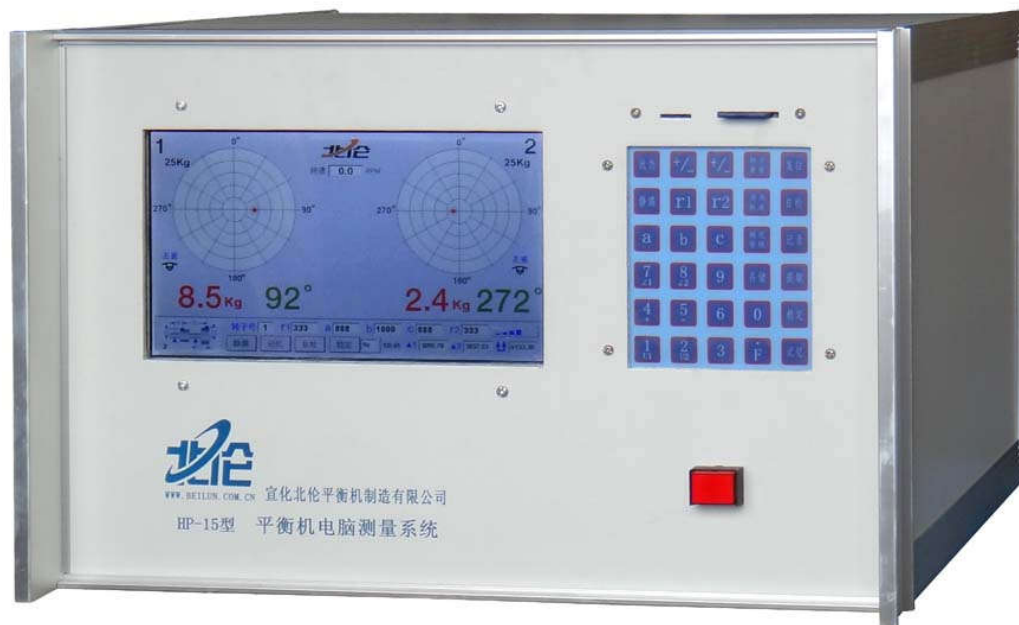


HP-15

Hard bearing balancing machine

Electrical measuring system



Xuanhua Beilun balance Machine Manufacturing Co., Ltd.

Table of Contents

1. Overview	2
2. Working environment for electric measuring box	3
3. Main technical parameters	3
4. Precautions for Use	4
5. Operating functions and instructions	4
6. Calibration of the electrical measuring box	12
7. Introduction of the principle of electrical measuring system	13
8. MAINTENANCE AND MAINTENANCE	14

HP-15 hard-bearing balancing machine computer measuring system for hard-bearing balancing machine unbalanced vibration signal detection.

The electrical measuring system is a computer-controlled balancing machine for measuring instruments.

The system has automatic sensitivity control, automatic storage of rotor data, direct readout of measurement data (size and angle position), keyboard input of rotor data, balancing of dynamic and static-even, on-site calibration, SD card Card) to save balance results and balance the report and other functions. The electrical measurement system may input the use parameters of the rotor to calculate the allowable residual unbalance corresponding to the selected balancing accuracy level.

This electrical measuring box is suitable for the unbalanced vibration signal detection of the hard bearing balancing machine.

Input of electric measuring box is:

A. The two sensors output the unbalanced vibration signal of the two bearing surfaces of the rotor.

B. A reference signal (sine wave or pulse) exactly the same as the rotation of the rotor output by a reference signal generating means,

The output of electric measuring box is:

A. The main display shows the unbalanced weight and phase or static and even imbalance weight and phase of the two correction planes of the rotor.

B. Balancing speed of the rotor.

The electric measuring box adopts the novel electric

measuring circuit and reasonable structure layout. It adopts single chip computer circuit for high-speed direct sampling and calculation, abc r1 r2 and bearing mode adopts direct input direct display, so the operator can understand the work of balancing machine at a glance status.

Conversion accuracy than the previous hardware conversion improved a lot. All linear and digital integrated circuits are the international standard package and the original series of surface-mount standard series, to bring convenience to the maintenance, and reliability has been significantly improved.

The core circuit of the electrical measuring box is 32-bit industrial single-chip AC direct high-speed full-wave sampling, software sine wave correlation function filtering, has a good filtering and frequency tracking performance. As a wide range of tracking, electrical measuring box with only a block speed range of work to facilitate the user. The speed of the electrical box instructions 80-2500RPM.

