



JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS C 5877-2 : 2012

(OITDA/JSA)

Test methods of polarizer

ICS 33.180.01

Reference number : JIS C 5877-2 : 2012 (E)

PROTECTED BY COPYRIGHT

Date of Establishment: 2012-01-20

Date of Public Notice in Official Gazette: 2012-01-20

Investigated by: Japanese Industrial Standards Committee
Standards Board

Technical Committee on Electronics Technology

JIS C 5877-2:2012, First English edition published in 2012-09

Translated and published by: Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

© JSA 2012

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

Printed in Japan

PROTECTED BY COPYRIGHT

Contents

	Page
1 Scope.....	1
2 Normative references	1
3 Terms and definitions	1
4 Test condition	2
4.1 Standard condition	2
4.2 Reference condition	2
4.3 Judgment condition	2
4.4 Condition of test location	2
5 Appearance and structure	2
6 Optical performance test	2
6.1 Test instrument and device	2
6.2 Preparation	4
6.3 Transmittance	4
6.4 Extinction ratio	6
6.5 Wavefront aberration	8
7 Mechanical performance test	14
7.1 Test instrument and device	14
7.2 Test method	15
7.3 Matters specified in individual standard	15
8 Test report	15

Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal for establishment of Japanese Industrial Standard submitted by Optoelectronics Industry and Technology Development Association (OITDA)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

This **JIS** document is protected by the Copyright Law.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public or utility model right. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public or the utility model right.

JIS C 5877 series consists of the following 2 parts:

JIS C 5877-1 *General specification of polarizer*

JIS C 5877-2 *Test methods of polarizer*

Test methods of polarizer

1 Scope

This Japanese Industrial Standard specifies the test methods of a polarizer used as an optical component.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS C 5860 *General rules of passive devices for light beam transmission*

JIS C 5877-1 *General specifications of polarizer*

JIS C 5900 *General rules of passive devices for fiber optic transmission*

JIS C 5901 *Test methods of passive devices for fibre optic transmission*

JIS C 60068-1 *Environmental testing Part 1: General and guidance*

3 Terms and definitions

For the purpose of this Standard, the terms and definitions in clause 3 of JIS C 5860, clause 3 of JIS C 5877-1, clause 3 of JIS C 5900 and clause 3 of JIS C 5901, and the following apply.

3.1 standard optical source

optical source of which the wavefront aberration is small enough, coherence is sufficient and output stability is satisfactory in the operating wavelength range

Normally, a gas laser, a solid-state laser or a semiconductor laser is used as the optical source. Furthermore, a light emitting diode may also be used with a suitable correction optical system.

3.2 standard lens

lens of which the transmitted wavefront aberration is small enough and transmission loss including internal reflection loss is known in the predetermined magnification within the operating wavelength and effective diameter

Normally, at an operating wavelength, an effective diameter and an effective focal distance or effective NA are specified and an anti-reflection coating is applied. The objective lens of an optical microscope, etc. corresponds to this example.

3.3 extinction ratio

ratio of the optical power that intends transmission to the optical power that intends blocking

The extinction ratio of a polarizer is defined by the ratio between the optical power of linearly polarized light in the polarization direction that passed the effective diameter of the polarizer and the optical power of the polarization direction perpendicular to it.

3.4 reference plane

plane in which the reflectance to incident light and the phase shift associated with reflection are uniform in the reflection plane

The reference plane has a function to reflect without changing the wavefront of incident spatial beam light (plane wave).

4 Test condition

4.1 Standard condition

The test and measurement, unless otherwise specified, shall be performed in the standard range of the atmospheric condition specified in **5.3** of **JIS C 60068-1** (a temperature of 15 °C to 35 °C, a relative humidity of 25 % to 75 % and an atmospheric pressure of 86 kPa to 106 kPa). However, if any doubt arises as to the measured values in this standard condition or if specially requested, those shall be performed as specified in **4.3**. Moreover, when the test condition (temperature and atmospheric pressure) is different from the standard condition, the reference condition when the conversion method of the test results or measured values is specified individually shall be as specified in **4.2**. Furthermore, when it is difficult to measure in the standard condition, if any doubt does not arise as to the judgment, the test and measurement may be performed in the condition other than the standard condition.

