



No. L0222



(2004)国认监认字(059)号



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No.WB-111(1)-2006

# 国家绝缘子避雷器质量监督检验中心

CHINA NATIONAL CENTRE FOR QUALITY SUPERVISION  
AND TEST OF INSULATORS AND SURGE ARRESTERS

## 检 验 报 告 TEST REPORT

Object YH10W-36/110 Polymeric housed metal  
oxide surge arrester without gaps  
产 品 名 称 \_\_\_\_\_

Client Wenzhou Yikun Electrical  
客 户 名 称 Apparatus Co., Ltd \_\_\_\_\_

Classification Type Test  
检 验 类 别 \_\_\_\_\_

中国西安  
XIAN P.R CHINA

2007

年

月 18

日

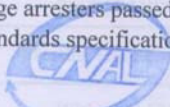


# CHINA NATIONAL CENTRE FOR QUALITY SUPERVISION AND TEST OF INSULATORS AND SURGE ARRESTERS

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|                       |                                                                                                                                                                                                                                                                                                                        |                       |                                            |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------------------------------------|
| Name                  | Polymeric housed metal oxide surge arrester without gaps                                                                                                                                                                                                                                                               | Type                  | YH10W-36/110                               |
|                       |                                                                                                                                                                                                                                                                                                                        | Trade Mark            | Yi kun                                     |
| Consignor             | Wenzhou Yikun Electrical Apparatus Co.,Ltd                                                                                                                                                                                                                                                                             | Manufacturer          | Wenzhou Yikun Electrical Apparatus Co.,Ltd |
| Representative        | Wang Tu Qiu                                                                                                                                                                                                                                                                                                            | Classification        | Type Test                                  |
| Address And Post Code | Hexiang road, Aojiang, Pingyang, Zhejiang, China 325401                                                                                                                                                                                                                                                                | Telephone             | 0577-63654819                              |
|                       |                                                                                                                                                                                                                                                                                                                        | Fax.                  | 0577-63654833                              |
| Quantity of Samples   | Arrester:6, Housing:1, Arrester section:30, Ratioarrester:1, Polymeric Rubber:5; Disconnector: 30.                                                                                                                                                                                                                     | Samples Received Date | 2006.10.30                                 |
|                       |                                                                                                                                                                                                                                                                                                                        | Test Date             | 2006.10.30~2007.01.08                      |
| Serial Number         | Arrester:1~6; Ratio arrester: BL1; Section:B1~B9; Housing :W; Polymeric Rubber:Y1~Y5; Disconnector: T1~T21.                                                                                                                                                                                                            |                       |                                            |
| Test Judge            | IEC 60099-4:2004-5 Metal-oxide surge arresters without gaps for a.c. systems<br>GB11032-2000 Metal oxide surge arresters without gaps for a.c. systems<br>GB/T 19519-2004 Composite insulators for a.c. overhead lines with a nominal voltddge greater than 1000V - Definitions, test methods and acceptance criteria. |                       |                                            |
| Test Items            | All test items see page 2 of this report.                                                                                                                                                                                                                                                                              |                       |                                            |
| Test Conclusion       | <p>This surge arresters passed all 12 items of type test and is deemed satisfactory to meet standards specifications.</p> <div style="text-align: center;">  <p>(Official sign)</p> <p>Confirmed on 2007.01.18</p> </div>           |                       |                                            |
| Remarks               | <p>1. The arrester height is : 700 mm,its housing is gray;its diameter is 58mm; diameter of sheds are 100/130mm, creepage distance is 1349mm</p> <p>2. The size of resistors is <math>\Phi 41 \times 23\text{mm}</math>.</p>                                                                                           |                       |                                            |

Approved: 李凡      Checked: [Signature]      Editor: [Signature]      Test-leader: 安新

