or height greater than 1 mm;</p> <p>Crack at the root of the shed notably next to the metal fittings</p> | Meet the requirements                            |
| Note: /                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                  |

|                                                                                               |                                    |                                                  |                 |
|-----------------------------------------------------------------------------------------------|------------------------------------|--------------------------------------------------|-----------------|
| China National Center for<br>Quality Supervision and Test of<br>Electrical Apparatus Products | Test Report                        | FPQ-24kV/12kN<br>POLYMERIC PIN TYPE<br>INSULATOR |                 |
| <b>Tensile load test</b>                                                                      |                                    |                                                  |                 |
| Test date: 2019-08-12                                                                         |                                    |                                                  |                 |
| 1. Test result                                                                                |                                    |                                                  |                 |
| No. of the specimens                                                                          | Applied mechanical loads<br>( kN ) | Duration ( s )                                   | Whether damaged |
| 19XJ0632-S-#01                                                                                | 6.15                               | 10                                               | 否               |
| 19XJ0632-S-#02                                                                                | 6.17                               |                                                  |                 |
| 19XJ0632-S-#03                                                                                | 6.15                               |                                                  |                 |
| 19XJ0632-S-#04                                                                                | 6.12                               |                                                  |                 |
| 19XJ0632-S-#05                                                                                | 6.14                               |                                                  |                 |
| 19XJ0632-S-#06                                                                                | 6.16                               |                                                  |                 |
| 19XJ0632-S-#07                                                                                | 6.17                               |                                                  |                 |
| 19XJ0632-S-#08                                                                                | 6.17                               |                                                  |                 |
| 19XJ0632-S-#09                                                                                | 6.18                               |                                                  |                 |
| 19XJ0632-S-#10                                                                                | 6.18                               |                                                  |                 |
| 19XJ0632-S-#11                                                                                | 6.15                               |                                                  |                 |
| 19XJ0632-S-#12                                                                                | 6.20                               |                                                  |                 |
| 19XJ0632-S-#13                                                                                | 6.16                               |                                                  |                 |
| 19XJ0632-S-#14                                                                                | 6.13                               |                                                  |                 |
| 19XJ0632-S-#15                                                                                | 6.18                               |                                                  |                 |
| 19XJ0632-S-#16                                                                                | 6.14                               |                                                  |                 |
| 19XJ0632-S-#17                                                                                | 6.15                               |                                                  |                 |
| 19XJ0632-S-#18                                                                                | 6.18                               |                                                  |                 |
|                                                                                               |                                    |                                                  |                 |
| Note: /                                                                                       |                                    |                                                  |                 |

| China National Center for<br>Quality Supervision and Test of<br>Electrical Apparatus Products                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Test Report                        | FPQ-24kV/12kN<br>POLYMERIC PIN TYPE<br>INSULATOR |                                                |                                         |                                     |                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|--------------------------------------------------|------------------------------------------------|-----------------------------------------|-------------------------------------|-------------------------|
| <b>Tests on interfaces and connections of end fittings (thermal-mechanical pre-stressing)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                    |                                                  |                                                |                                         |                                     |                         |
| Test date: 2019-08-18~2019-08-24                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                    |                                                  |                                                |                                         |                                     |                         |
| 1. Test requirement:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                    |                                                  |                                                |                                         |                                     |                         |
| <p>The three specimens shall be submitted to a mechanical load in two opposite directions and to temperature cycles. The 24h temperature cycle shall be performed twice. Each 24h temperature cycle has two temperature levels with a duration of at least 8h, one at <math>(+50 \pm 5) ^\circ\text{C}</math>, the other at <math>(-35 \pm 5) ^\circ\text{C}</math>. The cold period shall be at a temperature at least 85 K below the value actually applied in the hot period. The pre-stressing can be conducted in air or any other suitable medium.</p> <p>The load applied to the specimens shall correspond to the MDCL (12kN).</p> <p>The load shall be applied to the insulator at the conductor position. The initial direction shall be appropriate for the end fittings, and approximately perpendicular to the axis of the insulator at the point of application. The direction of the cantilever load applied to the specimens shall be reversed once, generally at the cooling passage through ambient temperature.</p> |                                    |                                                  |                                                |                                         |                                     |                         |
| 2. Test results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                    |                                                  |                                                |                                         |                                     |                         |
| No. of the<br>specimens                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Applied<br>cantilever<br>load (kN) | Cooling<br>temperature<br>( $^\circ\text{C}$ )   | Heating<br>temperature<br>( $^\circ\text{C}$ ) | Duration in<br>cold or hot<br>water (h) | Reversed<br>times in 24h<br>(times) | Whether<br>cracks occur |
| 19XJ0632-S-#<br>02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 12.14                              | -35.1                                            | 50.1                                           | 8                                       | 2                                   | No                      |
| 19XJ0632-S-#<br>03                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 12.16                              |                                                  |                                                |                                         |                                     | No                      |
| 19XJ0632-S-#<br>04                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 12.15                              |                                                  |                                                |                                         |                                     | No                      |
| Note: /                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                    |                                                  |                                                |                                         |                                     |                         |

China National Center for  
Quality Supervision and Test of  
Electrical Apparatus Products

## Test Report

FPQ-24kV/12kN  
POLYMERIC PIN TYPE  
INSULATOR

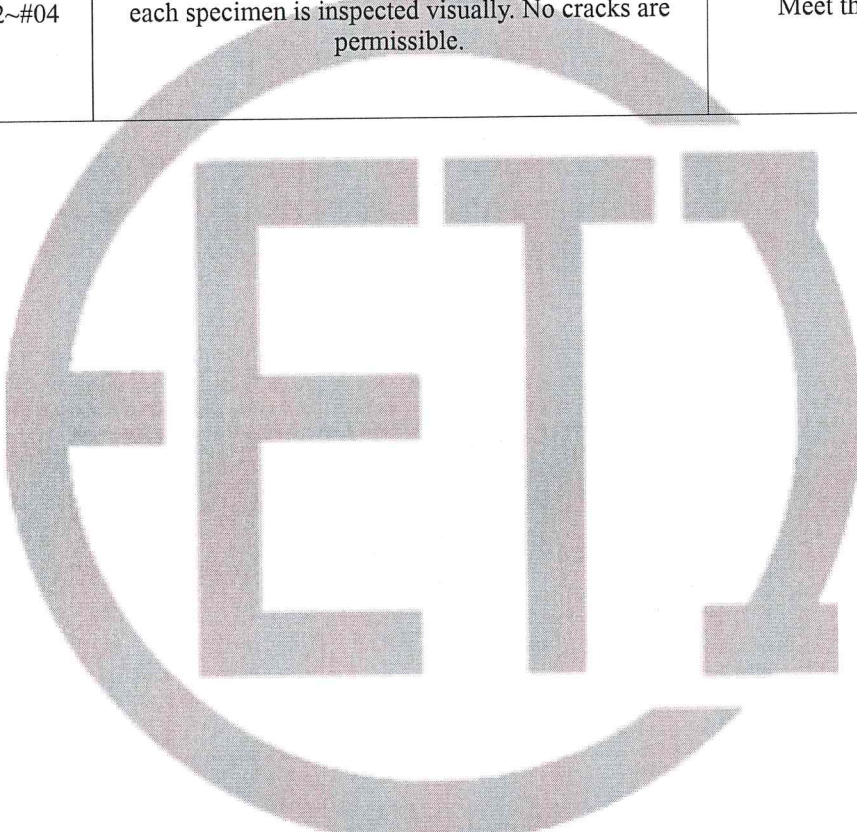
## Tests on interfaces and connections of end fittings (thermal-mechanical pre-stressing)

Test date: 2019-08-24~2019-08-26

## 1. Test results:

| No. of the specimens | Test liquor                                                             | Boiling time (h) |
|----------------------|-------------------------------------------------------------------------|------------------|
| 19XJ0632-S-#02       | Tap water with salt added. The conductivity is 1650 $\mu$ S/cm at 21 °C | 42               |
| 19XJ0632-S-#03       |                                                                         |                  |
| 19XJ0632-S-#04       |                                                                         |                  |

Note: /

|                                                                                               |                                                                                                                    |                                                  |
|-----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| China National Center for<br>Quality Supervision and Test of<br>Electrical Apparatus Products | Test Report                                                                                                        | FPQ-24kV/12kN<br>POLYMERIC PIN TYPE<br>INSULATOR |
| Tests on interfaces and connections of end fittings (Visual examination)                      |                                                                                                                    |                                                  |
| Test date: 2019-08-26                                                                         |                                                                                                                    |                                                  |
| 1. Test result                                                                                |                                                                                                                    |                                                  |
| No. of the specimens                                                                          | Appearance inspection standard of test specimen                                                                    | Test result                                      |
| 19XJ0632-S-#02~#04                                                                            | After water immersion pre-stressing the housing of each specimen is inspected visually. No cracks are permissible. | Meet the requirements                            |
|            |                                                                                                                    |                                                  |
| Note: /                                                                                       |                                                                                                                    |                                                  |