The electric box can automatically set the measured speed memory measurement data. Once again, the power box automatically enters the next measurement.

The unbalanced data of measurement and memory can be recalculated and displayed by re-inputting the parameters of a, b, c, r1 and r2 after re-inputting to the rotor.

Namely: Allows to measure the memory first, after supposes the bearing parameter.

2. The electric measuring box is suitable for the following working environment

2. 1 medium temperature is not higher than +40 °C and not lower than 0 °C.

-
2. 2 Air humidity not more than 85% (+25 °C)
 2. 3 The power supply voltage is $\sim 220V \pm 10\%$
 2. 4 power frequency 50Hz
 3. The main technical parameters
 3. Maximum error of $\pm 5\%$
 - 3.2 The maximum phase angle error $\ngtr 5^\circ$
 3. 3 plane operation maximum error of $\pm 3\%$
 3. 4 Maximum error of radius operation $\pm 3\%$
 3. 5 Range maximum error of $\pm 3\%$
 3. 6 Tachometer indicates the maximum error $< \pm 2\%$
 3. 7 supporting the different machine factory self-test status (TEST) electrical box instructions:

Self-test speed: 600rpm

Left scale: g Left phase: degrees

Right Scale: g Right Phase: Degrees

Note: (1) above parameters of the percent error are full of relative error;

(2) The above technical parameters according to the electrical test box test card provides the steps and methods of assessment;

(3) self-test, $r1 = r2 = b = 100, a = c = 100$.

(4) self-test signal is only used to check whether the normal use of electrical box, can not assess the accuracy of this test box.

(5) self-test status of the electrical test box indicates the value of field commissioning after the fill.

4. Precautions for use

The electrical measuring box has a, b, c separation and permanent calibration of the characteristics, to abandon the

tedious compensation, separation, calibration and a series of operational steps, greatly improving the work efficiency.

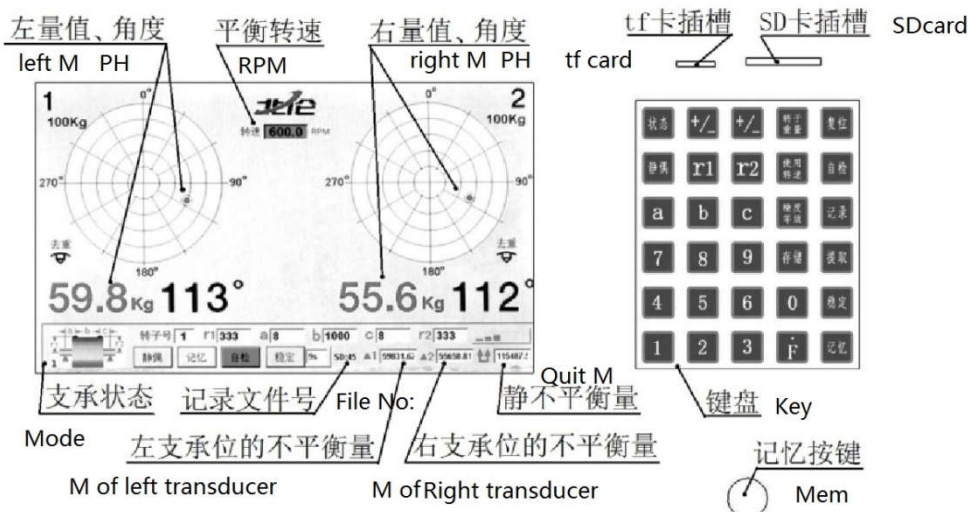
As the main technical indicators: minimum reachable residual imbalance Umar, unbalance reduction rate URR by the sensor and the electrical measurement system with the adjustment of the common guarantee, any link failure and replacement will be different degrees of impact The accuracy of the machine, it should be avoided because the machine does not understand the principle of random adjustable electrical measuring box within the adjustable components caused by human failure.

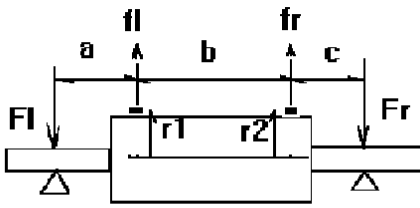
In the operating parameters of the r1, r2, b input settings, electrical measuring box to automatically avoid the 0000 position. Otherwise, the three sets of data in the input state, the electrical measurement system is not working properly.

