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**Calibration Specification for Multi-component Force Transducer
(English Translation)**

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Introduction

This specification is based on the rules set forth in JJF 1071-2010 "Rules for the Preparation of National Metrological Calibration Standards".

The calibration standard in the development process reference JJF (military) 20-2012 "multi-component dynamometer calibration specification" JJG391-2009 "Force Sensors" JJG632-1989 Terms, symbols and definitions in "Dynamic Force Sensors" and related technical requirements. This specification gives calibration conditions for calibration of multistage force sensors, calibration items and calibration methods.

This specification is the first release.

Multi - component force sensor calibration specification

1 Scope

This specification applies to static calibration of piezo-type and strain-type multi-component force sensors.

2 reference file

This specification refers to the following technical documents.

JJG391-2009 force sensor Dynamic Force Sensors JJG632-1989 Force and hardness measurement terms and definitions JJF (military) 20-2012 multi - component dynamometer calibration specification for dated references, only the dated edition applies to this specification; references that are not dated , The latest version (including all modifications) applies to this specification.

3 terms and units of measurement 3.1 single component calibration

calibrationofacomponent A process of calibrating a component of a multi-component force sensor individually.

3.2 multi-component calibration calibrationofmulti-component A process of applying a load to two or more components of a multi-component force sensor.

3.3 coupling error when a component load is applied to the sensor, the change in the load

of the other component load caused by the other component is rated negative the ratio of the output under the charge.

4 Overview

The multi-component force sensor refers to a force that can simultaneously measure at least two of the six generalized force components of the force vector sensor.

5 measurement characteristics Multi-component force sensor measurement characteristics in Table 1.

Table 1 Metrological characteristics

No. metering attribute name 1 zero output 2 back to zero difference 3 rated output

Table 1 (continued)

No. metering attribute name

4 Output sensitivity 5 repeatability 6 lag

7 Straightness

8 coupling error

6 calibration conditions

6.1 Environmental conditions Ambient temperature. 15 °C ~ 25 °C Relative humidity. ≤ 80% Other conditions. Calibration should not have interference sources that affect the calibration results.

6.2 Equipment for calibration the equipment used for calibration shall be calibrated (or calibrated) by the measuring technology body to meet the calibration requirements and shall be valid During the period, the range should be covered by the calibrated multi-component force sensor measurement range.

6.2.1 Multi-component force sensor calibration device the measurement uncertainty of the component complex value is less than the uncertainty of the corresponding component of the calibrated multi-component force sensor the degree of 1/3.

6.2.2 Force standard machine the uncertainty of the force value is less than 1/3 of the uncertainty of the corresponding measure of the multi-component force sensor.

6.2.3 Torque standard device the torque uncertainty is less than 1/3 of the uncertainty of the corresponding measure of the multi-component force sensor.

6.2.4 energize the power supply Multi-component force sensor calibration used in the excitation power supply output voltage 4h stability, should not exceed the multi-component force 1/5 of the corresponding accuracy of the sensor.

6.2.5 Indicator

Multi-component force sensor calibration instructions used in the instrument (including the multi-component force sensor to provide the excitation voltage Indicating the instrument) the accuracy of the relevant indicators, in principle, should not exceed the school multi-component force sensor corresponding accuracy indicators

6.2.6 Charge amplifier the maximum allowable error of the relevant technical indicators shall not exceed the corresponding accuracy index of the multi-component force sensor

6.2.7 Data acquisition system the data acquisition system shall have a multi-channel synchronous sampling function whose number of channels shall not be less than that of the multi-component force sensor and the sum of the number of data output channels of the calibration device. The sampling frequency of the data acquisition system should be no less than that of the multi-component force sensor when the output signal frequency of 20 times.

6.2.8 special fixture the relative measurement of the effective length between the individual loading positions of the special fixture and the force point of the multi-component force sensor itself is not the degree of determination should be less than 0.05% ($k = 2$).

7 Calibration items and calibration methods

7.1 Preparation before calibration

7.1.1 Determine the calibration items the calibration items can be selected according to the intended use of the multi-component force sensor, and the deviation from the calibration specification should in the calibration certificate.

7.1.2 Place time

The sensor should be placed under the specified environmental conditions for a sufficient period of time, the recommended placement time of not less than 8h.

7.1.3 Installation and loading conditions in accordance with the requirements of the instructions, the special fixture and multi-component force sensor installed correctly.

When the load should ensure that the multi-component force sensor axis and the load axis coincide, so that the tilt load and eccentric negative the effect of the Dutch is minimized.

7.1.4 Connection and preheating Before the calibration must be in accordance with the correct wiring method will be multi-component force sensor connected to the instrument, the excitation power Etc., adjust the excitation power, adjust the output voltage to the multi-component force sensor specified excitation voltage, and Preheating. The warm-up time should be in accordance with the requirements of the instructions.

Note: The manual does not specify the warm-up time, the multi-component force sensor, indicating the instrument, the excitation power and other general preheat 0.5h ~ 1h.

7.1.5 Preload

According to the multi-component force sensor manual and other information to confirm the