| China National Center for<br>Quality Supervision and Test of<br>Electrical Apparatus Products | Test Report                                                                                                                                              |                                        | FPQ-24kV/12kN<br>POLYMERIC PIN TYPE<br>INSULATOR |                          |                             |                          |  |  |  |  |
|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|--------------------------------------------------|--------------------------|-----------------------------|--------------------------|--|--|--|--|
| Tests on interfaces and connections of end fittings (steep-front impulse voltage test)        |                                                                                                                                                          |                                        |                                                  |                          |                             |                          |  |  |  |  |
| Test date: 2019-08-27                                                                         |                                                                                                                                                          |                                        |                                                  |                          |                             |                          |  |  |  |  |
| 1. Test results:                                                                              |                                                                                                                                                          |                                        |                                                  |                          |                             |                          |  |  |  |  |
| No. of the<br>specimens                                                                       | Specimen<br>section                                                                                                                                      | Status of the<br>specimen or test part | Positive polarity                                |                          | Negative polarity           |                          |  |  |  |  |
|                                                                                               |                                                                                                                                                          |                                        | Impulses in<br>each section                      | Flashover or<br>puncture | Impulses in<br>each section | Flashover or<br>puncture |  |  |  |  |
| 19XJ0632-S-#02                                                                                | 1                                                                                                                                                        | Between upper and<br>lower of the shed | 25                                               | Flashover                | 25                          | Flashover                |  |  |  |  |
| 19XJ0632-S-#03                                                                                | 1                                                                                                                                                        | Between upper and<br>lower of the shed | 25                                               | Flashover                | 25                          | Flashover                |  |  |  |  |
| 19XJ0632-S-#04                                                                                | 1                                                                                                                                                        | Between upper and<br>lower of the shed | 25                                               | Flashover                | 25                          | Flashover                |  |  |  |  |
| Steepness<br>kV/ $\mu$ s                                                                      | Specified value                                                                                                                                          |                                        | 1000~1500                                        |                          |                             |                          |  |  |  |  |
|                                                                                               | Measured value                                                                                                                                           |                                        | 1002.7~1315.4                                    |                          | 1091.9~1380.8               |                          |  |  |  |  |
| Conclusion                                                                                    | Pass                                                                                                                                                     |                                        |                                                  |                          |                             |                          |  |  |  |  |
| <p>Note: the data in the table has been corrected in the standard atmosphere condition.</p>   |                                                                                                                                                          |                                        |                                                  |                          |                             |                          |  |  |  |  |
| Atmosphere condition of test<br>zone                                                          | P=102.3kPa;      Environmental temperature t=26.1℃;      Relative humidity:47%<br>Atmosphere correction factor Kt= /      Height correction factor Ka= / |                                        |                                                  |                          |                             |                          |  |  |  |  |

| China National Center for<br>Quality Supervision and Test of<br>Electrical Apparatus Products | Test Report                                                                                                                                             |                                                         |       |       |       | FPQ-24kV/12kN<br>POLYMERIC PIN TYPE<br>INSULATOR |                  |                    |
|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|-------|-------|-------|--------------------------------------------------|------------------|--------------------|
| Tests on interfaces and connections of end fittings (dry power-frequency voltage test)        |                                                                                                                                                         |                                                         |       |       |       |                                                  |                  |                    |
| Test date: 2019-08-27                                                                         |                                                                                                                                                         |                                                         |       |       |       |                                                  |                  |                    |
| 1. Test results:                                                                              |                                                                                                                                                         |                                                         |       |       |       |                                                  |                  |                    |
| No. of the<br>specimens                                                                       | Status of the<br>specimen or test<br>part                                                                                                               | Dry power-frequency flashover withstand voltage<br>(kV) |       |       |       |                                                  | Average<br>value | Corrected<br>value |
|                                                                                               |                                                                                                                                                         | 1                                                       | 2     | 3     | 4     | 5                                                |                  |                    |
| 19XJ0632-S-#0<br>1                                                                            | Between upper<br>and lower end<br>surfaces of the<br>insulator                                                                                          | 120.6                                                   | 121.3 | 123.8 | 122.9 | 121.5                                            | 122.0            | 118.8              |
|            |                                                                                                                                                         |                                                         |       |       |       |                                                  |                  |                    |
| Note: the data in the table has been corrected in the standard atmosphere condition.          |                                                                                                                                                         |                                                         |       |       |       |                                                  |                  |                    |
| Atmosphere condition<br>of test zone                                                          | P=102.6kPa;    Environmental temperature t=26.1℃;    Relative humidity:57%<br>Atmosphere correction factor Kt= 1.0267    Height correction factor Ka= / |                                                         |       |       |       |                                                  |                  |                    |

| China National Center for<br>Quality Supervision and Test of<br>Electrical Apparatus Products                                                    | Test Report                                                                                                                                                                 |                                                         |                                           |       |       | FPQ-24kV/12kN<br>POLYMERIC PIN TYPE<br>INSULATOR |                  |                           |         |
|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------|-------|-------|--------------------------------------------------|------------------|---------------------------|---------|
| Tests on interfaces and connections of end fittings (dry power-frequency voltage test) continued                                                 |                                                                                                                                                                             |                                                         |                                           |       |       |                                                  |                  |                           |         |
| Test date: 2019-08-27                                                                                                                            |                                                                                                                                                                             |                                                         |                                           |       |       |                                                  |                  |                           |         |
| 1. Test results:                                                                                                                                 |                                                                                                                                                                             |                                                         |                                           |       |       |                                                  |                  |                           |         |
| No. of the<br>specimens                                                                                                                          | Status of the<br>specimen or test<br>part                                                                                                                                   | Dry power-frequency flashover withstand voltage<br>(kV) |                                           |       |       |                                                  | Average<br>value | Corrected<br>value        |         |
|                                                                                                                                                  |                                                                                                                                                                             | 1                                                       | 2                                         | 3     | 4     | 5                                                |                  |                           |         |
| 19XJ0632-S-#<br>02                                                                                                                               | Between upper<br>and lower end<br>surfaces of the<br>insulator                                                                                                              | 120.8                                                   | 119.7                                     | 121.3 | 119.2 | 121.6                                            | 120.5            | 117.4                     |         |
| 19XJ0632-S-#<br>03                                                                                                                               |                                                                                                                                                                             | 120.2                                                   | 119.7                                     | 119.1 | 122.2 | 118.6                                            | 120.0            | 117.0                     |         |
| 19XJ0632-S-#<br>04                                                                                                                               |                                                                                                                                                                             | 121.7                                                   | 119.4                                     | 120.1 | 118.8 | 121.5                                            | 120.3            | 117.3                     |         |
| 2. Conclusion: The values of flashover voltage of Specimens No. 19XJ0632-S-#02~#04 exceed 90% of based flashover voltage and the test is passed. |                                                                                                                                                                             |                                                         |                                           |       |       |                                                  |                  |                           |         |
| No. of the<br>specimens                                                                                                                          | 80% based<br>flashover<br>voltage<br>(kV)                                                                                                                                   | Durati<br>on<br>(min<br>)                               | Measured points                           |       |       |                                                  |                  |                           | Results |
|                                                                                                                                                  |                                                                                                                                                                             |                                                         | Applied points                            | 1     | 2     | 3                                                | Average<br>value | Temperature<br>rise(<10K) |         |
| 19XJ0632<br>-S-#02                                                                                                                               | 97.6                                                                                                                                                                        | 30                                                      | Refer to bar<br>temperature (°C)          | 26.0  | 26.2  | 25.9                                             | 26.0             | 0.3                       | Pass    |
|                                                                                                                                                  |                                                                                                                                                                             |                                                         | Temperature after<br>raising voltage (°C) | 26.2  | 26.5  | 26.1                                             | 26.3             |                           |         |
| 19XJ0632<br>-S-#03                                                                                                                               | 97.6                                                                                                                                                                        | 30                                                      | Refer to bar<br>temperature (°C)          | 26.0  | 26.2  | 25.9                                             | 26.0             | 0.4                       | Pass    |
|                                                                                                                                                  |                                                                                                                                                                             |                                                         | Temperature after<br>raising voltage (°C) | 26.3  | 26.6  | 26.2                                             | 26.4             |                           |         |
| 19XJ0632<br>-S-#04                                                                                                                               | 97.6                                                                                                                                                                        | 30                                                      | Refer to bar<br>temperature (°C)          | 26.0  | 26.2  | 25.9                                             | 26.0             | 0.3                       | Pass    |
|                                                                                                                                                  |                                                                                                                                                                             |                                                         | Temperature after<br>raising voltage (°C) | 26.2  | 26.4  | 26.2                                             | 26.3             |                           |         |
| Note: based flashover voltage refers to dry power-frequency flashover withstand voltage of specimen 19XJ0632-S-#01. See page 11.                 |                                                                                                                                                                             |                                                         |                                           |       |       |                                                  |                  |                           |         |
| Note: the data in the table has been corrected in the standard atmosphere condition.                                                             |                                                                                                                                                                             |                                                         |                                           |       |       |                                                  |                  |                           |         |
| Atmosphere condition<br>of test zone                                                                                                             | P=102.6kPa;      Environmental temperature t=26.1℃;      Relative humidity:57%<br>Atmosphere correction factor Kt= 1.0260/1.0258/1.0259      Height correction factor Ka= / |                                                         |                                           |       |       |                                                  |                  |                           |         |

|                                                                                               |             |                                                  |
|-----------------------------------------------------------------------------------------------|-------------|--------------------------------------------------|
| China National Center for<br>Quality Supervision and Test of<br>Electrical Apparatus Products | Test Report | FPQ-24kV/12kN<br>POLYMERIC PIN TYPE<br>INSULATOR |
|-----------------------------------------------------------------------------------------------|-------------|--------------------------------------------------|

