

JJF

**INDUSTRY STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

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**Calibration Specification for Optical 3D Measuring Systems
Based on Structured Light Scanning
(English Translation)**

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1 Scope

This calibration specification applies to the calibration of optical 3D measuring systems based on structured light scanning (hereinafter referred to as structured light measuring systems).

2 Terms and definitions

The following terms and definitions apply to this Specification.

2.1

point cloud [data]

A set of spatial coordinate points that are obtained by measurement to characterize contour features and are associated with each other.

2.2

ball bar, dumb bell

An etalon consisting of two spherical targets of the same diameter connected by a rigid structure.

2.3

ball plate

A standard measuring tool consisting of a series of standard balls with different diameters and a fixed bottom plate.

2.8

sphere-spacing error; SD

The difference between the measured value and the reference value of the center distance between two balls.

3 Overview

The structured light measuring system is a non-contact measurement device. By projecting the structured light onto the surface of the measured object, and by collecting the point cloud of the structured light pattern on the surface of the measured object, the surface contour features of the measured object are calculated and obtained.

4 Metrological characteristics

The metrological characteristics are shown in Table 1.

5.1 Operation modes and environmental conditions

Before calibration, the operation mode needs to be set, including the type and brightness of lighting, the measurement range, the type, quantity and distribution of sensors used in the system.

5.3 Etalons for calibration

Etalons for calibration shall be made of ceramic, steel, aluminum or other rigid material.

It shall have a diffuse surface (non-volumetric scattering). The etalons used to calibrate different metrological characteristics are shown in Table 1.

6 Calibration items and methods

6.1

spherical form probe error PF, size probe error PS

Select the appropriate diameter standard ball according to Table 1.

Standard balls shall be fixed in an appropriate way. Avoid introducing measurement errors due to instability.

6.1.2 Multi-view system

The standard ball shall be located in at least $n=3$ positions within the measurement range. The standard ball shall be measured from no less than 5 different directions at each position, see Figure 3, so that the point cloud shall cover the surface of the standard ball as completely as possible.

Figure 3 -- Schematic diagram of 5 measuring directions

6.2 Flat form probe error F

Select a standard plane of appropriate size according to Table 1.

6.3.1 Single-view system

Choose the appropriate length ball bar according to Table 1.

The sphere-spacing error SD shall be measured at 7 different positions in the entire measurement range. It is recommended to arrange and measure the etalon as shown in

Figure 5.

7 Processing of calibration results

Calibration certificate is issued to the calibrated structured light measuring system. The calibration certificate shall meet the requirements of 5.12 in JJF 1071-2010. Calibration results and their uncertainties list the calibration items and data.

8 Recalibration interval

The user decides the recalibration interval according to the actual usage. It is recommended that the interval between recalibration shall not exceed 1 year.

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