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## Type Test Items

| No. | Test Items                                   | Req.                                                                                                                                                                                     | Test Data                 | Result |
|-----|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------|
| 1   | Power frequency reference voltage test       | Voltage at $I_f=1\text{mA} \geq 36\text{ kV}$<br>( $\text{peak}/\sqrt{2}$ )                                                                                                              | (37~39)kV                 | passed |
| 2   | Flammability Test                            | Meeting requirement of Flammability test                                                                                                                                                 | passed                    | passed |
| 3   | Partial discharge test                       | $\leq 10\text{ pC}$                                                                                                                                                                      | (5~6) pC                  | passed |
| 4   | Residual voltage test                        | $8/20\mu\text{s } U_{10\text{kA}} \leq 110\text{ kV}$<br>$1/10\mu\text{s } U_{10\text{kA}} \leq 119\text{ kV}$<br>$30/60\mu\text{s } U_{500\text{A}} \leq 84\text{ kV}$                  | 107 kV<br>117 kV<br>80 kV | passed |
| 5   | Long duration current impulse withstand test | Line discharge class 1                                                                                                                                                                   | passed                    | passed |
| 6   | Bending load test                            | 147N, 10s                                                                                                                                                                                | 147N, 10s                 | passed |
| 7   | High current impulse operating duty test     | 100kA high current operating duty                                                                                                                                                        | passed                    | passed |
| 8   | Insulation withstand test                    | Lightning impulse withstand 170 kV,<br>15 times positive and negative;<br>power frequency voltage withstand:<br>dry 85 kV, wet 70 kV, each 1 min                                         | passed                    | passed |
| 9   | Environment test                             | Meeting requirement of environment test                                                                                                                                                  | passed                    | passed |
| 10  | Moisture ingress test                        | Withstand $60^\circ\text{C} \pm 5\text{K} \rightarrow -35^\circ\text{C} \pm 5\text{K}$<br>heat-cool cycle, twice; boiling 42h in boiled<br>0.1%NaCl water; test within 8h after take out | passed                    | passed |
| 11  | Weather ageing test                          | Applied $U_c$ 1000 hours in salt fog                                                                                                                                                     | passed                    | passed |
| 12  | Time versus current curve test               | 20A, 200A, 800A                                                                                                                                                                          | passed                    | passed |

Test Conclusion: Satisfied.

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## 1 Power Frequency Reference Voltage Test

| No.                                                  | 1  | 2  | 3  | Req.      |
|------------------------------------------------------|----|----|----|-----------|
| A.C. Reference voltage at 1mA kV (peak/ $\sqrt{2}$ ) | 37 | 39 | 37 | $\geq 36$ |

Test Conclusion: Satisfied.

## 2 Flammability Test

$t_d=20.0^{\circ}\text{C}$ , RH=70%, P=97kPa, Method FV.

| No.                                                                  | Y1    | Y2   | Y3   | Y4   | Y5   | FVO            |
|----------------------------------------------------------------------|-------|------|------|------|------|----------------|
| Length mm                                                            | 130   | 130  | 130  | 130  | 130  | 130 $\pm$ 3    |
| Width mm                                                             | 13.0  | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 $\pm$ 0.3 |
| Thickness mm                                                         | 3.0   | 3.0  | 3.0  | 3.0  | 3.0  | 3.0 $\pm$ 0.3  |
| Flammability combustion time after the first application s           | 2.96  | 2.45 | 2.69 | 2.74 | 2.65 | $\leq 10$      |
| Flammability combustion time after the second application s          | 4.31  | 3.98 | 4.25 | 3.92 | 4.16 | $\leq 10$      |
| The totaling time s                                                  | 9.79  | 9.21 | 9.88 | 9.36 | 9.94 | $\leq 30$      |
| Glowing combustion time after the second removal of the test flame s | 34.11 |      |      |      |      | $\leq 50$      |
| Up to the holding clamp                                              | NO    | NO   | NO   | NO   | NO   | NO             |
| Dripping flaming                                                     | NO    | NO   | NO   | NO   | NO   | NO             |

Test Conclusion: Satisfied.



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## 3 Partial Discharge Test

| No.  | Applied voltage kV(r.m.s) | P.D. Value pC |
|------|---------------------------|---------------|
| 1    | 31.0                      | 5             |
| 2    | 31.0                      | 5             |
| 3    | 31.0                      | 6             |
| Req. | 30.4                      | ≤ 10          |

Test Conclusion: Satisfied.