## Hardness test

Test date: 2019-08-17~2019-08-19

## 1. Test results:

| No. of the<br>specimens | Ambient<br>temperature<br>( °C ) | Hardness |      |      |                   | Boiling<br>time<br>(h) | Temperat<br>ure after<br>boiling<br>(°C) | Hardness after boiling |      |      |                   | Changement<br>from the<br>pre-boiled<br>value<br>< ±20% |
|-------------------------|----------------------------------|----------|------|------|-------------------|------------------------|------------------------------------------|------------------------|------|------|-------------------|---------------------------------------------------------|
|                         |                                  | 1        | 2    | 3    | The mid-<br>value |                        |                                          | 1                      | 2    | 3    | The mid-<br>value |                                                         |
| 19XJ0632-S-<br>C01      | 27.8                             | 56.1     | 55.6 | 55.0 | 55.6              | 42                     | 28.5                                     | 54.4                   | 55.0 | 54.8 | 54.8              | 1.44                                                    |
| 19XJ0632-S-<br>C02      | 27.8                             | 54.0     | 53.8 | 53.4 | 53.8              | 42                     | 28.5                                     | 54.6                   | 54.6 | 54.2 | 54.6              | -1.49                                                   |

## 2. Conclusion: Pass

Note: /

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                 |               |                                                                            |                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| China National Center for<br>Quality Supervision and Test of<br>Electrical Apparatus Products                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Test Report     |               | FPQ-24kV/12kN<br>POLYMERIC PIN TYPE<br>INSULATOR                           |                                                                                              |
| <b>Accelerated weathering test</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                 |               |                                                                            |                                                                                              |
| Test date: 2019-08-10~2019-09-20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                 |               |                                                                            |                                                                                              |
| 1. Test requirement:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |               |                                                                            |                                                                                              |
| <p>Cut three specimens from one insulator (if possible, identify each test specimen by suitable indelible marking) for the test. The specimens should be tested for 1000h UV light with one of the following methods. If there are indelible markings, they should be exposed directly under UV light.</p> <p>--- Xenon-arc lamps according ISO 4892-2:</p> <ul style="list-style-type: none"> <li>• Test method A,</li> <li>• Standard injection cycle,</li> <li>• Temperature of blackboard 为 <math>65^{\circ}\text{C} \pm 3\text{K}</math>,</li> <li>• Radiance: <math>550\text{W}/\text{m}^2</math>.</li> </ul> <p>--- Fluorescent ultraviolet lamps according ISO 4892-2:</p> <ul style="list-style-type: none"> <li>• I type fluorescent ultraviolet lamps,</li> <li>• Exposed way No.2.</li> </ul> <p>Acceptance criteria:</p> <p>After the test markings on shed or housing material shall be legible; surface degradations such as cracks and raised areas are not permitted.</p> <p>In case of doubt concerning such degradation, two surface roughness measurements shall be made on each of the three specimens. The roughness, Rz as defined in ISO 4287, shall be measured along a sampling length of at least 2,5 mm. Rz shall not exceed 0,1 mm.</p> |                 |               |                                                                            |                                                                                              |
| 2. Test results:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                 |               |                                                                            |                                                                                              |
| No. of the<br>specimens                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Test method     | Duration<br>h | After the test markings on shed<br>or housing material shall be<br>legible | After the test surface<br>degradations such as cracks and<br>raised areas are not permitted. |
| 19XJ0632-S-C<br>03~C05                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Xenon-arc lamps | 1000          | Meet the requirements                                                      | No surface degradations                                                                      |
| 3. Conclusion: Pass                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                 |               |                                                                            |                                                                                              |
| Note: /                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                 |               |                                                                            |                                                                                              |

|                                                                                               |             |                                                  |
|-----------------------------------------------------------------------------------------------|-------------|--------------------------------------------------|
| China National Center for<br>Quality Supervision and Test of<br>Electrical Apparatus Products | Test Report | FPQ-24kV/12kN<br>POLYMERIC PIN TYPE<br>INSULATOR |
|-----------------------------------------------------------------------------------------------|-------------|--------------------------------------------------|

## Tracking and erosion test

Test date: 2019-08-13~2019-09-24

## 1. Test result:

| No. of the<br>specimens | Applied<br>voltage<br>( kV ) | Creepage distance<br>( mm ) |                    | Duration<br>( h ) | Times of<br>flashover | Times of<br>interruption | Depth of erosion<br>( mm ) |                   |
|-------------------------|------------------------------|-----------------------------|--------------------|-------------------|-----------------------|--------------------------|----------------------------|-------------------|
|                         |                              | Specified<br>value          | Specified<br>value |                   |                       |                          | Specified<br>value         | Measured<br>value |
| 19XJ0632<br>-S-#05      | 18.51                        | 480~690                     | 645                | 1000              | 0                     | 0                        | <3                         | <0.5              |
| 19XJ0632<br>-S-#06      | 18.51                        | 480~690                     | 645                | 1000              | 0                     | 0                        | <3                         | <0.5              |

## 2. Conclusion

After test there are no tracks on the specimens. The erosion depth does not reach the core material (the core cannot be visible). Corrosion resistance meets the requirement. The test is passed.

Note: Water velocity:  $0.40\text{L}/(\text{m}^3\cdot\text{h})$ ; Fog house temperature:  $20.0^\circ\text{C}$ ; Concentration of NaCl in water:  $10.0\text{ kg}/\text{m}^3$ .  
19XJ0632-S-#05 is tested mounted horizontally and 19XJ0632-S-#06 is tested mounted vertically.

|                                                                                               |             |                                                  |
|-----------------------------------------------------------------------------------------------|-------------|--------------------------------------------------|
| China National Center for<br>Quality Supervision and Test of<br>Electrical Apparatus Products | Test Report | FPQ-24kV/12kN<br>POLYMERIC PIN TYPE<br>INSULATOR |
|-----------------------------------------------------------------------------------------------|-------------|--------------------------------------------------|

## Flammability test

Test date: 2019-08-14~2019-08-21

## 1. Test results:

| No. of the specimens | First ignition time (s) | $t_1$ (s) | Second ignition time (s) | $t_2$ (s) | $t_3$ (s) | Individual test specimen afterflame time plus afterglow time after thesecond flame application ( $t_2+t_3$ ) (s) | Total afterflame time $t_f$ (s) |
|----------------------|-------------------------|-----------|--------------------------|-----------|-----------|------------------------------------------------------------------------------------------------------------------|---------------------------------|
| 19XJ0632-S-C06       | 10                      | 0         | 10                       | 0         | 0         | 0                                                                                                                | 0                               |
| 19XJ0632-S-C07       | 10                      | 0         | 10                       | 0         | 0         | 0                                                                                                                |                                 |
| 19XJ0632-S-C08       | 10                      | 0         | 10                       | 0         | 0         | 0                                                                                                                |                                 |
| 19XJ0632-S-C09       | 10                      | 0         | 10                       | 0         | 0         | 0                                                                                                                |                                 |
| 19XJ0632-S-C10       | 10                      | 0         | 10                       | 0         | 0         | 0                                                                                                                |                                 |
| 19XJ0632-S-C16       | 10                      | 0         | 10                       | 0         | 0         | 0                                                                                                                | 0                               |
| 19XJ0632-S-C17       | 10                      | 0         | 10                       | 0         | 0         | 0                                                                                                                |                                 |
| 19XJ0632-S-C18       | 10                      | 0         | 10                       | 0         | 0         | 0                                                                                                                |                                 |
| 19XJ0632-S-C19       | 10                      | 0         | 10                       | 0         | 0         | 0                                                                                                                |                                 |
| 19XJ0632-S-C20       | 10                      | 0         | 10                       | 0         | 0         | 0                                                                                                                |                                 |

Afterflame and/or afterglow of any specimen does not burned to the holding clamp and cotton indicator pad does not ignited by flaming particles or drops.

2. Conclusion: materials passing V-0

Note: specimens No. 19XJ0632-S-C06-C10 have preprocessed under temperature of 22.8°C~24.3°C and humidity of 51%~54% for 48h; specimen No. 19XJ0632-S-C16-C20 have preprocessed under temperature of 70°C for 168h

| China National Center for<br>Quality Supervision and Test of<br>Electrical Apparatus Products | Test Report                       | FPQ-24kV/12kN<br>POLYMERIC PIN TYPE<br>INSULATOR |                                                                         |                              |                                                                               |                                                                           |
|-----------------------------------------------------------------------------------------------|-----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| Tests on the core material (Dye penetration test)                                             |                                   |                                                  |                                                                         |                              |                                                                               |                                                                           |
| Test date: 2019-08-16                                                                         |                                   |                                                  |                                                                         |                              |                                                                               |                                                                           |
| 1. Test results:                                                                              |                                   |                                                  |                                                                         |                              |                                                                               |                                                                           |
| No. of the specimens                                                                          | Test liquor                       | Diameter of<br>steel ball<br>mm                  | The level<br>which is<br>higher than<br>the level of<br>the balls<br>mm | Length of<br>specimens<br>mm | Time which<br>dye rises<br>through the<br>specimens<br>Specified value<br>min | Time which dye<br>rises through<br>the specimens<br>Measured value<br>min |
| 19XJ0632-S-B01                                                                                | 1% magenta<br>alcohol<br>solution | 2.0                                              | 2                                                                       | 10.5                         | > 15                                                                          | 21                                                                        |
| 19XJ0632-S-B02                                                                                |                                   | 2.0                                              | 2                                                                       | 10.4                         | > 15                                                                          | 20                                                                        |
| 19XJ0632-S-B03                                                                                |                                   | 2.0                                              | 2                                                                       | 10.4                         | > 15                                                                          | 20                                                                        |
| 19XJ0632-S-B04                                                                                |                                   | 2.0                                              | 2                                                                       | 10.5                         | > 15                                                                          | 25                                                                        |
| 19XJ0632-S-B05                                                                                |                                   | 2.0                                              | 2                                                                       | 10.4                         | > 15                                                                          | 23                                                                        |
| 19XJ0632-S-B06                                                                                |                                   | 2.0                                              | 2                                                                       | 10.2                         | > 15                                                                          | 20                                                                        |
| 19XJ0632-S-B07                                                                                |                                   | 2.0                                              | 2                                                                       | 10.4                         | > 15                                                                          | 22                                                                        |
| 19XJ0632-S-B08                                                                                |                                   | 2.0                                              | 2                                                                       | 10.4                         | > 15                                                                          | 21                                                                        |
| 19XJ0632-S-B09                                                                                |                                   | 2.0                                              | 2                                                                       | 10.4                         | > 15                                                                          | 25                                                                        |
| 19XJ0632-S-B10                                                                                |                                   | 2.0                                              | 2                                                                       | 10.5                         | > 15                                                                          | 24                                                                        |
| 2. Conclusion: Pass                                                                           |                                   |                                                  |                                                                         |                              |                                                                               |                                                                           |
| Note: /                                                                                       |                                   |                                                  |                                                                         |                              |                                                                               |                                                                           |