Electric measuring box is a precision measuring instruments, should be hand operation and regular inspection, the operator should be professional training.

5. Operation function and explanation

5.1 Function and description of the operation panel (see the figure below, press the operation keyboard order)





标准支承方式示意图

(1) "state": the rotor "support state", rotor bearing surface, the relative position of the selection key correction.

A total of 1,2,3,4,5,6 six kinds of two-plane separation of the dynamic balance correction mode and with the "static" function combination of the other six out of 7,8,9,10,11,12 static even separation Static and even balance correction. Press this key and observe the display panel until the displayed figure matches the rotor actual loading form.

The details of the 12 correction methods are shown in the following figure.

(2) "static couple": static and even unbalance correction mode selection key.

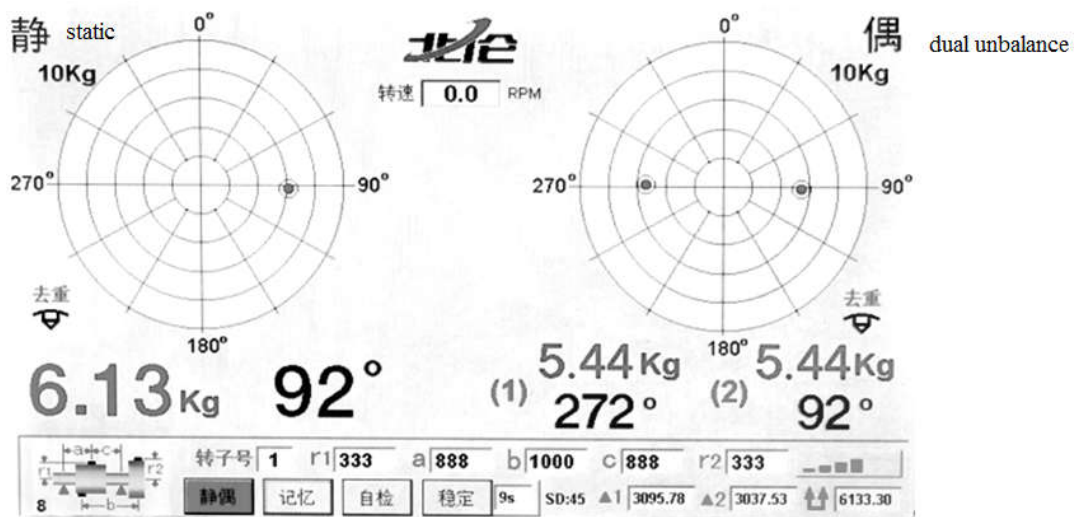
"Static" key press "static" indicator light, the electrical measurement system into the static imbalance and force couple imbalance correction.

"Static" key and then press the "static" indicator off, into the two plane separation dynamic balance.