In addition, the standard condition in which the test and measurement were performed shall be described in the test report.

4.2 Reference condition

The reference condition shall be as specified in **5.1** of **JIS C 60068-1**. However, it may be determined only by temperature.

4.3 Judgment condition

The judgment condition shall be taken as a temperature of 20 °C ± 2 °C, a relative humidity of 60 % to 70 % and an atmospheric pressure of 86 kPa to 106 kPa among conditions specified in **5.2** of **JIS C 60068-1**.

4.4 Condition of test location

The test location shall be kept clean enough so that there may be no foreign particles, dust, etc.

5 Appearance and structure

The appearance and structure shall be as specified in clause **5** of **JIS C 5901**.

6 Optical performance test

6.1 Test instrument and device

The instrument and device used for this test shall be as specified as follows.

- a) **Optical source** For the optical source, unless otherwise specified, a standard optical source shall be used. Furthermore, normally, the standard optical source of which the wavefront aberration is not more than $\lambda/10$ at an operating wavelength

and of which the output stability is superior to ± 0.05 dB/h shall be used. The details shall be as specified in the individual standard.

- b) **Lens** For the lens, unless otherwise specified, a standard lens shall be used. Furthermore, normally, the lens of which the wavefront aberration is not more than $\lambda/10$ at an operating wavelength shall be used. The details shall be as specified in the individual standard.
- c) **Aperture diaphragm** For the aperture diaphragm, unless otherwise specified, a circular diaphragm shall be used.
- d) **Beam expander** Unless otherwise specified, the beam expander that has the beam diameter larger than the maximum diameter of the aperture diaphragm shall be used. Furthermore, the beam expander of which the wavefront aberration is not more than $\lambda/10$ at an operating wavelength. The details shall be as specified in the individual standard.
- e) **Optical power meter** Unless otherwise specified, the optical power meter of which the linearity error including a polarization-dependent loss in the measurement range is within 0.05 dB and the sensitivity and dynamic range required for measurement can be sufficiently obtained shall be used. The light receiving element of which the sensitivity distribution is uniform and of which the effective light receiving diameter is large enough to the core diameter of the optical fibre for incident optical power measurement and the effective diameter of a polarizer shall be used. The optical power on the light receiving surface should be lower than the saturation level of the light receiving element by not less than 10 dB.
- f) **Image sensor** The image sensor of which the sensitivity distribution for the wavelength to be measured is uniform and of which the dynamic range can be sufficiently obtained shall be used. Furthermore, in consideration of the magnification of the image projected on the image sensor by an imaging lens, the face-shaped image sensor with spatial resolution capable of detecting the wavefront aberration of not more than $\lambda/10$ shall be used.
- g) **Semi-transparent mirror** Unless otherwise specified, the semi-transparent mirror that has absorptance of not more than 0.5 % and the effective area larger than the maximum diameter of an aperture diaphragm shall be used. The semi-transparent mirror of which an anti-reflection coating is applied to the opposite plane of the plane with a partial reflection coating shall be used. Furthermore, the semi-transparent mirror of which the wavefront aberration is not more than $\lambda/10$ at an operating wavelength shall be used.
- h) **Mirror** Unless otherwise specified, the mirror that has reflectance of not less than 98 % (for both polarization components), wavefront aberration of not more than $\lambda/10$ and the effective area sufficiently larger than the luminous flux diameter shall be used.
- i) **Standard polarizer** Unless otherwise specified, the standard polarizer that has the effective area larger than the maximum diameter of an aperture diaphragm shall be used. The standard polarizer of which anti-reflection coatings are applied to the incident and outgoing planes shall be used. Furthermore, the standard polarizer of which the wavefront aberration is sufficiently small at an operating