| China National Center for<br>Quality Supervision and Test of<br>Electrical Apparatus Products                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Test Report                      | FPQ-24kV/12kN<br>POLYMERIC PIN TYPE<br>INSULATOR |                 |                      |                |                      |                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------------------------------|-----------------|----------------------|----------------|----------------------|------------------------------------------|
| <b>Tests on the core material (Water diffusion test)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                  |                                                  |                 |                      |                |                      |                                          |
| Test date: 2019-08-16~2019-08-21                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                  |                                                  |                 |                      |                |                      |                                          |
| 1. Test requirements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                  |                                                  |                 |                      |                |                      |                                          |
| <p>Six specimens shall be cut from a production line insulator making the cut approximately 90° to the long axis of the insulator with a diamond-coated circular saw blade under running cold water. The length of the specimens h shall be 30 mm±0,5 mm. The cut surfaces shall be smoothed by means of fine abrasive cloth (grain size 180). The cut ends shall be clean and parallel.</p> <p>The surfaces of the specimens shall be cleaned with isopropyl-alcohol and filter-paper immediately before boiling. The specimens shall be boiled in a glass container for 100 h±0,5 h in deionised water with 0,1 % by weight of NaCl.</p> <p>Specimens of only one core material shall be boiled together in the same container. After boiling, the specimens shall be removed from the boiling container and placed in another glass container filled with tap water at ambient temperature for at least 15 min. The voltage test shall be carried out within the next 3 h after the removal of the specimens from the boiling container.</p> <p>Immediately before the voltage test, the specimens shall be removed from the container and their surfaces dried with filter paper. Each specimen shall then be put between the electrodes. The test voltage shall be increased at approximately 1 kV per second up to 12 kV. The voltage shall be kept constant at 12 kV for 1 min and then decreased to zero.</p> <p>During the test no puncture or surface flashover shall occur. The current during the whole test shall not exceed 1mA (r.m.s.).</p> |                                  |                                                  |                 |                      |                |                      |                                          |
| 2. Test results:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                  |                                                  |                 |                      |                |                      |                                          |
| No. of the specimens                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | The length of the specimens (mm) | Boiling time (h)                                 | Whether damaged | Applied voltage (kV) | Duration (min) | Leakage current (mA) | Results                                  |
| 19XJ0632-S-B11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 30.4                             | 100                                              | No              | 12.0                 | 1              | 0.058                | No puncture and surface flashover occurs |
| 19XJ0632-S-B12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 30.4                             | 100                                              | No              | 12.0                 | 1              | 0.056                | No puncture and surface flashover occurs |
| 19XJ0632-S-B13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 30.4                             | 100                                              | No              | 12.0                 | 1              | 0.058                | No puncture and surface flashover occurs |
| 19XJ0632-S-B14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 30.4                             | 100                                              | No              | 12.0                 | 1              | 0.058                | No puncture and surface flashover occurs |
| 19XJ0632-S-B15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 30.2                             | 100                                              | No              | 12.0                 | 1              | 0.058                | No puncture and surface flashover occurs |
| 19XJ0632-S-B16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 30.1                             | 100                                              | No              | 12.0                 | 1              | 0.058                | No puncture and surface flashover occurs |
| 3. Conclusion: Pass                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                  |                                                  |                 |                      |                |                      |                                          |
| Note: /                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                  |                                                  |                 |                      |                |                      |                                          |

China National Center for  
Quality Supervision and Test of  
Electrical Apparatus Products

## Test Report

FPQ-24kV/12kN  
POLYMERIC PIN TYPE  
INSULATOR

### Assembled core load-time test (Verification of the maximum design cantilever load (MDCL) )

Test date: 2019-08-24~2019-09-05

#### 1. Test results

The insulator shall be gradually loaded to 1.1 times the MDCL at a temperature of  $(20 \pm 10) ^\circ\text{C}$ . This load shall be maintained for 96 h. The load shall be applied to the insulator at the conductor position, in the direction appropriate for the end fittings, and initially perpendicular to the core of the insulator.

MDCL=12kN

1.1 times the MDCL: 13.2kN

| No. of the specimens | 1.1 times the MDCL ( kN ) | Duration ( h ) | Whether any cracks or permanent deformation in the base end fitting | Whether bolts on the base end fitting can be used | Perform a dye penetration test to the cut surfaces to reveal cracks |
|----------------------|---------------------------|----------------|---------------------------------------------------------------------|---------------------------------------------------|---------------------------------------------------------------------|
| 19XJ0632-S-#07       | 13.24                     | 96             | No                                                                  | Yes                                               | No                                                                  |
| 19XJ0632-S-#08       | 13.26                     | 96             | No                                                                  | Yes                                               | No                                                                  |
| 19XJ0632-S-#09       | 13.23                     | 96             | No                                                                  | Yes                                               | No                                                                  |

#### 2. Conclusion: Pass

Note: /

|                                                                                               |             |                                                  |
|-----------------------------------------------------------------------------------------------|-------------|--------------------------------------------------|
| China National Center for<br>Quality Supervision and Test of<br>Electrical Apparatus Products | Test Report | FPQ-24kV/12kN<br>POLYMERIC PIN TYPE<br>INSULATOR |
|-----------------------------------------------------------------------------------------------|-------------|--------------------------------------------------|

### Assembled core load-time test (Tensile load test)

Test date: 2019-08-15

#### 1. Test results:

The tensile load shall be applied in line with the axis of the core of the insulator, at or near the intended service attachment point. The load shall be increased rapidly but smoothly from zero to approximately 75 % of the STL and shall then be gradually increased in a time between 30 s and 90 s until the STL is reached. If the STL is reached in less than 90 s, the load shall be maintained for the remainder of the 90 s.

The test shall be regarded as passed if there is no evidence of: pull-out of the core from the end fitting, or breakage of the end fitting.

STL: 12kN

| No. of the<br>specimens | 75%STL<br>(kN) | Time form 75%<br>STL to STL<br>(s) | STL<br>(kN) | Duration<br>(s) | Whether damaged |
|-------------------------|----------------|------------------------------------|-------------|-----------------|-----------------|
| 19XJ0632-S-#10          | 9.00           | 50                                 | 12.01       | 40              | No              |
| 19XJ0632-S-#11          | 9.02           | 49                                 | 12.00       | 41              | No              |
| 19XJ0632-S-#12          | 9.01           | 51                                 | 12.01       | 39              | No              |

#### 2. Conclusion: Pass

Note: /

| China National Center for<br>Quality Supervision and Test of<br>Electrical Apparatus Products | Test Report                                                                                                                                   |                   |                  | FPQ-24kV/12kN<br>POLYMERIC PIN TYPE<br>INSULATOR |                   |                  |                   |
|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------|--------------------------------------------------|-------------------|------------------|-------------------|
| Dry lightning impulse withstand voltage test                                                  |                                                                                                                                               |                   |                  |                                                  |                   |                  |                   |
| Test date: 2019-08-13                                                                         |                                                                                                                                               |                   |                  |                                                  |                   |                  |                   |
| No. of the specimens                                                                          | Status of the<br>specimen or test part                                                                                                        | Positive polarity |                  |                                                  | Negative polarity |                  |                   |
|                                                                                               |                                                                                                                                               | Voltage<br>(kV)   | Applied<br>times | Puncture<br>times                                | Voltage<br>(kV)   | Applied<br>times | Puncture<br>times |
| 19XJ0632-S-#13                                                                                | Between upper and<br>lower end surfaces<br>of the insulator                                                                                   | 150.2             | 15               | 0                                                | 200.3             | 15               | 0                 |
|            |                                                                                                                                               |                   |                  |                                                  |                   |                  |                   |
| Note: the data in the table has been corrected in the standard atmosphere condition.          |                                                                                                                                               |                   |                  |                                                  |                   |                  |                   |
| Atmosphere condition<br>of test zone                                                          | P=103.2kPa; Environmental temperature t=25.0℃; Relative humidity:61%<br>Atmosphere correction factor Kt=1.0017 Height correction factor Ka= / |                   |                  |                                                  |                   |                  |                   |

|                                                                                               |                                                                                                                                                        |                                                  |                          |                |
|-----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|--------------------------|----------------|
| China National Center for<br>Quality Supervision and Test of<br>Electrical Apparatus Products | Test Report                                                                                                                                            | FPQ-24kV/12kN<br>POLYMERIC PIN TYPE<br>INSULATOR |                          |                |
| Wet power-frequency withstand voltage test                                                    |                                                                                                                                                        |                                                  |                          |                |
| Test date: 2019-08-13                                                                         |                                                                                                                                                        |                                                  |                          |                |
| Average<br>sprinkling rate                                                                    | Horizontal component: 1.51mm/min<br>Vertical component: 1.57mm/min                                                                                     | Conductance ratio:101.2 $\mu$ S/cm               | Water temperature: 23.9℃ |                |
| No. of the specimen                                                                           | Status of the specimen<br>or test part                                                                                                                 | Power-frequency withstand voltage ( Wet )        |                          |                |
|                                                                                               |                                                                                                                                                        | Voltage (kV)                                     | Duration (s)             | Puncture times |
| 19XJ0632-S-#13                                                                                | Between upper and<br>lower end surfaces of                                                                                                             | 70.0                                             | 60                       | 0              |
|            |                                                                                                                                                        |                                                  |                          |                |
| Note: the data in the table has been corrected in the standard atmosphere condition.          |                                                                                                                                                        |                                                  |                          |                |
| Atmosphere condition<br>of test zone                                                          | P=103.2kPa;    Environmental temperature t=25.0℃;    Relative humidity:61%<br>Atmosphere correction factor Kt=1.0004    Height correction factor Ka= / |                                                  |                          |                |

