

Confidentiality level: public release

CHINA TELECOM CORPORATION TECHNICAL STANDARDS

Q/CT 2299-2010

**Technical Requirements for Field-mountable Optical
Connector of China Telecom**

中国电信现场组装光纤活动连接器 技术要求
(Temporary)

Issued on: December, 2010

Implemented on: December, 2010

Issued by: China Telecom Corporation

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Technical Requirements for Field-mountable Optical Connector of China Telecom

1 Scope

This Standard specifies the classification, general requirements, performance requirements, test standards and methods, marks, packaging, transportation and storage requirements of field-mountable optical fiber connectors (optical field connectors for short, or quick connectors for short).

This Standard applies to the single-mode fiber optic field connector series products.

2 Normative references

The provisions in following documents become the provisions of this Standard through reference in this Standard. For dated references, the subsequent amendments (excluding corrigendum) or revisions do not apply to this Standard, however, parties who reach an agreement based on this Standard are encouraged to study if the latest versions of these documents are applicable. For undated references, the latest edition of the referenced document applies.

GB/T 16529.4-1997, *Splices for optical fibers and cables. Part 4: Sectional specification. Mechanical splices for optical fibers and cables*

GB/T 12507.1-2000, *Connectors for optical fibers and cables. Part 1: Generic specification*

GB/T 2421.1-2008, *Environmental testing for electric and electronic products - General and guidance*

GB/T 5169.5-2008, *Fire hazard testing for electric and electronic products - Part 5: Test flames - Needle test method - Apparatus, confirmatory arrangement and guidance*

YD/T 1272.1-2003, *Optical fiber connector. Part 1: Type LC*

YD/T 1272.3-2005, *Optical fiber connector Part 3: Type SC connector family*

YD/T 778-2006, *Optical fiber distribution frames*

YD/T 1997-2009, *Bow-type drop cables for access network*

YD/T ××××-20××, *Reliability requirements and test methods of optical fiber movable connectors*

YD/T ××××-20××, *Single-core optical fiber mechanical connector for communication*

3 Noun terms and abbreviations

3.1 Noun terms

3.1.1 field-mountable optical connector

A field-mountable optical connector (optical field connector for short) is a fiber optic connector that is directly terminated at the construction site and terminated by mechanical splicing or thermal fusion splicing.

Optical field connectors can be widely used in the occasions of fast termination and interconnection of optical fibers or cables. They possess the same connection performance as standard SC/LC connectors. They are compatible with standard SC/LC connectors and sockets.

3.2 Abbreviations

The following abbreviations apply to this Standard:

FTTH Fiber To The Home

ODN Optical Distribution Network

4 Classification of optical field connectors

4.1 Classify by connector structure

According to the connector structure, it can be classified into the following types:

- a) Plug type: including SC type, LC type, FC type;
- b) Socket type: including straight (SC type, LC type, FC type), curved (SC type, LC type, FC type).

field connectors shall be within 3 minutes.

5.2.2 Assembly success rate

The one-time assembly success rate of the optical field connector shall not be less than 95% (for example, if 100 samples are assembled, the assembly failure of up to 5 samples is allowed).

5.2.3 Repeatable assembly

The pre-installed optical mechanical splicing and straight-through optical field connectors shall have repeatable assembly. Ensure that after an assembly failure, it can be reworked and assembled again. And when repeated assembly, it shall be easy to turn on.

Repeated assembly refers to turning on the assembled connector, remaking the fiber end face according to the assembly procedure, and reassembling the connector. Repeatable assembly shall be more than 5 times.

5.3 Working environment requirements

The environmental requirements for optical field connectors are as follows:

- a) Working temperature: $-40^{\circ}\text{C}\sim+85^{\circ}\text{C}$;
- b) Storage temperature: $-40^{\circ}\text{C}\sim+85^{\circ}\text{C}$;
- c) Relative humidity: $\leq 95\%$ (at $+30^{\circ}\text{C}$);
- d) Atmospheric pressure: $62\text{kPa}\sim 106\text{kPa}$.

5.4 Material requirements

The materials used for optical field connectors shall meet the following requirements:

- a) The refractive index of the refractive index matching material needs to be close to the core. The material shall be stable and reliable for 25 years;
- b) The combustion performance of plastic parts used in optical field connectors shall meet the requirements of GB/T 5169.5-2008. The duration of applying the test flame is 10s;
- c) They shall comply with RoHS standards, no pollution to the environment, and comply with relevant environmental protection standards;
- d) When the finished product is damaged, its parts are not allowed to cause harm to people.

measurement is carried out under the standard atmospheric pressure conditions specified in GB/T 2421.1-2008. The accuracy of the measuring instruments and meters shall meet the requirements and be calibrated regularly.

