

JIS

JAPANESE INDUSTRIAL STANDARD

**Test methods for fiber optic
test sources**

JIS C 6190—1993

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In the event of any doubt arising,
the original Standard in Japanese is to be final authority.

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Test methods for fiber optic test sources

C 6190-1993

1. Scope This Japanese Industrial Standard specifies test methods for light sources which output continuous light of emission wavelengths ranging from 400 nm to 1800 nm without intensity modulation and which have output ports for optical fiber connectors.

Remarks: The following standards are cited in this Standard:

JIS C 1002 Glossary of terms used in electronic measuring apparatus

JIS C 1003 Testing methods for digital voltmeters

JIS C 6183 Test methods of fiber-optic spectrum analyzer

JIS C 6184 Test methods of optical power meters for optical fiber

JIS Z 8103 Glossary of terms used in instrumentation

2. Definitions For the purpose of this Standard, in addition to the definitions specified in JIS C 1002 and JIS Z 8103, the following principal definitions shall apply:

- (1) output power Optical power which is outputted from the output end of an optical fiber connected to the output port for optical connector of a fiber optic test source.
- (2) error The difference between the true value of an amount supplied from a light source (supplied value) and the value set on the light source (set value or rated value). The magnitude is expressed in absolute error or percentage error and calculated from the following formulae, respectively:

$$\varepsilon = Q_x - Q_o$$

where, ε : absolute error

Q_x : supplied value

Q_o : set value or rated value

$$\varepsilon_r = \frac{Q_x - Q_o}{Q_o} \times 100$$

where, ε_r : percentage error (%)

- (3) intrinsic error The error obtained under the standard test conditions (see JIS C 1002).
- (4) bias The value obtained by subtracting the set value or rated value from the average of supplied values.

- (5) operating error The error obtained under the rated operating conditions (see JIS C 1002).

3. Test conditions

3.1 General matters In general, the conditions at the tests of fiber optic test sources (hereafter referred to as "specimens") shall be as stated in 3.2 to 3.4. If it is difficult to carry out the tests under these test conditions, the conditions employed and the influence shall be recorded in the test results.

3.2 Preparation of tests Carry out the preparation of tests in the following sequence:

- (1) Before switching on the power supply, the specimen should be exposed to the standard test conditions or conditions close thereto for at least 2 h.
- (2) Switch on the power supply and carry out the preheating for the specified duration.

3.3 Standard test conditions The standard test conditions shall be as follows:

- (1) Temperature $23 \pm 2^{\circ}\text{C}$
- (2) Relative humidity $(65 \pm 10) \%$

However, temperature $20 \pm 2^{\circ}\text{C}$ or $25 \pm 2^{\circ}\text{C}$, and relative humidity $(50 \pm 10) \%$ may be selected, unless any doubt arises on the decision of test results.

3.4 Measuring optical fiber The optical fiber and the connector attached thereto shall be those specified in the specimen.

4. Classification of tests and performances Classification of tests and performances are shown in Table 1.

Table 1. Classification of tests and performances

Classification		Performances
Accuracy test		Output power
Intrinsic error test		Peak wavelength or center wavelength
Individual error test	Temperature stability test	Spectral bandwidth
	Time stability test	
Strength test	Vibration test	Strength
	Shock test	

Remarks: If the test itself is meaningless for a performance due to the characteristics of the specimen, the test for such performance may be omitted.

5. Accuracy test

5.1 Performances on which accuracy tests are performed The accuracy test shall be carried out on each of the performances stated in Table 1.

5.2 Obtainment of accuracy Calculate the limits of operating error from the formulae given below based on the partial errors obtained by the intrinsic error test of 6, and the individual error test of 7., and take the limits as the accuracy of the specimen.

$$\varepsilon_{tu} = (\bar{\varepsilon}_{to} + \bar{\varepsilon}_{tv}) + 2 \sqrt{\varepsilon_{to}^2 + \varepsilon_{tv}^2 + \left(\frac{\varepsilon_{ts}}{2}\right)^2}$$

$$\varepsilon_{tl} = (\bar{\varepsilon}_{to} + \bar{\varepsilon}_{tv}) - 2 \sqrt{\varepsilon_{to}^2 + \varepsilon_{tv}^2 + \left(\frac{\varepsilon_{ts}}{2}\right)^2}$$

where, ε_{tu} : upper limit of operating error
 ε_{tl} : lower limit of operating error
 $\bar{\varepsilon}_{to}$: bias of specimen in intrinsic error test
 ε_{to} : error excluding bias of specimen in intrinsic error test
 $\bar{\varepsilon}_{tv}$: average value of errors in temperature stability test (average value of upper limit and lower limit of variation)

$$\frac{\varepsilon_{tvu} + \varepsilon_{tv1}}{2}$$

ε_{tv} : standard deviation of error in temperature stability test

$$\sqrt{\frac{(\varepsilon_{tvu} - \varepsilon_{tv1})^2}{12}}$$

where, ε_{tvu} : upper limit of variation in temperature stability test

ε_{tv1} : lower limit of variation in temperature stability test

ε_{ts} : time stability in time stability test

6. Intrinsic error test

6.1 Outline of intrinsic error test The tests shall be carried out under the standard test conditions. The testing circuit is shown in Fig. 1. The output power, the peak wavelength or center wavelength and the spectral bandwidth shall be measured by an optical power meter for optical fiber and an optical spectrum analyzer serving as the reference, respectively. The above reference optical spectrum analyzer and optical power meter for optical fiber shall be the ones calibrated or error evaluated under the standard test conditions. The method of calibration or error evaluation shall be as specified in JIS C 6183 and JIS C 6184.