|                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |                                                      |                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------------------------------------------|---------------------|
| China National Center for<br>Quality Supervision and Test of<br>Electrical Apparatus Products                                                                                                                                                                                                                                                                                                                                     | Test Report   | FPQ-24kV/12kN<br>POLYMERIC PIN TYPE<br>INSULATOR     |                     |
| <b>Cantilever failing load test</b>                                                                                                                                                                                                                                                                                                                                                                                               |               |                                                      |                     |
| Test date: 2019-09-16                                                                                                                                                                                                                                                                                                                                                                                                             |               |                                                      |                     |
| 1. Test requirement:                                                                                                                                                                                                                                                                                                                                                                                                              |               |                                                      |                     |
| <p>Test method: the load shall be applied gradually, starting from 0 to 75% of the specified Cantilever load, and then gradually increased to the SML in a time between 30 s to 300 s until the core or accessory of the fitting damaged. The load shall be applied so that the direction of loading passes through the axis of the post insulator, and is perpendicular to it.</p> <p>Specified Cantilever load (SCL): 12kN.</p> |               |                                                      |                     |
| No. of the specimen                                                                                                                                                                                                                                                                                                                                                                                                               | 75%SCL ( kN ) | Duration from 75% SCL<br>to damaged failing load (s) | Failing load ( kN ) |
| 19XJ0632-S-#13                                                                                                                                                                                                                                                                                                                                                                                                                    | 9.00          | 78                                                   | 15.51               |
| 19XJ0632-S-#14                                                                                                                                                                                                                                                                                                                                                                                                                    | 9.01          | 104                                                  | 17.80               |
| 19XJ0632-S-#15                                                                                                                                                                                                                                                                                                                                                                                                                    | 9.02          | 91                                                   | 17.01               |
| 2. Conclusion: Pass                                                                                                                                                                                                                                                                                                                                                                                                               |               |                                                      |                     |
| Note: /                                                                                                                                                                                                                                                                                                                                                                                                                           |               |                                                      |                     |

|                                                                                               |             |                                                  |
|-----------------------------------------------------------------------------------------------|-------------|--------------------------------------------------|
| China National Center for<br>Quality Supervision and Test of<br>Electrical Apparatus Products | Test Report | FPQ-24kV/12kN<br>POLYMERIC PIN TYPE<br>INSULATOR |
|-----------------------------------------------------------------------------------------------|-------------|--------------------------------------------------|

## Annex

[illegible]

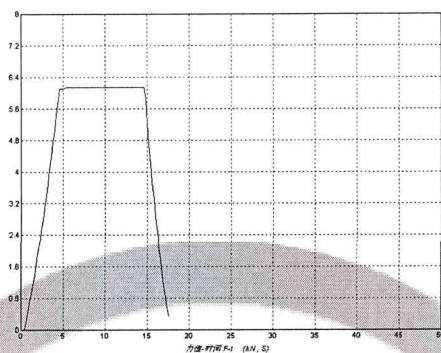
## Oscillogram of tensile load test

FPQ-24kV/12kN

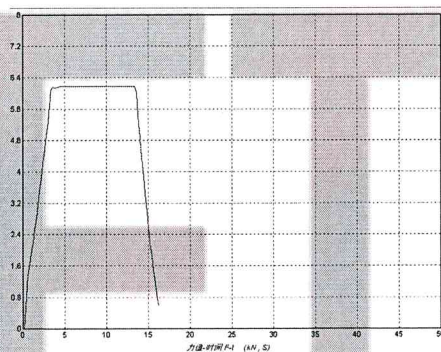
POLYMERIC PIN TYPE INSULATOR

No.: /

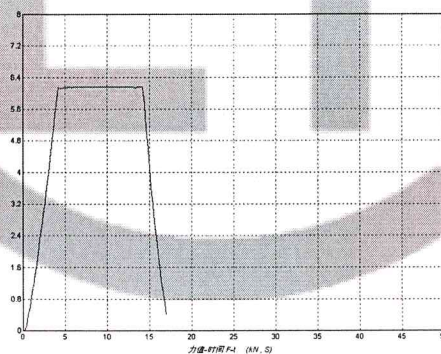
19XJ0632-S-#01



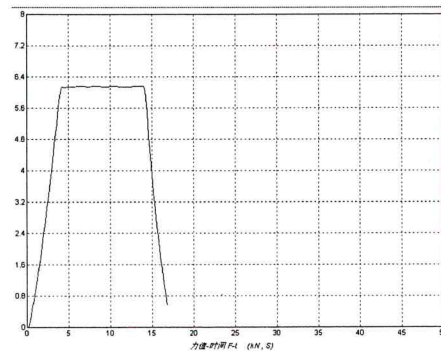
19XJ0632-S-#02



19XJ0632-S-#03



19XJ0632-S-#04

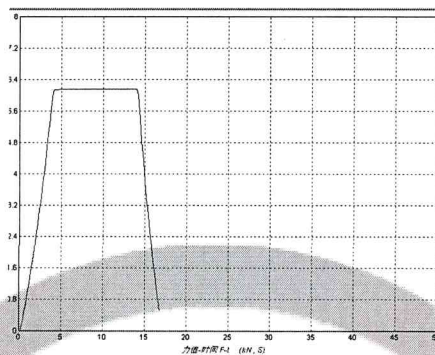


## Oscillogram of tensile load test

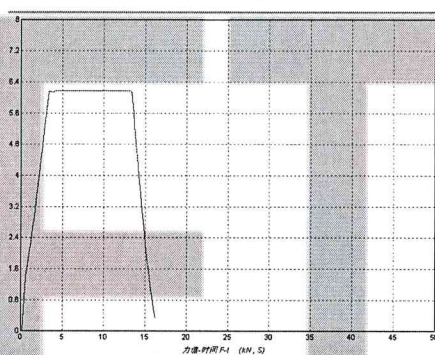
FPQ-24kV/12kN  
POLYMERIC PIN TYPE INSULATOR

No.: /

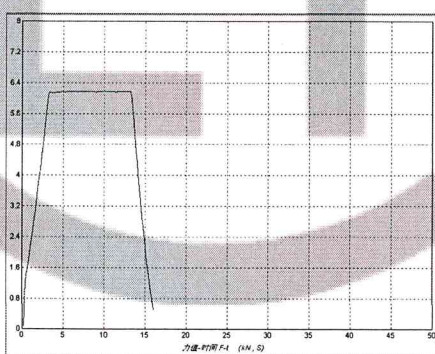
19XJ0632-S-#05



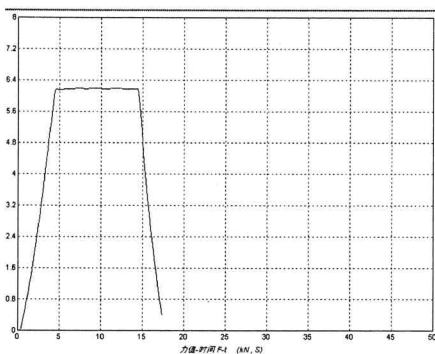
19XJ0632-S-#06



19XJ0632-S-#07



19XJ0632-S-#08

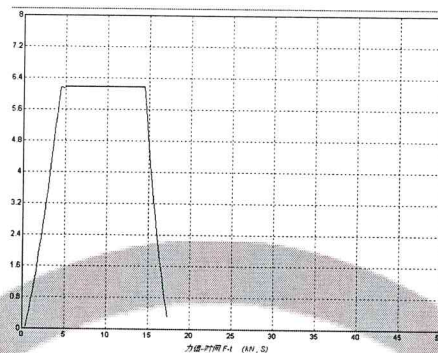


## Oscillogram of tensile load test

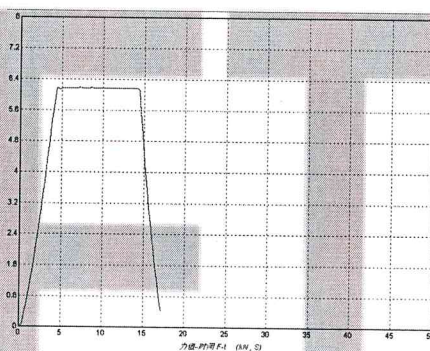
FPQ-24kV/12kN  
POLYMERIC PIN TYPE INSULATOR