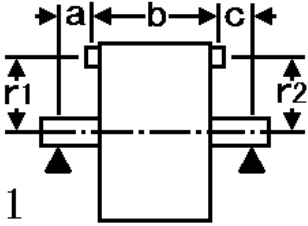
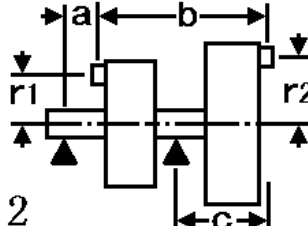
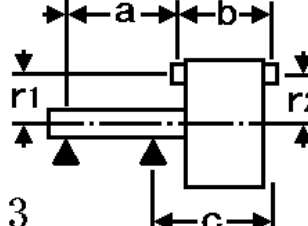
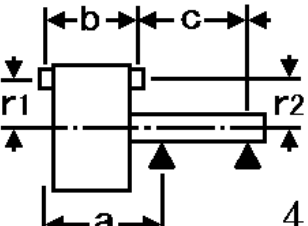
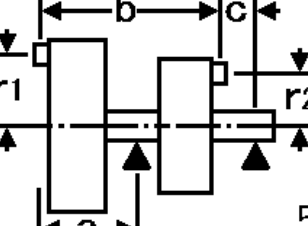
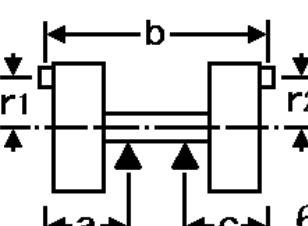
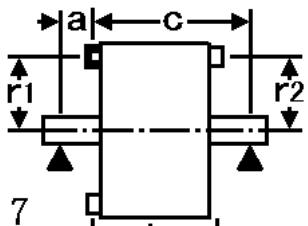
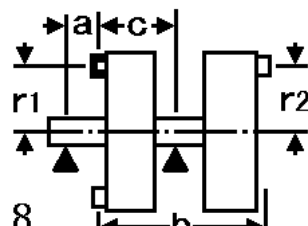
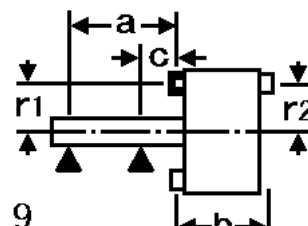
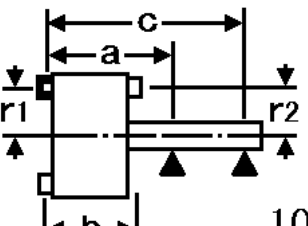
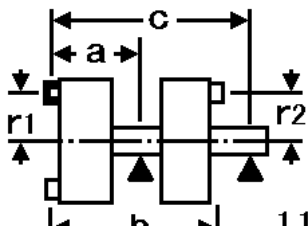
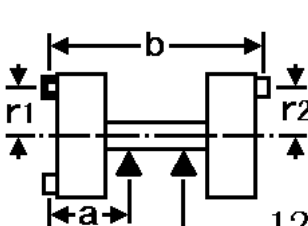
Any one of the dynamic imbalance, both sides of the decomposition method can be corrected, can also be used static and even decomposition method correction. For some special rotor dynamic balance correction, the use of static and even decomposition method is very convenient and reasonable.

The machine for the decomposition of the static and even, according to the map on the back of the map to set the abc parameters, ac, respectively, left and right to support the distance to the unbalanced correction, $a + c$ is equal to the

distance between the two bearings, b is even imbalance between the distance between the correction surface , R1 is the static unbalance correction radius, press the "static" even to make "static couple" light, the "state" selection key according to the actual imbalance between the correction surface and support the relationship between the selection (generally even imbalance correction in the bearing inside, this When the "state" selection key can be selected to "1"), the left table indicates the value of static imbalance, the right table indicates the value of even unbalance, then the corresponding static imbalance in the calibration surface, the radius On the right unbalance correction surface, correcting the even unbalance amount indicated by the right table on the determined radius; and correcting the right balance on the same correction radius on the left even unbalance correction plane Indicates the even imbalance amount..



MODE 12 kinds of correction methods (support state) and a, b, c, r1, r2 settings Legend:

 <p>1 动平衡支承方式1</p>	 <p>2 动平衡支承方式2</p>	 <p>3 动平衡支承方式3</p>
 <p>4 动平衡支承方式4</p>	 <p>5 动平衡支承方式5</p>	 <p>6 动平衡支承方式6</p>
 <p>7 静偶平衡支承方式7</p>	 <p>8 静偶平衡支承方式8</p>	 <p>9 静偶平衡支承方式9</p>
 <p>10 静偶平衡支承方式10</p>	 <p>11 静偶平衡支承方式11</p>	 <p>12 静偶平衡支承方式12</p>

(3) a, b, c separation set number.

"A" (1) Correction surface to ① bearing surface distance or static imbalance correction to ① bearing surface distance of the set number.

"B" (1) The distance from the calibration plane to (2) the correction surface or the distance between the pair of

unbalance correction surfaces. note! Do not set the 0000 position.

"C" ② the distance from the correction surface to ② bearing surface or even unbalanced correction surface to the ② bearing surface distance of the set number.

(4) r1, r2 are the left and right (① ②) correction surface correction radius of the set number (unit: mm). Note: r1, r2 not allowed to set 0000 position.

When the value of r1, r2, a, b, and c is set by the keyboard, press any of r1, r2, a, b, and c to change the character to red. Press numeric key to input the value and delay it for several seconds. . The characters change to black. Power failure or shutdown will not lose data.

A, b, c, r1, r2 units are mm.

(5) "+ / -" respectively for the left and right (① ②) correction surface of the increase, to re-select key.

"Aggravated" means that the correction plane is light and must be corrected by adding weight (welding, riveting, bonding, etc.).

"De-emphasis" means that the correction plane is heavy and must be corrected by de-weighting (drilling, grinding, milling, etc.).

(6) 1,2, ... 9,0,.. Digital input keys.

