

KEMA TYPE TEST CERTIFICATE OF SHORT-CIRCUIT PERFORMANCE

Object One compact switchgear assembly comprising a three-pole SF₆ circuit-breaker and a three-position disconnecter/earthing switch, the circuit-breaker incorporating one interrupter per pole in single-pole enclosures with a common operating mechanism **2155-16**

Type THP 145-40-25 **Serial No.** 16000702

Rated voltage 145 kV Rated normal current 2500 A
 Rated short-circuit current 40 kA Rated frequency 50/60 Hz

Manufacturer Qingdao TGOOD Electric Co., Ltd.,
 Qingdao, China *)

Client Qingdao TGOOD Electric Co., Ltd.,
 Qingdao, China

Tested by KEMA Nederland B.V.,
 Arnhem, The Netherlands

Date of tests 4 July 2016

The object, constructed in accordance with the description, drawings and photographs incorporated in this Certificate, has been subjected to the series of proving tests in accordance with

IEC 62271-205 (2008) subclause 6.6 (STC).

This Certificate has been issued by DNV GL following exclusively the STL Guides.

The results are shown in the record of proving tests and the oscillograms attached hereto. The values obtained and the general performance are considered to comply with the above standard(s) and to justify the ratings assigned by the manufacturer as listed on page 4.

This Certificate applies only to the object tested. The responsibility for conformity of any object having the same type references as that tested rests with the Manufacturer.

*) as declared by the manufacturer

This Certificate consists of 39 pages in total.

KEMA Nederland B.V.



J.P. Fonteijne
 Executive Vice President
 KEMA Laboratories



Laboratories

Arnhem, 12 August 2016

INFORMATION SHEET

1 KEMA Type Test Certificate

A KEMA Type Test Certificate contains a record of a series of (type) tests carried out in accordance with a recognized standard. The object tested has fulfilled the requirements of this standard and the relevant ratings assigned by the manufacturer are endorsed by DNV GL. In addition, the object's technical drawings have been verified and the condition of the object after the tests is assessed and recorded. The Certificate contains the essential drawings and a description of the object tested. A KEMA Type Test Certificate signifies that the object meets all the requirements of the named subclauses of the standard. It can be identified by gold-embossed lettering on the cover and a gold seal on its front sheet.

The Certificate is applicable to the object tested only. DNV GL is responsible for the validity and the contents of the Certificate. The responsibility for conformity of any object having the same type references as the one tested rests with the manufacturer.

Detailed rules on types of certification are given in DNV GL's Certification procedure applicable to KEMA Laboratories.

2 KEMA Report of Performance

A KEMA Report of Performance is issued when an object has successfully completed and passed a subset (but not all) of test programmes in accordance with a recognized standard. In addition, the object's technical drawings have been verified and the condition of the object after the tests is assessed and recorded. The report is applicable to the object tested only. A KEMA Report of Performance signifies that the object meets the requirements of the named subclauses of the standard. It can be identified by silver-embossed lettering on the cover and a silver seal on its front sheet.

The sentence on the front sheet of a KEMA Report of Performance will state that the tests have been carried out in accordance with The object has complied with the relevant requirements.

3 KEMA Test Report

A KEMA Test Report is issued in all other cases. Reasons for issuing a KEMA Test Report could be:

- Tests were performed according to the client's instructions.
- Tests were performed only partially according to the standard.
- No technical drawings were submitted for verification and/or no assessment of the condition of the object after the tests was performed.
- The object failed one or more of the performed tests.

The KEMA Test Report can be identified by the grey-embossed lettering on the cover and grey seal on its front sheet.

In case the number of tests, the test procedure and the test parameters are based on a recognized standard and related to the ratings assigned by the manufacturer, the following sentence will appear on the front sheet. The tests have been carried out in accordance with the client's instructions. Test procedure and test parameters were based on If the object does not pass the tests such behaviour will be mentioned on the front sheet. Verification of the drawings (if submitted) and assessment of the condition after the tests is only done on client's request.

When the tests, test procedure and/or test parameters are not in accordance with a recognized standard, the front sheet will state the tests have been carried out in accordance with client's instructions.

4 Official and uncontrolled test documents

The official test documents of DNV GL are issued in bound form. Uncontrolled copies may be provided as a digital file for convenience of reproduction by the client. The copyright has to be respected at all times.

5 Accreditation of KEMA Laboratories

The KEMA Laboratories of DNV GL are accredited in accordance with ISO/IEC 17025 by the respective national accreditation bodies. KEMA Laboratories Arnhem, the Netherlands, is accredited by RvA under nos. L020, L218, K006 and K009. KEMA Laboratories Chalfont, United States, is accredited by A2LA under no. 0553.01. KEMA Laboratories Prague, the Czech Republic, is accredited by CAI as testing laboratory no. 1035.



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1 IDENTIFICATION OF THE OBJECT TESTED

1.1 Ratings/characteristics of the object tested

Disconnecter/earthing switch:

| | | |
|---|-----------|---|
| Voltage | 145 kV | |
| Normal current | 2500 A | |
| Number of poles | 3 | |
| Frequency | 50/60 Hz | |
| Short-time withstand current | 40 kA | X |
| Peak withstand current | 104 kA | X |
| Duration of short-circuit | 3 s | X |
| Pressure for interruption and insulation SF ₆ at 20 °C | 0,75 MPa | |
| Supply voltage of closing and opening devices | 220 Vd.c. | |
| Class (earth position) | E0 | X |

X = This rating has been proved by the tests of this Certificate.