## 4 Residual Voltage Test

n = 12

### 4.1 8/20μs lightning impulse current residual voltage

| No. | Residual voltage of sections kV |       |       | Equivalent residual voltage of arresters at 10 kA kV | Req. kV |
|-----|---------------------------------|-------|-------|------------------------------------------------------|---------|
|     | 5 kA                            | 10 kA | 20 kA |                                                      |         |
| B1  | 8.27                            | 8.94  | 10.06 | 107                                                  | ≤ 110   |
| B2  | 8.26                            | 8.94  | 10.07 |                                                      |         |
| B3  | 8.26                            | 8.93  | 10.06 |                                                      |         |

### 4.2 1/10μs steep impulse current residual voltage

| No. | Residual voltage of sections at 10kA kV | Equivalent residual voltage of arresters at 10 kA kV | Req. kV |
|-----|-----------------------------------------|------------------------------------------------------|---------|
| B1  | 9.74                                    | 117                                                  | ≤ 119   |
| B2  | 9.74                                    |                                                      |         |
| B3  | 9.72                                    |                                                      |         |

### 4.3 30/60μs switching impulse current residual voltage

| No. | Residual voltage of sections at 500A kV | Equivalent residual voltage of arresters at 500A kV | Req. kV |
|-----|-----------------------------------------|-----------------------------------------------------|---------|
| B1  | 6.70                                    | 80                                                  | ≤ 84    |
| B2  | 6.69                                    |                                                     |         |
| B3  | 6.69                                    |                                                     |         |

Test Conclusion: Satisfied.

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## 5 Long Duration Current Impulse Withstand Test

| No.                                               |                                 | B4+T4     | B5+T5     | B6+T6     | Req.      |
|---------------------------------------------------|---------------------------------|-----------|-----------|-----------|-----------|
| U <sub>10kA</sub> ,before                      kV |                                 | 8.94      | 8.93      | 8.94      | /         |
| U <sub>r</sub> kV                                 |                                 | 3.00      | 3.00      | 3.00      | 3~6       |
| U <sub>125A</sub> kV                              |                                 | 6.40      | 6.38      | 6.40      | /         |
| Time                                μs            |                                 | 2080      | 2080      | 2080      | 2000      |
| 1st.                                              | Current                      A  | 230       | 221       | 221       | /         |
|                                                   | Voltage                      kV | 6.40      | 6.40      | 6.40      | /         |
|                                                   | Energy                      kJ  | 3.07      | 2.94      | 2.94      | 2.80      |
| 2nd.                                              | Current                      A  | 221       | 221       | 221       | /         |
|                                                   | Voltage                      kV | 6.40      | 6.40      | 6.40      | /         |
|                                                   | Energy                      kJ  | 2.94      | 2.94      | 2.94      | 2.80      |
| 18th.                                             | Current                      A  | 221       | 221       | 221       | /         |
|                                                   | Voltage                      kV | 6.40      | 6.40      | 6.40      | /         |
|                                                   | Energy                      kJ  | 2.94      | 2.94      | 2.94      | 2.80      |
| Checking samples                                  |                                 | all right | all right | all right | all right |
| U <sub>10kA</sub> , after                      kV |                                 | 8.96      | 8.97      | 8.96      | /         |
| Varity of U <sub>10kA</sub> %                     |                                 | 0.2       | 0.3       | 0.2       | ≤5        |

Test Conclusion: Satisfied.

## 6 Bending Load Test

 $F_1=147N$  (Required by consignor)

| NO. | Load N | Time s | Result |
|-----|--------|--------|--------|
| 4   | 147    | 10     | passed |

| NO.  |        | Partial discharge value pC | Water immersion                  |                                        |                                       |                  | Result |
|------|--------|----------------------------|----------------------------------|----------------------------------------|---------------------------------------|------------------|--------|
|      |        |                            | Temperature of water $^{\circ}C$ | Temperature of environment $^{\circ}C$ | Difference in temperature $^{\circ}C$ | Dipping time min |        |
| 4    | before | 5                          | 55.0                             | 10                                     | 45                                    | 11               | passed |
|      | after  | 5                          | 55.0                             | 10                                     | 45                                    | 11               | passed |
| Req. |        | $\leq 10$                  | /                                | /                                      | $40^{\circ}C \pm 5K$                  | $> 10$           | passed |

Test Conclusion: Satisfied.