Input a, b, c, r1, r2 and read, save the rotor data and other necessary digital input operation supporting the use.

(7) "Save": Save the rotor data; (Set the auto memory speed, stabilization time setting, a, b, c, r1, r2)

"Extract": Reads the stored rotor data.

Save the rotor data via the keyboard as a rotor number 1 ---- 99. Press the "extract" button, the rotor number window into a red font, you can enter the rotor number to be saved, the input is completed, and then press the Save button to save. The rotor number window changes to a black font. The rotor data of the rotor number 1 ---- 99 is read via the keyboard. Press the "extract" button, the rotor number window into a red font, you can enter the rotor number to read, enter the end, then read the key to read.

(8)AVR Stable function selection key "AVR".

Press the "AVR" button "AVR" to display the green background, indicating that the stable function works. Steady Time Displays the red font in the "AVR" indicator position. (The settling time can be changed with the numeric keys. The allowable range is 3-75 seconds, the recommended setting is 10 to 20 seconds. Too large will affect the normal display speed of the measured data.

Press the "AVR" button again to display "AVR", which means the stable function does not work.

When the accuracy of the machine calibration imbalance is very high, press this key, the display part indicates slow and the digital fluctuation quantity decreases to facilitate the reading.

Note: This key is pressed, the stabilization time after the time to work, the general measurement of the situation without this function.

(9) "memory", memory function keys. The "Memory" icon changes to a green background and represents the memory status.

There is a separate memory button on the right side of the panel, which has the same function as the memory function button on the panel.

Normal use of balancing machine testing, you can wait for a stable reading after the press this key, unbalanced data in the display digital form on the memory, the measurement stops working. And then shut down for imbalance correction. When the test box is equipped with a specific host computer, it can automatically memorize and drive the control system to stop at the set speed.

Set the speed of automatic memory:

When the rotor work to the normal measurement speed, click the "storage" button, the electrical box can automatically remember the measurement data at this speed. Data automatically after the memory. When the power is turned on again, the electric box starts the automatic memory function at this speed (the tachometer background color turns green), and does not affect any other operation. As long as you do not change the balance measurement speed, when the balancing machine is turned on again, the electrical box will open the automatic memory function, without having to manually operate the "memory" button.

Whether it is manual memory or automatic memory, the measured imbalance data can be re-entered into the rotor of the a, b, c, r1, r2 increase the de-weighting and other parameters to re-enter the parameters calculated and displayed.

MEM Namely: memory state, allowing the first measurement - memory, after setting the support parameters.

(10)RES "reset": the computer software part of the restart button, the normal operation generally do not.

(11)TEST "self-test" button

In order to facilitate the parking alone when the electrical test box is normal, you can press this button, then cut off the external measurement of electrical measuring signal and reference signal, in turn from the electrical measuring box to generate a signal into the reference and measurement channels, from the figures The table shows a pair of unbalances. The self-test signal of each balancing machine is the definite value, see the parameter table in section 3.7.

Self-test signal only for checking whether the normal use of electric box, not this assessment of electrical box accuracy.

(12)REC "record" button.

If the user needs to record the test results in writing, press the Record button to record the measurement data to the SD card (or tf card) for permanent recording or printing of the test report. The number next to the SD display icon is the number of the file stored in the SD card each time you press the Save key. SD card and tf card can only insert one.

The right picture shows the print test report pattern.

文件号(FILE No.): 45

动平衡测试报告
DYNAMIC BALANCE TEST REPORT

测试结果 (RESULT) :
左残余量 U1: +0.100g 左角度 PH1: 213
右残余量 U2: +0.350g 右角度 PH2: 35

测试条件 (CONDITION) :
平衡转速 (SPEED (RPM)) : 1147
支承方式 (MODE): 1
转子参数 (ROTTER): a=50 b=80 c=60 r1=70 r2=70

操作者签字 (OPERATER) :

测试单位 (章) (DEPARTMENT) :

日期 (DATE) :

(13) Display section - tachometer. A numerical table in the upper part of the display indicates the working speed of the workpiece on the balancing machine in revolutions per minute.

Tachometer with normal, stable instructions under the premise of the circuit began to work normal measurement. Self-test when the tachometer is 600rpm.

(14) shows the lower right part of the output level meter has nothing to do with the balance process.

(15) Unbalance display table

The left side of the two digital tables and the corresponding red coordinates of the polar display ① plane unbalanced amount and its phase.