7.1.2 Test light source and tail fiber

LD light source is used for measurement. Its peak wavelength is 1310nm/1550nm.

The tail fiber connected to the light source shall be a single-mode fiber. To eliminate the influence of the cladding mode on the measurement, a small circle of $\Phi 30\text{mm}$ is marked on the tail fiber.

7.1.3 Standard connectors

When testing the optical performance of SC optical field connectors, the standard connectors used shall meet the requirements of 4.3 in YD/T 1272.3-2005. When testing the optical performance of LC-type optical field connectors, the standard connectors used shall meet the requirements of 4.3 in YD/T 1272.1-2003.

7.1.4 Preparation before measurement

Before measurement, use lint-free fiber paper or absorbent cotton to wipe and clean the pin body and the end surface and the inner surface of the adapter sleeve. Use absolute alcohol to scrub if necessary.

7.1.5 Specimen

The samples for mechanical performance test and environmental performance test shall be the samples that pass the insertion loss and return loss test after the on-site assembly test.

7.2 Appearance and size inspection

The appearance of the assembled optical field connector shall be smooth, clean, free of oil and burrs, without scars and cracks, with bright colors, and good consistency. Each component combination needs to be flat. The insertion and removal of the adapter needs to be smooth and easy. The connection is strong. The switch works normally.

Measure the length of the assembled fiber optic field connector with a caliper. The length shall meet the requirements of 5.1.1.

7.3 Insertion loss measurement

The insertion loss of the optical field connector is measured according to one

In the formula: The unit of P_1 and P_0 is mw, and the unit of insertion loss is dB.

7.4 Echo wave loss measurement

Measure according to the method specified in 6.5 of YD/T 1272.3-2005. The indicators shall meet the requirements of Table 2b.

7.5 High temperature

Perform high temperature measurement of optical field connectors as follows:

a) Conditions

- Temperature: +85°C;
- Duration: 96h.

b) Procedures

- Pretreat the specimen at room temperature. Measure the insertion loss value and echo wave loss value of the specimen as the original value before the test;
- Place the specimen in a thermostatic oven with an accuracy of $\pm 2^\circ\text{C}$. The temperature is 85°C. Keep constant temperature for 96 hours. During the test, test and record the insertion loss and echo wave loss of the specimen. After the test is over, take the specimen out and place it in a room temperature environment for 2 hours. Test and record the insertion loss and echo wave loss values.

c) Test results

- The test results of insertion loss and echo wave loss of the specimen during and after the test shall meet the requirements of Table 2. The test results of the change in input loss and the change in shape shall meet the requirements of Table 3a.

7.6 Low temperature

Perform low temperature measurement of optical field connectors as follows:

a) Conditions

- Temperature: -40°C;
- Duration: 96h.

b) Procedures

- Pretreat the specimen at room temperature. Measure the insertion loss value and echo wave loss value of the specimen as the original value before the test;
- Place the specimen in a thermostatic oven with an accuracy of $\pm 2^{\circ}\text{C}$. The temperature is -40°C . Keep constant temperature for 96 hours. During the test, test and record the insertion loss and echo wave loss of the specimen. After the test is over, take the specimen out and place it in a room temperature environment for 2 hours. Test and record the insertion loss and echo wave loss values.

c) Test results

- The test results of insertion loss and echo wave loss of the specimen during and after the test shall meet the requirements of Table 2. The test results of insertion loss change and shape change shall meet the requirements of Table 3b.

7.7 Temperature cycle

Perform temperature cycle measurement of optical field connectors as follows:

a) Conditions

- Extreme high-temperature temperature: $T_a = +85^{\circ}\text{C}$;
- Limit low-temperature temperature: $T_b = -40^{\circ}\text{C}$;
- Cycle times: 21 cycles (8 hours for 1 cycle), 168 hours in total.