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## 7 High current impulse operating duty test

$K_{ct} < 1.0$  (Given by consignor)

| No.                                          |                                                                          | B7+T7     | B8+T8     | B9+T9     |
|----------------------------------------------|--------------------------------------------------------------------------|-----------|-----------|-----------|
| 8/20 $\mu$ s, $U_{10kA}$ , before kV         |                                                                          | 8.93      | 8.94      | 8.94      |
| $U_r$ ( $U_r^*$ ) kV                         |                                                                          | 3.00      | 3.00      | 3.00      |
| $U_c$ ( $U_c^*$ ) kV                         |                                                                          | 2.55      | 2.55      | 2.55      |
| Condition test                               | Applied $1.2U_c = 3.06$ kV, 8/20 $\mu$ s, $I_n = 10$ kA, 45 °before peak |           |           |           |
|                                              | Times                                                                    | 20        | 20        | 20        |
| 4/10 $\mu$ s high current impulse            | 1st. current kA                                                          | 100.8     | 98.4      | 97.6      |
|                                              | Preheated to 60.0 °C                                                     |           |           |           |
|                                              | 2nd. Current kA                                                          | 98.8      | 97.6      | 100.2     |
| Applied power frequency voltage within 40 ms |                                                                          |           |           |           |
| $U_r^*$ kV                                   |                                                                          | 3.00      | 3.00      | 3.00      |
| Power losses (max) at $U_r^*$ W              |                                                                          | 8.78      | 9.65      | 8.86      |
| Applied $U_c^*$ kV                           |                                                                          | 2.55      | 2.55      | 2.55      |
| Power losses at $U_c^*$ W                    | 1 min                                                                    | 1.954     | 1.977     | 1.944     |
|                                              | 15 min                                                                   | 1.158     | 1.186     | 1.175     |
|                                              | 30 min                                                                   | 0.642     | 0.684     | 0.668     |
| Checking samples                             |                                                                          | all right | all right | all right |
| 8/20 $\mu$ s, $U_{10kA}$ , after kV          |                                                                          | 8.98      | 8.96      | 8.96      |
| Variety of $U_{10kA}$ %                      |                                                                          | 0.6       | 0.2       | 0.2       |

Test Conclusion: Satisfied.

## 8 Housing Insulation Withstand Test

### 8.1 Lightning impulse voltage withstand test

$t_{dry} = 22.0^\circ\text{C}$   $t_{wet} = 18.0^\circ\text{C}$   $P = 970 \times 10^2$  Pa

Req. = 170kV  $K = 0.9784$

| No. | Test value kV |         | Adj. kV | Withstand times | Result |
|-----|---------------|---------|---------|-----------------|--------|
| W   | (+)           | 173~175 | 177~179 | 15              | passed |
|     | (-)           | 173~175 | 177~179 | 15              | passed |

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## 8.2 Power frequency insulation withstand test

$P=970 \times 10^2 \text{ Pa}$   $t_{\text{dry}}=22.0^\circ\text{C}$   $t_{\text{wet}}=18.0^\circ\text{C}$   $t_{\text{water}}=16.0^\circ\text{C}$

$\rho_{16.0}=125 \Omega \cdot \text{m}$  specific resistance of rain  $\rho_{20}=105 \Omega \cdot \text{m}$

rainfall: horizon=1.1mm/min verticality=1.2mm/min

Req.=85 kV  $K_{\text{dry}}=0.9953$

Req.=70 kV  $K_{\text{wet}}=0.9940$

| No. | Test value kV | Adj. kV | Keeping time min | Result |
|-----|---------------|---------|------------------|--------|
| W   | 85(dry)       | 85      | 1                | passed |
|     | 70(wet)       | 70      | 1                | passed |

Test Conclusion: Satisfied.

## 9 Environment test

### 9.1 Check of sealing (before test)

| No.  | P.D. Value pC | Water immersion                       |                                             |                                            |                  | Result |
|------|---------------|---------------------------------------|---------------------------------------------|--------------------------------------------|------------------|--------|
|      |               | Temperature of water $^\circ\text{C}$ | Temperature of environment $^\circ\text{C}$ | Difference in temperature $^\circ\text{C}$ | Dipping time min |        |
| 5    | 5             | 60.0                                  | 15.0                                        | 45.0                                       | 15               | passed |
| Req. | $\leq 10$     | /                                     |                                             | $40^\circ\text{C} \pm 5\text{K}$           | $\geq 10$        | passed |