The two numbers on the right and the corresponding red coordinates of the polar display ② plane unbalance and its phase.

(16) the lower right of the LCD screen has three auxiliary instructions digital table, respectively, as follows:

"▲1" Represents the amount of unbalance of the left bearing, but also the output of the left sensor indication.

"▲2" Represents the amount of unbalanced right support point, but also the output of the right sensor instructions.

"▲▲" Indicates the amount of static unbalance of the rotor.

(17) Calculate the allowable residual imbalance

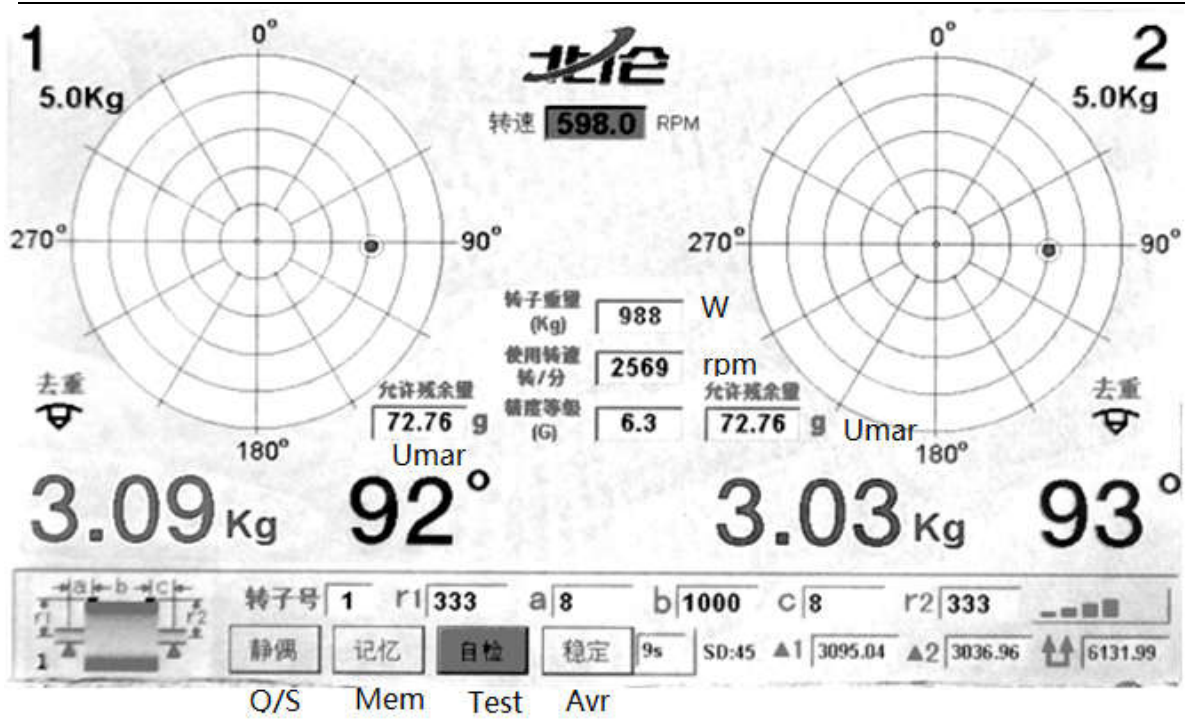
Press the "Rotor weight" key to enter the weight of the balanced rotor in kg.

Press the "Use speed" key to input the rotation speed of the balanced rotor under actual working conditions, in revolutions per minute.

Press the "Accuracy" button to select the accuracy level. Each time you press it, the four values of G 16, G 6.3, G 2.5, G 1 are displayed alternately. General fan, pump selection G6.3 level.

When the above data input, the polar coordinates will have a good calculation to allow the residual amount of data corresponding to the red circle graphics. When the red dot representing the imbalance is entered into the red circle, it indicates that the balance result has reached the technical requirement.

After the above three data input, if no other operation within 8 seconds, the input window will automatically disappear, leaving only the polar coordinates of the accuracy of the red circle graph.



(18) keyboard

definition Brief:

MODE Status: Select the bearing status corresponding

to the actual rotor.

Q/S Static: Select static or dynamic balance.

R1, r2, a, b, c: Support parameter setting key.

+/-: Increases de-emphasis selection.

0 to 9: Numeric key.

Save: Save the current rotor data.