No.: /

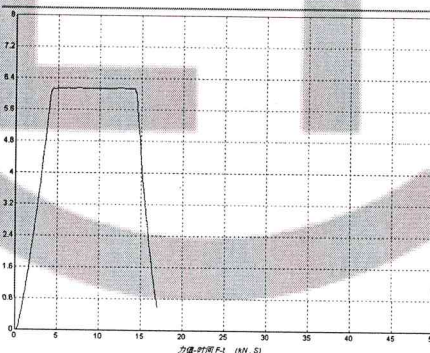
19XJ0632-S-#09



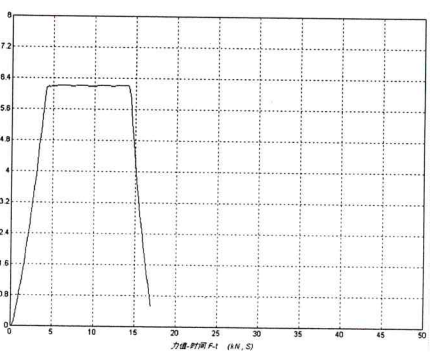
19XJ0632-S-#10



19XJ0632-S-#11



19XJ0632-S-#12

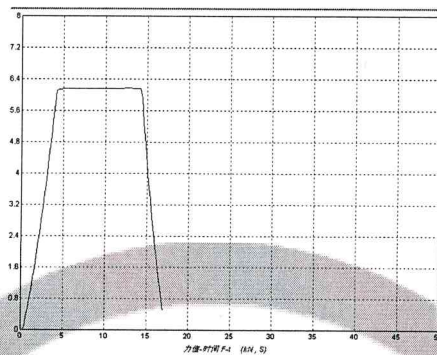


## Oscillogram of tensile load test

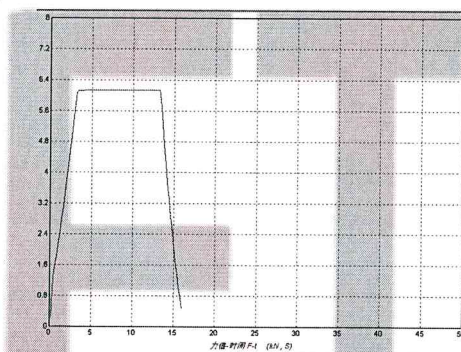
FPQ-24kV/12kN  
POLYMERIC PIN TYPE INSULATOR

No.: /

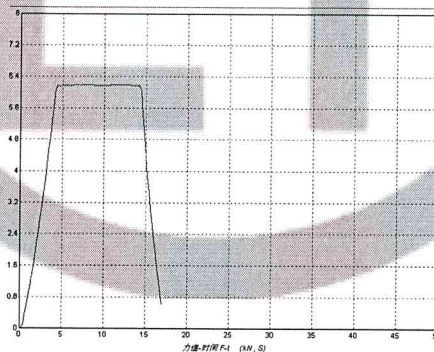
19XJ0632-S-#13



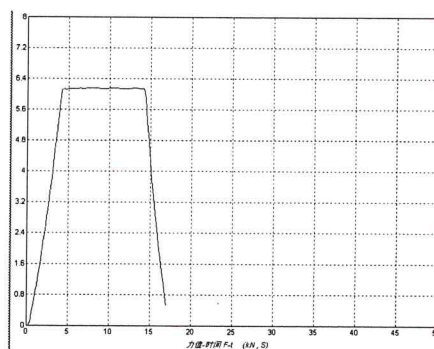
19XJ0632-S-#14



19XJ0632-S-#15



19XJ0632-S-#16

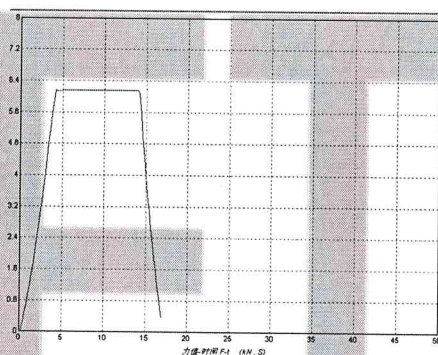


## Oscillogram of tensile load test

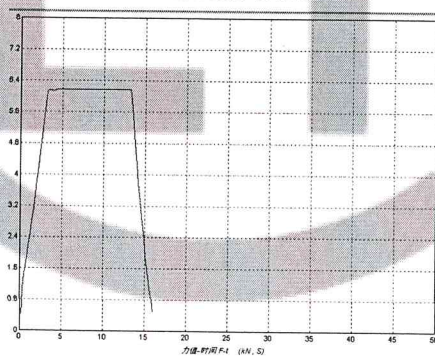
FPQ-24kV/12kN  
POLYMERIC PIN TYPE INSULATOR

No.: /

19XJ0632-S-#17



19XJ0632-S-#18

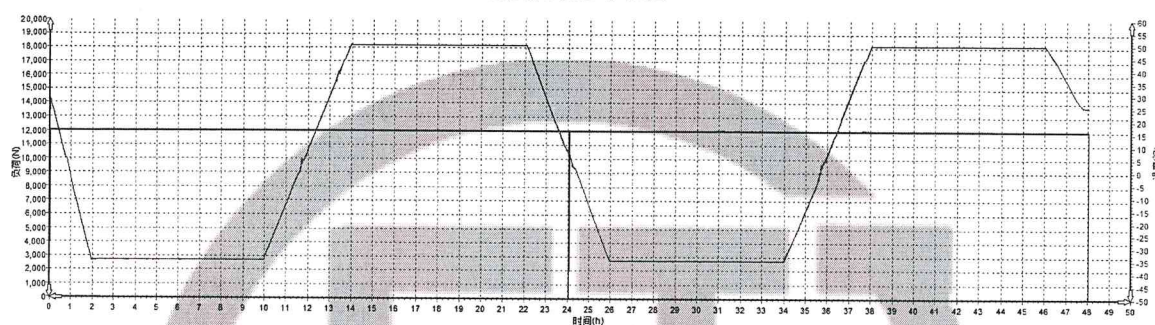


# Oscillogram of tests on interfaces and connections of end fittings (Thermal-mechanical pre-stressing)

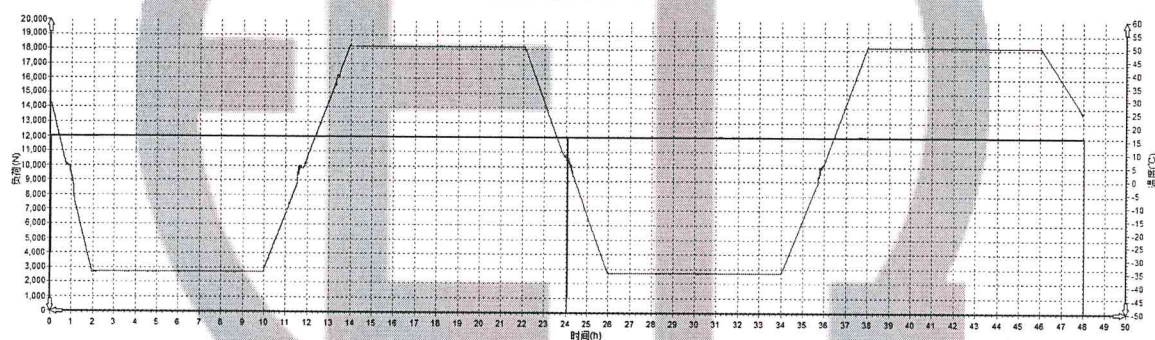
FPQ-24kV/12kN  
POLYMERIC PIN TYPE INSULATOR

No.: /

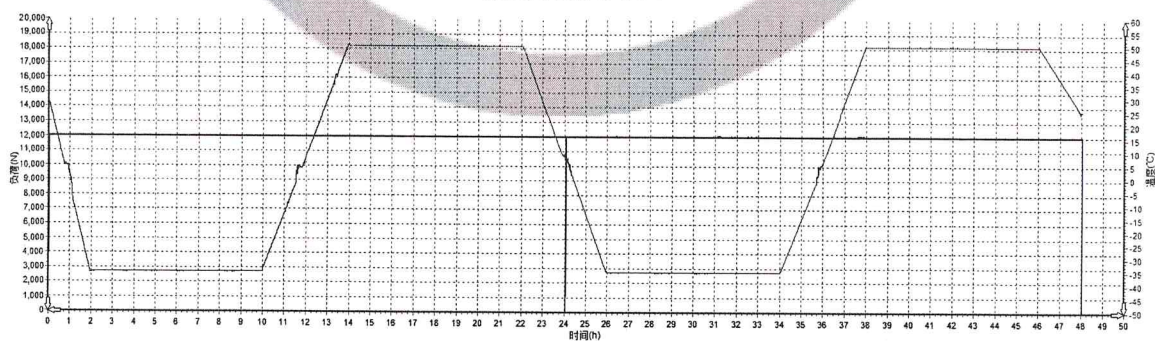
19XJ0632-S-#02



19XJ0632-S-#03



19XJ0632-S-#04



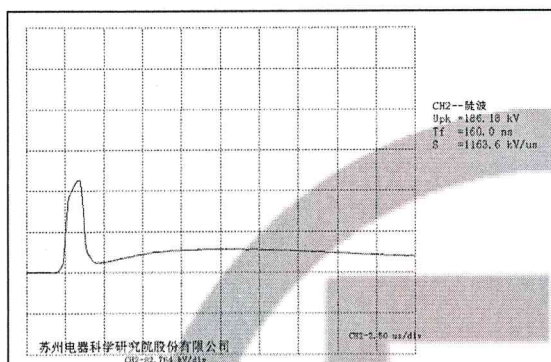
# Oscillogram of tests on interfaces and connections of end fittings (Steep-front impulse voltage test)