The circuit-breaker has been certified to IEC 62271-100 for:

Short-circuit performance: Certificate 2153-16.

Switching performance: Certificate 2154-16.

Circuit-breaker:

| | | |
|---|---------------------|---|
| Voltage | 145 kV | |
| Normal current | 3150 A | |
| Number of poles | 3 | |
| Frequency | 50/60 Hz | X |
| Operating sequence | O-0,3 s-CO-3 min-CO | X |
| Short-time withstand current | 40 kA | X |
| Peak withstand current | 104 kA | X |
| Duration of short-circuit | 3 s | X |
| Short-circuit making current | 104 kA | X |
| Short-circuit breaking current | 40 kA | X |
| DC time constant of rated short-circuit current | 45 ms | X |
| DC component | 53 % | X |
| First-pole-to-clear factor | 1,5 | X |
| Out-of-phase breaking current | 10 kA | X |
| Line-charging breaking current | 50 A | X |
| Cable-charging breaking current | 160 A | X |
| Pressure for interruption and insulation SF ₆ at 20 °C | 0,75 MPa | |
| Supply voltage of closing and opening devices | 125 Vd.c. | |
| Class | E1, C2 | X |

X = This rating has been proved by the tests of this Certificate.

1.2 Description of the object tested

One compact switchgear assembly comprising a three-pole SF₆ circuit-breaker and a three-position disconnect/earthing switch, the circuit-breaker incorporating one interrupter per pole in single-pole enclosures with a common operating mechanism

Mechanism:

Dependent power closing (motor).

Dependent power opening (motor).

| | |
|-----------------------------|-----------|
| Supply voltage closing coil | 125 Vd.c. |
| Supply voltage opening coil | 125 Vd.c. |
| Supply voltage motor | 125 Vd.c. |

1.3 List of drawings

The manufacturer has guaranteed that the object submitted for tests has been manufactured in accordance with the following drawings and/or documents. KEMA Laboratories has verified that these drawings and/or documents adequately represent the object tested. The manufacturer is responsible for the correctness of these drawings and/or documents and the technical data presented.

The following drawings and/or documents have been included in this Certificate:

| Drawing no./document no. | Revision |
|--------------------------|----------|
| 6TG.100.002 | 1 |

The following drawings and/or documents are only listed for reference and are kept in KEMA Laboratories' files:

| Drawing no./document no. | Revision | Drawing no./document no. | Revision |
|--------------------------|----------|--------------------------|----------|
| 6TG.100.001 | 1 | 8TG.200.007 | 1 |
| 5TG.569.001 | 1 | 5TG.722.004 | 1 |
| 5TG.569.002 | 1 | 2TG.046.006 | 1 |
| 5TG.551.001 | 1 | 8TG.282.273 | 1 |
| 5TG.743.005 | 1 | 8TG.282.310 | 1 |
| 5TG.569.003 | 1 | 8TG.510.024 | 1 |
| 5TG.550.007 | 1 | 8TG.510.025 | 1 |
| 5TG.780.007 | 1 | 6TG.203.003 | 1 |
| 5TG.780.008 | 1 | 5TG.743.006 | 1 |
| 8TG.040.010 | 1 | 5TG.020.025 | 1 |
| 8TG.040.005 | 1 | 8TG.510.035 | 1 |
| 8TG.040.009 | 1 | 8TG. 550.025 | 1 |
| 8TG.423.001 | 1 | 8TG.003.006 | 1 |
| 8TG.104.002 | 1 | 5TG.780.012 | 1 |
| 8TG.550.004 | 1 | 8TG.170.008 | 1 |
| 8TG.550.006 | 1 | 8TG.177.016 | 1 |
| 8TG.550.008 | 1 | 8TG.232.014 | 1 |
| 8TG.550.009 | 1 | 8TG.232.015 | 1 |
| 8TG.599.001 | 1 | 8TG.232.016 | 1 |
| 8TG.599.002 | 1 | 8TG.450.001 | 1 |
| 8TG.750.001 | 1 | 8TG.550.013 | 1 |
| 8TG.750.002 | 1 | 8TG.550.106 | 1 |
| 5TG.743.004 | 1 | 8TG.569.106 | 1 |
| 5TG.232.004 | 1 | | |

2 GENERAL INFORMATION

2.1 The tests were witnessed by

| Name | Company |
|-------------|-----------------------------------|
| Luo, X. | Qingdao TGOOD Electric Co., Ltd., |
| Yang, L. | Qingdao, China |
| Dong, G. | |
| Xu, S. | |

2.2 The tests were carried out by

| Name | Company |
|----------------|-------------------------|
| Ebbers, L.F.H. | KEMA Nederland B.V., |
| | Arnhem, The Netherlands |

2.3 Accuracy of measurement

The guaranteed uncertainty for the measured voltages and currents taking into account the total measuring system, is less than 5%, unless mentioned otherwise.

2.4 Notes

For test purposes equipment filled with air at atmospheric pressure for insulation instead of SF₆ gas.

3 LEGEND

Phase indications

If more than one phase is recorded on oscillogram, the phases are indicated by the digits 1, 2 and 3. These phases 1, 2 and 3 correspond to the phase values in the columns of the accompanying table, respectively from left to right.

Explanation of the letter symbols and abbreviations on the oscillograms

| | |
|------|--|
| pu | Per unit (the reference length of one unit is represented by the black bar on the oscillogram) |
| I1TO | Current through test object |
| I2TO | Current through test object |
| I3TO | Current through test object |