READ : Reads the saved rotor data.

AVR Stability: Steady reading.

MEM Memory: memory readings, convenient parking weight.

RES Reset: Software reset or hardware reset.

TEST Self-test: electrical test box internal detection.

REC Record: Record measurement results to the SD card (or tf card).

WEIT Rotor weight: used to calculate the rotor accuracy.

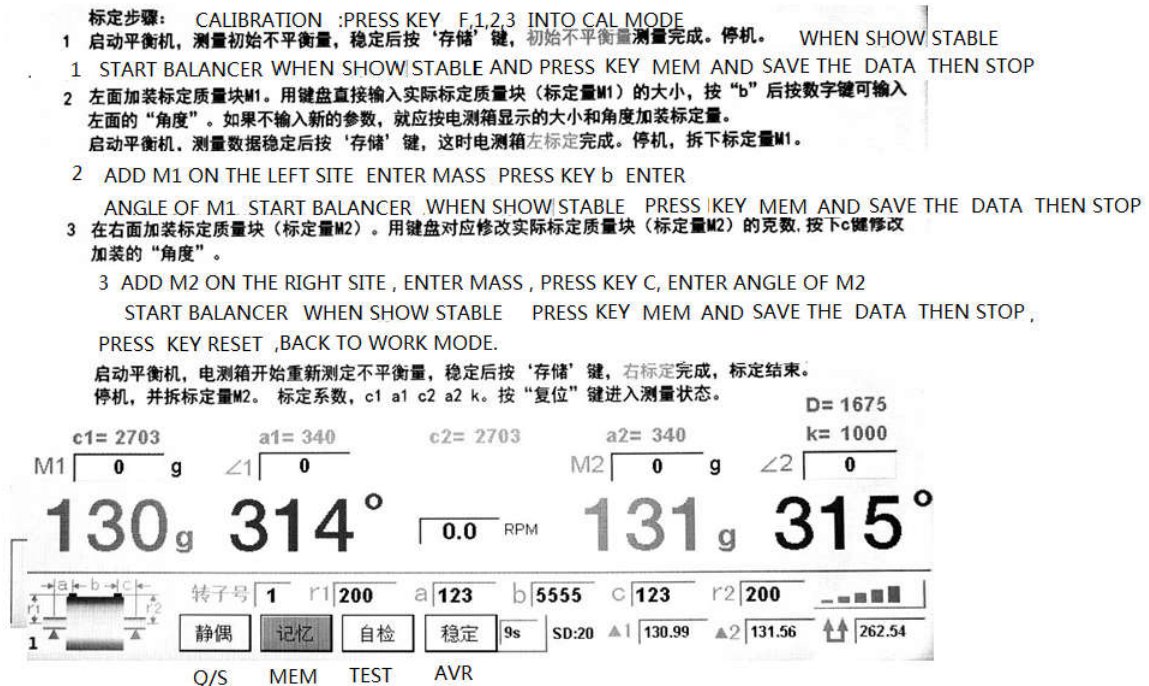
RPM Use the speed: to calculate the rotor accuracy.

G Accuracy class: Select the ISO1940 specified accuracy level. Such as: G 6.3 and so on.

5.2 Operation The function and description of the rear panel (omitted)

- (1) electric measuring box power switch.
- (2) FU1: 50Hz, 220V AC power fuse wire, the core 0.75A.
- (3) 50Hz, 220V AC power into the line socket.
- (4) reference signal input socket (with the rotor rotation strictly the same frequency reference signal)
- (5) automatic parking memory function selector switch).
- (6) "①" "②" surface sensor socket.

6. Calibration of electrical measuring box



The electrical measuring box with calibration function. In the specific case, the operator can calibrate according to the contents of this chapter.

This electrical measuring box has been permanently calibrated when the whole machine is debugged and delivered to users. Consult the manufacturer if the user deems it necessary to use this function to calibrate the balancer.

Press "F", "1", "2" and "3" to enter the calibration status before starting the main unit.

Before the calibration of the rotor does not require a particularly high balance accuracy, but in the case of conditions, the calibration is best carried out before a rough balance weight. This makes it easier to maintain calibration accuracy.

Before calibration, you need to prepare the appropriate calibration mass in advance with reference to the rotor size and the host specification. Calibration quality block is too small, will affect the calibration accuracy, too big will produce unsafe

factors.

It is preferable that the weight of the calibration mass be greater than the residual unbalance of the rotor so that sufficient calibration accuracy can be ensured.