FPQ-24kV/12kN  
POLYMERIC PIN TYPE INSULATOR

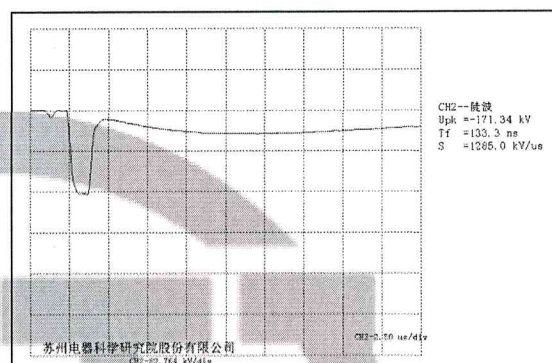
No.: /

19XJ0632-S-#02

Positive polarity

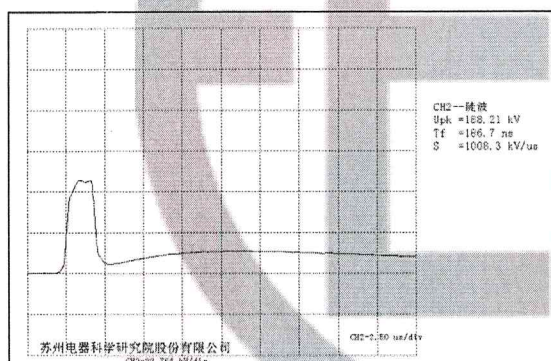


Negative polarity

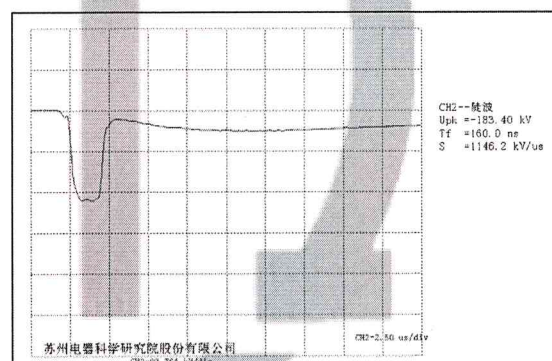


19XJ0632-S-#03

Positive polarity

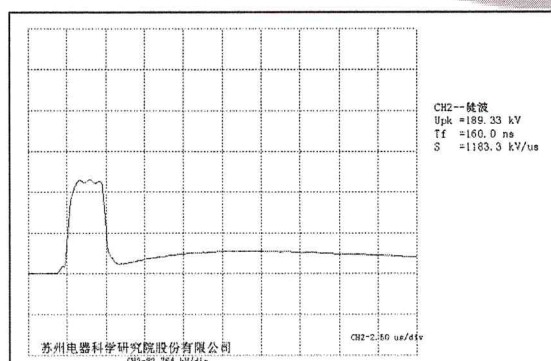


Negative polarity

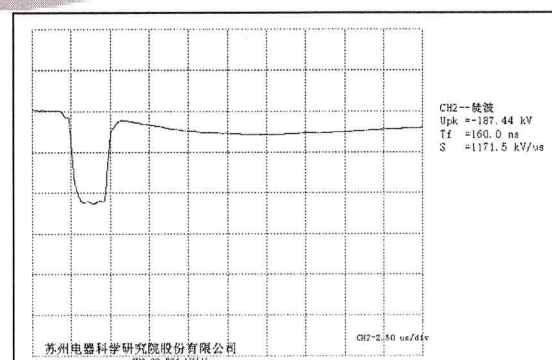


19XJ0632-S-#04

Positive polarity



Negative polarity

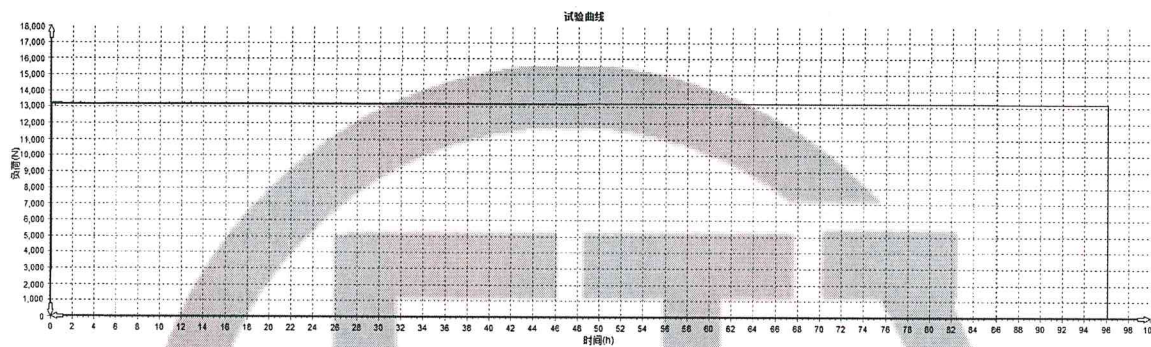


Oscillogram of assembled core  
load-time test(Verification of  
the maximum design  
cantilever load (MDCL) )

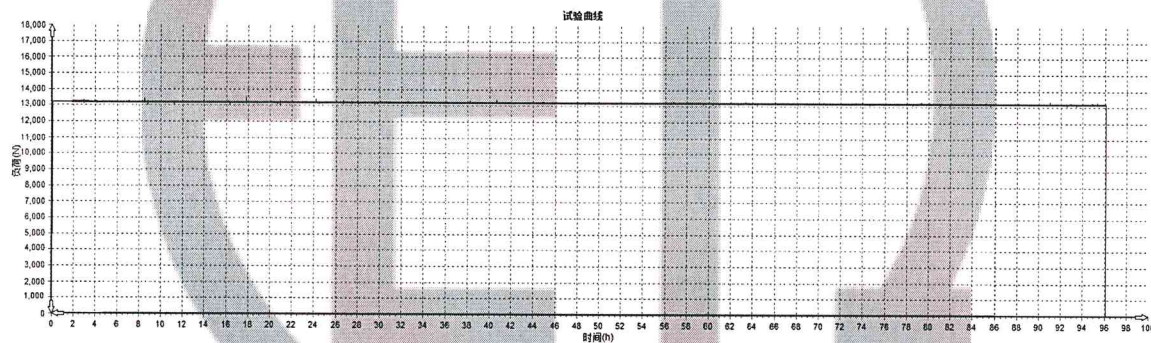
FPQ-24kV/12kN  
POLYMERIC PIN TYPE INSULATOR

No.: /

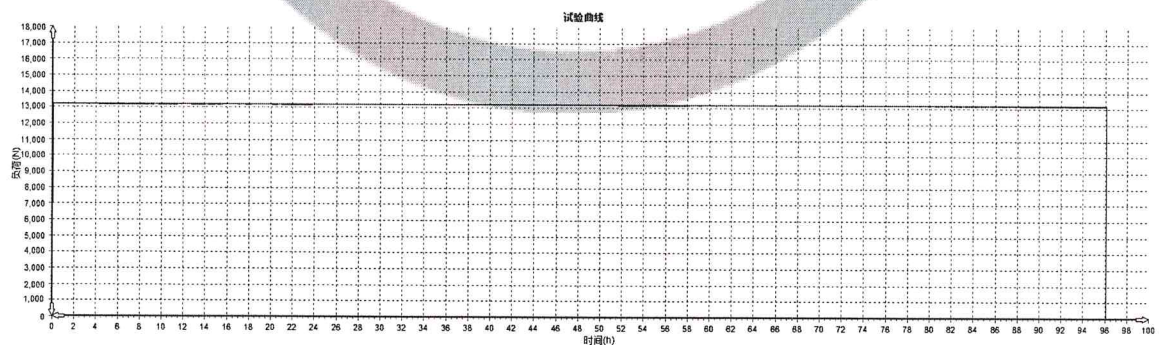
19XJ0632-S-#07



19XJ0632-S-#08



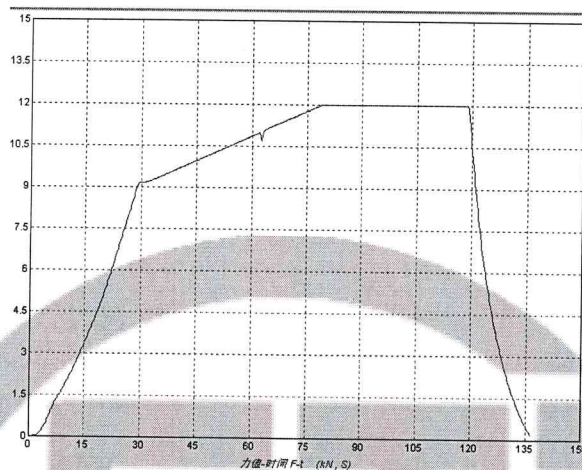
19XJ0632-S-#09



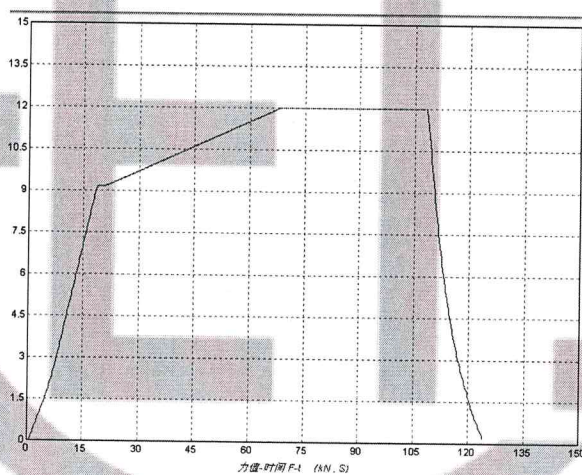
Oscillogram of assembled core  
load-time test (Tensile load test)FPQ-24kV/12kN  
POLYMERIC PIN TYPE INSULATOR