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## 9.2 Temperature cycling test

| No.  | Testing time      | Temperature<br>℃                | Testing time      | Temperature<br>℃                |
|------|-------------------|---------------------------------|-------------------|---------------------------------|
| 5    | 11.06 09:00~12:00 | -25                             | 11.11 09:00~12:00 | -25                             |
|      | 11.06 13:30~16:30 | 65                              | 11.11 13:30~16:30 | 65                              |
|      | 11.07 09:00~12:00 | -25                             | 11.12 09:00~12:00 | -25                             |
|      | 11.07 13:30~16:30 | 65                              | 11.12 13:30~16:30 | 65                              |
|      | 11.08 09:00~12:00 | -25                             | 11.13 09:00~12:00 | -25                             |
|      | 11.08 13:30~16:40 | 65                              | 11.13 13:30~16:30 | 65                              |
|      | 11.09 09:00~12:00 | -25                             | 11.14 09:00~12:00 | -25                             |
|      | 11.09 13:30~16:30 | 65                              | 11.14 13:30~16:30 | 65                              |
|      | 11.10 09:00~12:00 | -25                             | 11.15 09:00~12:00 | -25                             |
|      | 11.10 13:30~16:30 | 65                              | 11.15 13:30~16:30 | 65                              |
| Req. | 3h                | heat: 40~70<br>cool: $\geq -50$ | 3h                | heat: 40~70<br>cool: $\geq -50$ |

## 9.3 Sulphur dioxide test

Testing time: 2006.11.17~2006.12.07

| No.  | Testing time | Content of<br>SO <sub>2</sub> | Humidity<br>% | Temper-<br>ature<br>℃ | Testing time | Content of<br>SO <sub>2</sub> | Humidity<br>% | Temper-<br>ature<br>℃ |
|------|--------------|-------------------------------|---------------|-----------------------|--------------|-------------------------------|---------------|-----------------------|
| 5    | 2006.11.17   | $23 \times 10^{-6}$           | 73            | 24                    | 2006.11.25   | $22 \times 10^{-6}$           | 75            | 24                    |
|      | 2006.11.18   | $23 \times 10^{-6}$           | 73            | 24                    | 2006.11.26   | $22 \times 10^{-6}$           | 73            | 25                    |
|      | 2006.11.19   | $22 \times 10^{-6}$           | 72            | 23                    | 2006.11.29   | $23 \times 10^{-6}$           | 73            | 25                    |
|      | 2006.11.20   | $24 \times 10^{-6}$           | 75            | 25                    | 2006.12.01   | $24 \times 10^{-6}$           | 75            | 25                    |
|      | 2006.11.21   | $22 \times 10^{-6}$           | 75            | 25                    | 2006.12.03   | $24 \times 10^{-6}$           | 73            | 24                    |
|      | 2006.11.22   | $24 \times 10^{-6}$           | 73            | 24                    | 2006.12.04   | $24 \times 10^{-6}$           | 75            | 24                    |
|      | 2006.11.23   | $24 \times 10^{-6}$           | 73            | 23                    | 2006.12.06   | $23 \times 10^{-6}$           | 73            | 24                    |
|      | 2006.11.24   | $23 \times 10^{-6}$           | 73            | 24                    | 2006.12.07   | $22 \times 10^{-6}$           | 73            | 25                    |
| Req. | 21×24h       | $(25 \pm 5) \times 10^{-6}$   | 75±5          | 25±2                  | 21×24h       | $(25 \pm 5) \times 10^{-6}$   | 75±5          | 25±2                  |

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## 9.4 Salt mist test

Level area:  $21904\text{cm}^2$ , High: 2m, density of salt: 5%.

Testing time: 2006.12.08~2006.12.12

| Time       |       | Temperature<br>℃ | Humidity<br>% | PH value | Speed of water<br>$\text{L/m}^3 \cdot \text{h}$ |
|------------|-------|------------------|---------------|----------|-------------------------------------------------|
| 2006.12.8  | 09:00 | 36               | 88            | 6.8      | 0.88                                            |
| 2006.12.9  | 10:00 | 36               | 88            | 6.8      | 1.00                                            |
| 2006.12.10 | 09:00 | 36               | 88            | 7.0      | 1.00                                            |
| 2006.12.11 | 09:00 | 37               | 88            | 7.0      | 0.88                                            |
| 2006.12.12 | 09:00 | 36               | 88            | 6.8      | 1.00                                            |
| Req.       | 96h   | $35 \pm 3$       | $>85$         | 6.5~7.2  | 0.548~1.095                                     |

## 9.5 Check of seal(after test)

| No.  | P.D.<br>Value<br>pC | Water immersion              |                                    |                                   |                        | Result |
|------|---------------------|------------------------------|------------------------------------|-----------------------------------|------------------------|--------|
|      |                     | Temperature<br>of water<br>℃ | Temperature of<br>environment<br>℃ | Difference in<br>temperature<br>℃ | Dipping<br>time<br>min |        |
| 5    | 6                   | 56                           | 11                                 | 45                                | 15                     | passed |
| Req. | $\leq 10$           | /                            |                                    | $40^\circ\text{C} \pm 5\text{K}$  | $\geq 10$              | passed |

Test Conclusion: Satisfied.