By default, it is necessary to add a calibration mass of 100 g at 0 °. If you do not calibrate with a 100g calibration block, you need to manually enter the weight of the calibration mass and the angle of the installation during the calibration process.

6. 1. 1 Enter the calibration state, set the rotor parameters as required:

The calibration rotor is defined as:

MODE Support state: 1

According to the actual state of the rotor input a, b, c, r1, r2

Increase the way

Double-sided dynamic balance

The permissible weight of the calibration mass is: 1g to 9900g

6. 1. 2 Calibration method: Before starting the main unit, press "F", "1", "2" and "3" to enter the calibration interface,

The first box icon appears, the electrical measuring box into the calibration state.

6. 1. 3 Start the balancing machine. The electrical measuring box starts to measure the initial unbalance of the rotor. Press the 'Mem ' key after the data is stable and press the 'Store' key. Then shut down.

The second box icon appears

6. 1. 4 At this time, the size of the calibration volume (M1) to be installed on the left side of the test box is shown in red font and angle (initial setting is 100g-0 degrees).

On the left side, add the calibration mass (calibration quantity M1). Use the keyboard to directly input the size of the actual calibration mass (calibration quantity M1). Press "b" and then "Angle" to change to red font. Press the numeric keys to enter the "angle" of the left side. If you do not enter a new parameter, you should install the calibrator in the size and angle shown in the box.

6. 1. 5 Start the balancing machine. The electric measuring box starts to re-measure the unbalance. Press the 'memory' key after the data is stable and press the 'storage' key.

The third box icon appears

Stop, and remove the left side of the installation of the calibration volume M1.

6. 1. 6 At this time, the right side of the box needs to be installed with the calibration quantity (M2) in red font and angle (the initial setting is 100g-0 degrees).

On the right side, a calibration mass (standard quantity M2) is added. Use the keypad to change the actual calibration mass (the amount of calibration M2), press c "angle" into a red font, modify the installation of the "angle."

6. 1. 7 Start the balancing machine. The electric measuring box starts to re-measure the unbalance. After the data is stable, press the 'memory' key and then press the 'store' key.

Stop, and remove the left side of the installation of the standard amount of M2.

Press the 'Reset' key to exit the calibration state and enter the measurement state.

6. 1. 8 The balancing machine can perform the normal measurement with the parameters of this calibration. That is,

starting the balancer now allows the residual unbalance of the rotor to be measured on the basis of this calibration.

Customers can make a calibration of the rotor, the left and right phase to do two zero phase 100g amount of work stations, so the calibration process will not have to enter the calibration parameters, to speed up the calibration speed.

6. 1. 9 In the stop state: Press "F", "7", "8" and "9" to return to the original factory calibration data.

7. Brief introduction of electric measuring system

7. Introduction to the principle of electrical measuring system

Power supply: the 220V AC power supply transformer into $\pm 15V$, 5V DC for the measurement system.

CPU board: the input of the reference signal phase-locked frequency, providing tracking pulse and tachometer signals, and produce self-test signal.

Pre-filter section: the ① and ② sensor input ② ② bearing surface signal pre-filter, while the measurement or self-test switch.

The main filter part: the pre-filter, after processing ① or ② correction surface radius correction signal, into the computer part to achieve high-speed sampling, correlation filtering, a, b, c, r1, r2 operation, and bandwidth switching , Memory and other functions.

Two sensors to adjust all the matching of the computer software.

7.2 Digital table:

The left side of the two digital tables and the corresponding red coordinates of the polar display ① plane

unbalanced amount and its phase.

The two numbers on the right and the corresponding red coordinates of the polar display ② plane unbalance and its phase.

The intermediate digital table measures the speed of rotation of the rotor, in revolutions per minute.

8. Maintenance and maintenance

Balancing the maintenance and maintenance of electromechanical measuring system is to ensure that the work of the key balancing machine in good condition.

Electrical test box should be placed in a ventilated, dry, clean room. Near the strong electromagnetic interference should not be. Not often used when the electrical test box should be a week in the self-test state under the power 2 or 3 times, each 2 to 3 hours. When the electric measuring box is in use, it should be covered with dust cover and desiccant. Every 3 to 6 months, the chassis cover should be changed to replace the desiccant. Every 1 to 2 years should check the indicators according to the technical requirements of the electric box , And electrical and mechanical adjustment with the machine accuracy.

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