b) Procedures

- Pretreat the specimen at room temperature. Measure the insertion loss value and echo wave loss value of the specimen as the original value before the test;
- Place the specimen in a constant temperature high and low temperature circulating box with an accuracy of $\pm 2^{\circ}\text{C}$. According to the temperature change curve shown in Figure 12, the temperature is increased from room temperature to 23°C for 1 hour and then at a constant rate for 1 hour to T_a temperature. After 1 hour at the constant temperature in T_a , cool down at a constant rate for 1 hour to 23°C . Keep at the constant temperature for 1 hour. After 1 hour at the T_b constant temperature, the temperature is increased to room temperature of 23°C at a constant speed. That will be the end of a cycle. It lasts 21 cycles for a total of 168 hours. During the

Set the temperature and humidity as required. Maintain constant temperature and humidity for 96 hours. During the test, test and record the insertion loss and echo wave loss of the specimen. After the test is over, take the specimen out and place it in a room temperature environment for 2 hours. Test and record the insertion loss value and echo wave loss value.

c) Test results

- The insertion loss and return loss test results of the specimen in and after the test shall meet the requirements of Table 2. The test results of insertion loss change and shape change shall meet the requirements of 3d.

7.9 Water immersion

Perform the water immersion measurement of the optical field connector as follows:

a) Conditions

- Water tank environment: tap water at room temperature;
- Duration: 168 hours.

b) Procedures

- Pretreat the specimen at room temperature. Measure the insertion loss value and echo wave loss value of the specimen as the original value before the test;
- Put the specimen in a tap water tank at room temperature. Keep for 168 hours. Take the specimen out and place it in a room temperature environment for 24 hours. Test and record the insertion loss and echo wave loss values.

c) Test results

- After the test, the insertion loss and echo wave loss test results of the specimen shall meet the requirements of Table 2. The test results of insertion loss change and shape change shall meet the requirements of Table 3e.

7.10 Repeatable assembly

This test only applies to mechanical optical field connectors. Repeatable assembly tests are not required for thermal fusion splicing optical field connectors.

Perform repeatable assembly measurement of mechanical optical field connectors as follows:

a) Conditions

- Assembly times: 5.

b) Procedures

- Pretreat the specimen at room temperature. Measure the insertion loss value and echo wave loss value of the specimen as the original value before the test;
- Open the assembled optical field connector specimen. Re-make the fiber end face according to the assembly procedure. Reassemble the connector. Assemble 5 times in a row. After each assembly is completed, it is necessary to measure and record the insertion loss and echo wave loss values.

c) Test results

- The test results of insertion loss and echo wave loss of the specimen during and after the test shall meet the requirements of Table 2. The test results of insertion loss change and shape change shall meet the requirements of Table 4a.

7.11 Vibration (sinusoidal)

Carry out the vibration measurement of the optical field connector as follows:

a) Conditions

- Frequency range: 10-50Hz;
- Frequency sweep requirements: 45 times per minute;
- Amplitude: 0.75mm single amplitude;
- Duration: X, Y, Z three directions, 2 hours for each.

b) Procedures

- Pretreat the specimen at room temperature. Measure the insertion loss value and echo wave loss value of the specimen as the original value before the test;
- The specimen is fixed on a dedicated vibration table. With an amplitude of 0.75mm, the continuous frequency range is 10-50Hz. The frequency

- Mating cycles: 500.

b) Procedures

- Pretreat the specimen at room temperature. Measure the insertion loss value and echo wave loss value of the specimen as the original value before the test;
- Insert and remove the specimen in the usual way. Measure and record insertion loss and echo wave loss every 50 times. Insert and remove for 500 times. Record the data of 10 times.

c) Test results

- The test results of insertion loss and echo wave loss of the sample during and after the test shall meet the requirements of Table 2. The test results of insertion loss change and shape change shall meet the requirements of Table 4e.

7.15 Tensile

Perform the tensile measurement of the optical field connector as follows:

a) Conditions

- Load weight: the load for 0.25mm fiber type optical field connector is 2N; the load for 0.9mm fiber type optical field connector is 4N; the loads for optical cable type optical field connector are 20N and 30N;
- Load time: 2 minutes;
- Distance between the load point and the optical field connector: $L=22\sim 28\text{cm}$.

b) Procedures

- Pretreat the specimen at room temperature. Measure the insertion loss value and echo wave loss value of the specimen as the original value before the test;
- Connect the specimen as shown in Figure 14. Apply a load on the specimen. Duration is 2 minutes. For specimens with 4N and 20N loads, perform online optical performance monitoring. Measure and record insertion loss and echo wave loss during the test. Measure and record the insertion loss and echo wave loss again after the test. For specimens with 2N and 30N, do not monitor their optical performance online. Measure and record the insertion loss and echo wave loss after the test.

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