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## 10 Moisture Ingress Test

### 10.1 Terminal torque test

M=30 N·m time:30s

### 10.2 Thermomechanical test

F=147N (Required by consignor)

| No.  | Test time                         | Temperature<br>°C          | Applied<br>angle<br>degrees<br>° | Keeping<br>times<br>h | Bend load<br>N |
|------|-----------------------------------|----------------------------|----------------------------------|-----------------------|----------------|
| 6    | 2006.12.16 08:00~2006.12.17 01:00 | 59.0~61.0                  | 0                                | 16                    | 147            |
|      | 2006.12.17 09:00~2006.12.18 01:00 | -24.0~-26.0                | 180                              | 16                    |                |
|      | 2006.12.18 09:00~2006.12.19 01:00 | 44.0~46.0                  | 270                              | 16                    |                |
|      | 2006.12.19 09:00~2006.12.20 01:00 | -39.0~-41.0                | 90                               | 16                    |                |
| Req. | 24h×4                             | 60°C→-25°C →<br>45°C→-40°C | 0~360                            | ≥16                   | 147            |

### 10.3 Water immersion test

| No.  | Boiling time<br>h | Partial discharge<br>value<br>pC |       |      | Power losses<br>W |       |           | Residual voltage of complete<br>arresters at 10kA kV |       |           |
|------|-------------------|----------------------------------|-------|------|-------------------|-------|-----------|------------------------------------------------------|-------|-----------|
|      |                   | before                           | after | var. | before            | after | var.<br>% | before                                               | after | var.<br>% |
| 6    | 42                | 4                                | 4     | 0    | 3.48              | 3.96  | 14        | 109                                                  | 109   | 0         |
| Req. | 42                | ≤10                              |       |      | /                 |       |           | ≤110                                                 |       |           |

Test Conclusion: Satisfied.

## 11 Weather Ageing Test

fog room: 10.83 m<sup>3</sup> temperature of fog room: 21.0°C~24.0°C

water speed: (0.41~0.49)L/m<sup>3</sup>·h NaCl in water: 9.8kg/m<sup>3</sup>

date of test: 2006.11.19~2006.12.31

| No.  | Uc<br>kV | Creep<br>distance<br>mm | Arc<br>distance<br>mm | Uc<br>keeping<br>time<br>h | P.D. Value<br>pC |       |      | A.C. reference voltage at<br>1mA kV |       |           |
|------|----------|-------------------------|-----------------------|----------------------------|------------------|-------|------|-------------------------------------|-------|-----------|
|      |          |                         |                       |                            | before           | after | var. | before                              | after | var.<br>% |
| BL1  | 15.3     | 391                     | 217                   | 1008                       | 7                | 7     | 0    | 18.4                                | 18.4  | 0         |
| Req. | /        | /                       | /                     | ≥1000                      | ≤10              |       |      | /                                   |       |           |

Test Conclusion: Satisfied.

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## 12 Time versus current curve test

| No.  | Current<br>A | Time<br>s | No.  | Current<br>A | Time<br>s | No.  | Current<br>A | Time<br>s |
|------|--------------|-----------|------|--------------|-----------|------|--------------|-----------|
| T1   | 20.9         | 0.760     | T12  | 205          | 0.079     | T17  | 785          | 0.01      |
| T2   | 21.1         | 0.476     | T13  | 213          | 0.063     | T18  | 825          | 0.01      |
| T3   | 20.5         | 0.650     | T14  | 211          | 0.058     | T19  | 845          | 0.01      |
| T10  | 20.7         | 0.710     | T15  | 202          | 0.074     | T20  | 863          | 0.01      |
| T11  | 21.2         | 0.590     | T16  | 208          | 0.062     | T21  | 833          | 0.01      |
| Req. | 20           | ≤ 2       | Req. | 200          | ≤ 0.1     | Req. | 800          | ≤ 0.03    |

Test Conclusion: Satisfied.

**Testor: An Li , Su Miao , Sang Jian-ping**