No.: /

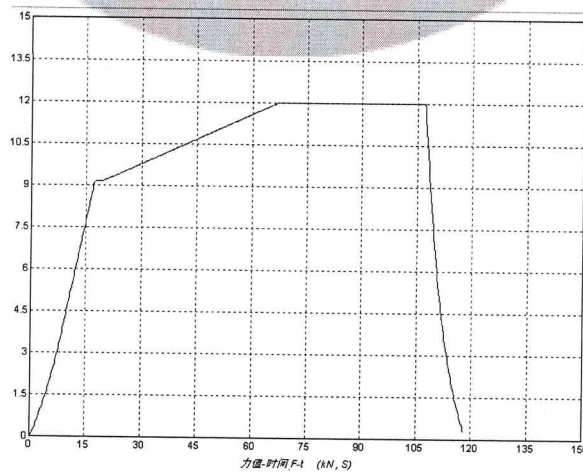
19XJ0632-S-#10



19XJ0632-S-#11



19XJ0632-S-#12



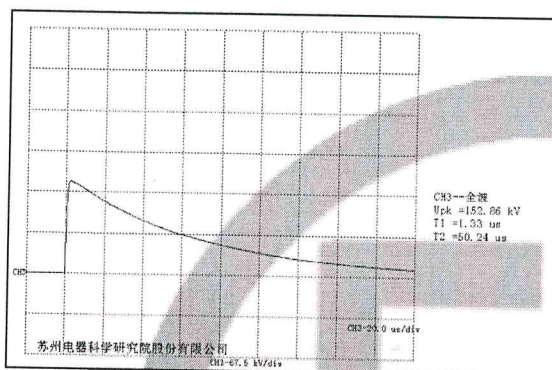
# Oscillogram of dry lightning impulse withstand voltage test

FPQ-24kV/12kN  
POLYMERIC PIN TYPE INSULATOR

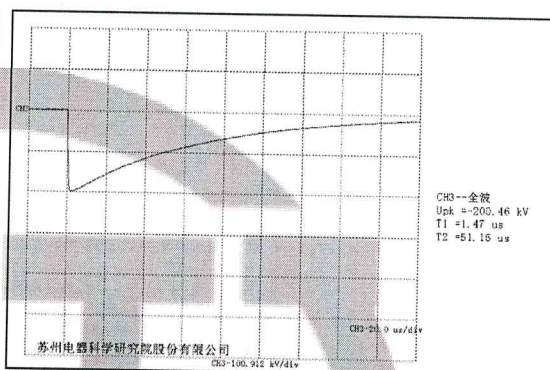
No.: /

19XJ0632-S-#13

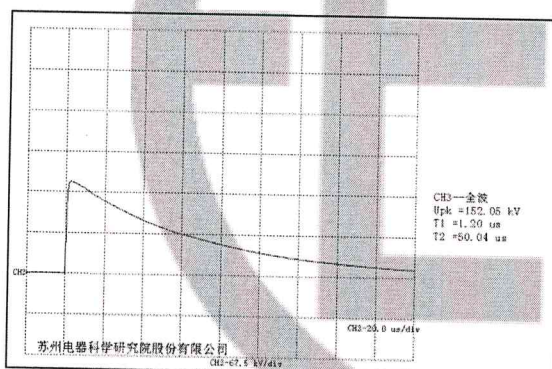
Positive polarity



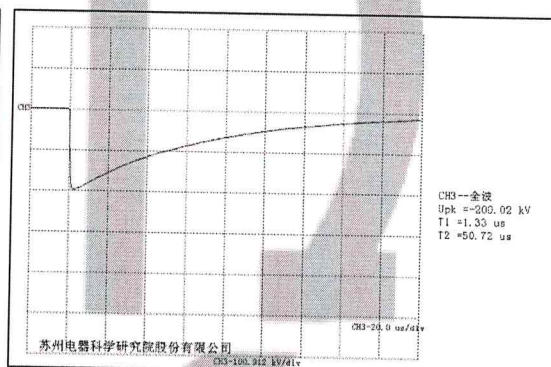
Negative polarity



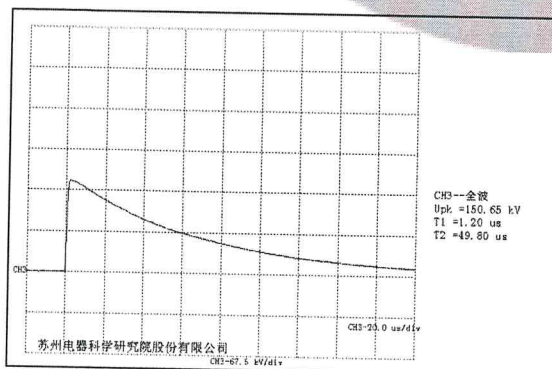
Positive polarity



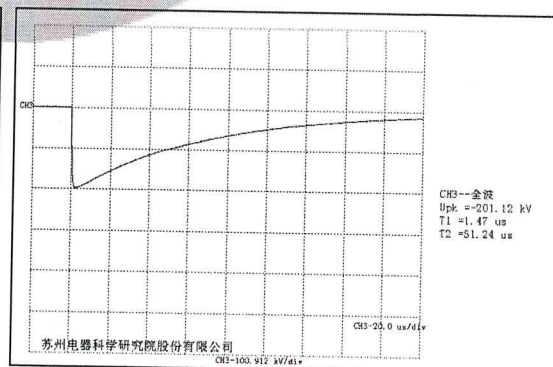
Negative polarity



Positive polarity



Negative polarity

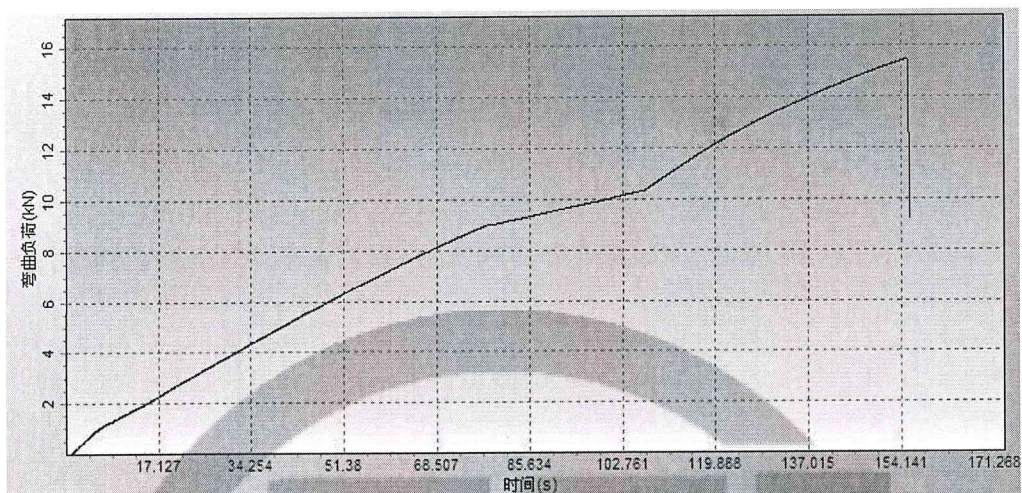


# Oscillogram of cantilever failing load test

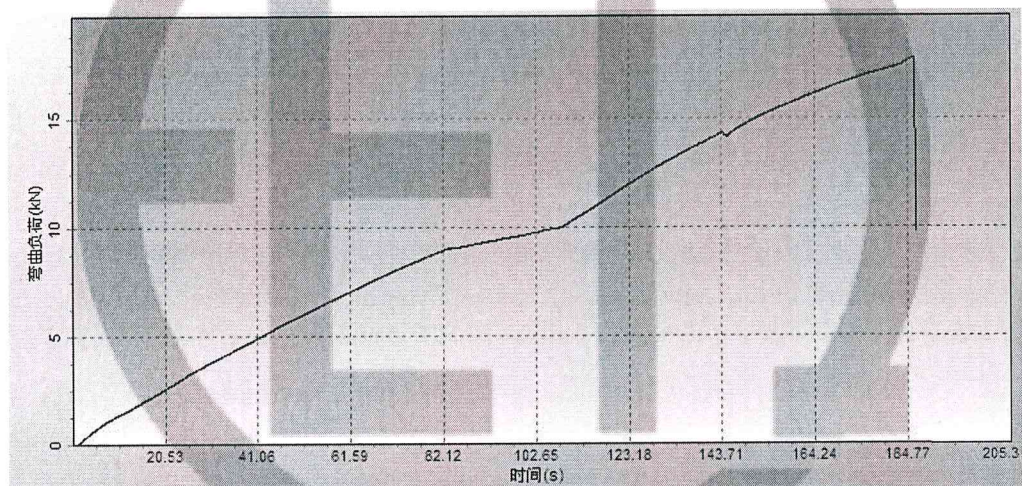
FPQ-24kV/12kN  
POLYMERIC PIN TYPE INSULATOR

No.: /

19XJ0632-S-#13



19XJ0632-S-#14



19XJ0632-S-#15



No text below

## DECLARATION

1. The report is invalid without special seal for testing and page combining seal on the report;
2. The report is invalid if altered;
3. The report is invalid without signatures of persons for drawing up, proof-reading, reviewing and approval;
4. The report is valid only for the inspected and tested samples.

## NOTICE

1. In case there is any objection to this report, please raise it to the laboratory within fifteen days starting from the date of receiving the report. Thank you for your cooperation.
2. In case there is no objection, please take back the samples within one month starting from the date of receiving the report, when the manufacturer is going to take back the samples, certificate for sample taking and along with the written approval for the report should be brought in presence, only then the samples could be taken back. On time due, the samples will be in the laboratory's own disposal.

The Test Report is in total 36 pages Including 12 figures and 1 photo

Typewriter Gao Hongbo Proofreader Ding Qing Binder Gao Hongbo

Address: No.5 Qianzhu Rd., Yuexi, Wuzhong District, Suzhou

Tel: (0512) 66556600 68252753 68081201 Fax: (0512) 68081686

Post code: 215104

<http://www.eeti.cn>

E-mail: [eservice@eeti.cn](mailto:eservice@eeti.cn)

