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**INDUSTRY STANDARD OF THE
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JJF 1570-2016

**Calibration Specification for Dynamic Balance Measuring
Instruments
(English Translation)**

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9 Re-school time interval (8)

Appendix A Calibration Original Record Recommended Format (9)

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Appendix C Examples of Uncertainty Evaluation (14)

Introduction

This specification is based on JJF 1071 "National Metrological Calibration Rules". Which evaluates the uncertainty of the measurement According to JJF 1059.1 "measurement uncertainty assessment and presentation" to write.

This specification is the first release.

Calibration standard for on - site dynamic balance measurement analyzers

1 Scope

This specification applies to the calibration of a dynamic balance measuring analyzer (hereinafter referred to as a dynamic balancer).

2 reference file

This specification refers to the following documents.

JJG105-2000 tachometer verification procedures Test procedure for magnetoelectric velocity sensor JJG134-2003 JJG233-2008 Verification of piezoelectric accelerometer Methods for Verification of Vibration Displacement Sensors JJG644-2003 JJG676-2000 working vibrometer verification procedures Dynamic Signal Analyzers JJG834-2006 Evaluation and Representation of Measurement Uncertainty JJF 1059.1-2012 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 definitions 3.1 balance efficiency the ratio of the amount of change in vibration to the initial vibration after a balance test. Expressed by equation (1).

$\eta =$

$\frac{V_0 - V_1}{V_0}$

100% (1)

Where.

V_0 --- initial vibration of the rotor;

V_1 --- the amount of residual vibration of the rotor after a balanced test.

4 Overview

Balancing instrument is composed of a phase detector, a number of vibration sensors and the host, is used to measure and analyze the rotating machine the analysis of the size and orientation of the unbalanced rotor. It is mainly used in industrial field, calibration has been installed on the machine Rotor field balance. The principle of measuring the balance is shown in Fig.

Figure 1 Schematic diagram of the balancing instrument

5 measurement characteristics

5.1 Sensor reference sensitivity the reference sensitivity is the sensor sensitivity calibrated at the reference frequency point, and the calibration uncertainty is 3% ($k = 2$).

5.2 amplitude-frequency characteristics the amplitude and frequency characteristics of the balancing instrument should meet the requirement of $\pm 5\%$.

5.3 amplitude linearity the amplitude linearity of the balancer should meet the requirement of $\pm 5\%$.

5.4 phase frequency characteristics the phase balance of the dynamic balancer should be given.

5.5 Phase linearity

The linearity of the balancer phase should meet the requirement of $\pm 2\%$.

5.6 channel consistency the balance between any two channels of the balancing instrument shall be consistent with the provisions of Table 1.

Table 1 Channel Consistency

Amplitude ratio/dB ± 0.1 Phase difference/(°) ± 1 5.7 speed Balancing instrument speed measurement accuracy level above 1.5.

5.8 Balanced efficiency After the balance, the initial unbalance should be reduced by more than 60%.

Note: The above indicators are not used for qualifying, for reference only.

6 calibration conditions

6.1 Environmental conditions Ambient temperature. $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$;

Relative humidity. $\leq 80\%$;

The change in supply voltage should be within $\pm 10\%$ of the rated voltage.

Laboratory and its surrounding environment should be no vibration and shock source, no strong electric field, strong magnetic field, strong sound field interference.

6.2 Standard equipment for calibration and other equipment

6.2.1 Vibration standard device the vibration standard device for calibrating the balancing instrument includes the absolute vibration standard device and the comparative vibration standard device.

Vibration standard device technical indicators in Table 2.

Table 2 vibration standard device technical indicators

Name	measurement range	Measurement uncertainty (k = 2)	Frequency range/Hz	Urel /%
Uphi/(°)	Absolute vibration	Standard device	f. 1Hz ~ 400Hz	a. 0.1 m/s ² to 100 m/s ²
phi. 0 ° to 360 °	1 ~ 400	1	1 Comparison of vibration	Standard device
to 100 m/s ²	phi. 0 ° to 360 °	10 ~ 400	3	2
6.2.2 phase shifter	Phase shifter	phase shift	range of 0 ° ~ 360 ° , phase shift resolution is better than 0.2 ° , phase shift drift less than ± 0.2 °/h, work the frequency band is 1Hz ~ 1kHz.	

6.2.3 Dynamic signal analyzer Dynamic signal analyzer selection of A-level.

6.2.4 Single disc rotor test stand the speed of the single disc rotor test stand is.200r/min ~ 3100r/min. Excellent stability within 1min speed at 0.1%.

6.2.5 Speed standard device Speed standard device accuracy level should be higher than the school object accuracy level 2 to 3 times.

6.2.6 Sinusoidal signal generator the distortion is not more than 0.03%, the frequency stability is better than 0.05%, the stability within 8h is better than 1%.

7 Calibration items and calibration methods

7.1 Calibration items Balancing instrument calibration items in Table 3. The actual calibration items should be based on the balancing instrument parameters and customer requirements.

Table 3 Dynamic Balancer Calibration Project

Serial number	calibration item
1	visual inspection
2	reference sensitivity
3	amplitude
4	frequency response
5	amplitude linearity
6	phase calibration
7	channel consistency
8	speed
9	balance efficiency

7.2 Calibration method 7.2.1 appearance inspection and power supply the knob should be flexible, the switch jumping clear, accurate positioning. The output input socket should not be loose. No effect normal Work of mechanical damage.

According to the instructions to the balancer power, warm-up time should be more than 15min.

7.2.2 Reference sensitivity You can use the absolute and comparative methods to calibrate the dynamic balance reference sensitivity.

The balancing device is equipped with a displacement sensor, a speed sensor, an