JH-P100 Automatic Polarimeter

Operation Instructions

Please read operating manual before installation and operation.

Drawell International Technology Limited
Chongqing Drawell Instrument Co., Ltd.
Shanghai Drawell Scientific Instrument Co.,Ltd.

Chongqing Center : Suite 2705,Building No.12,Shiyou Road No.1, Yuzhong District, Chongqing, China.
Shanghai Office : Suite 1117,Lane561 XiuChuan Rd.,PuDong New Area,Shanghai,China
Homepage : www.drawell.com.cn
Tel : 0086-023-63268643
Email : sales05@drawell.com.cn

Add : Suite 2705,Building No.12,Shiyou Road No.1, Yuzhong District, Chongqing, China.
Email: sales05@drawell.com.cn Tel: 86 23 63268643 Web : www.drawell.com.cn

Catalog

1. Purpose

2. Main Technical Parameters

3. Structure and Principle

4. How to Use

4.1 Working Methods

4.2 Optical Rotation Determination

4.3 Brix Determination

4.4 Specific Rotation Determination

4.5 Concentration Determination

5. Maintenance

6. Common Malfunctions and Troubleshooting Methods

7. Appended Drawings

I Purpose

Polarimeter, an instrument for optical rotation determination, is applied to analyze and determine substance concentration, content and purity by means of mensurating sample optical rotation. JH-100 automatic polarimeter adopts photoelectric detection self-poise principle. The result

of automatic measurement is displayed on the lattice LCD, not only keeping the advantages of JH-P10 and JH-P20 automatic polarimeters, such as excellent stabilization and reliability, small size, high sensitivity, free from personal equation, convenient indication, etc., but also adding four measurement operating modes on optical rotation, specific rotation, solution concentration and Brix, as a great convenience for customer use. Consequently, polarimeter is widely used in medicament, food, organic chemicals and other fields.

Agriculture: component analysis on agricultural antibiotics, agricultural hormones, microbial pesticides, starch content of agricultural products and so on.

Medicament: antibiotics, vitamins, glucose and other pharmaceutical analysis, pharmacological studies on Chinese herbal medicine.

Food: sugar, monosodium glutamate, soy sauce process control and finished product inspection, determination of sugar content in food.

Petroleum: analysis on mineral oil, surveillance on petroleum fermentation process.

Perfume: analysis on essential oil.

Healthcare Services: analysis on clinical diabetes.

II Main Technical Parameters

1. Measuring Range: -45 ~ +45
2. Accuracy: ±(0.01+ measurement value >0.05%)
3. Repeatability: ≤0.003 (standard deviation $\sigma = \sqrt{\frac{\sum_{i=1}^{n}(x_i-\bar{x})^2}{n-1}}$)
4. Display Mode: lattice LCD

   Minimum Reading: 0.001 Stability (5min): 0.0050
5. Optical Source: sodium-vapor lamp with 589.44nm wavelength
6. Cuvette: 200mm and 100mm
7. Power Supply: 220V±22V，50HZ±1HZ
8. Size: 600mm×310mm×220mm
9. Net Weight: 28kg
10. RS232 Interface: baud 9600.1 stop bit, 8-bit data bits

III Structure and Principle

Adopting 20W sodium-vapor lamp as optical source, the small diaphragm and objective lens form a simple pointolite collimator (Figure 1), and the collimated light is turned into plane-polarized light through polarizer (E) with 00 indication on plane of oscillation (Figure 2a). When the polarized light goes through the magnetic rotation coil with Faraday effect, its plane of oscillation generates 50Hz β -angle swinging back and forth (Figure 2b), and the light is projected into photomultiplier via polarizer (H) to

generate alternating electric signal.

The instrument regards the optical axis orthogonality of two polarizers, that is, 00 is perpendicular to PP, as optical null point, and at this point, α =00 (Figure 3). The β -angle swing generated via the magnetic rotation coil gets 100Hz photoelectric signal (Curve C) at optical null point or 50Hz photoelectric signal when in α 1^0 and α 2^0 samples, however, their phases are just the opposite (Curve B and D). As a result, the servo motor with 50Hz operating frequency can be rotated. The servo motor uses worm gear to rotate polarizers by α 0（α＝α 1 or α＝α 2), and the instrument is back to optical null point. Under the control of 100Hz signal, the servo motor reappears balance indication.

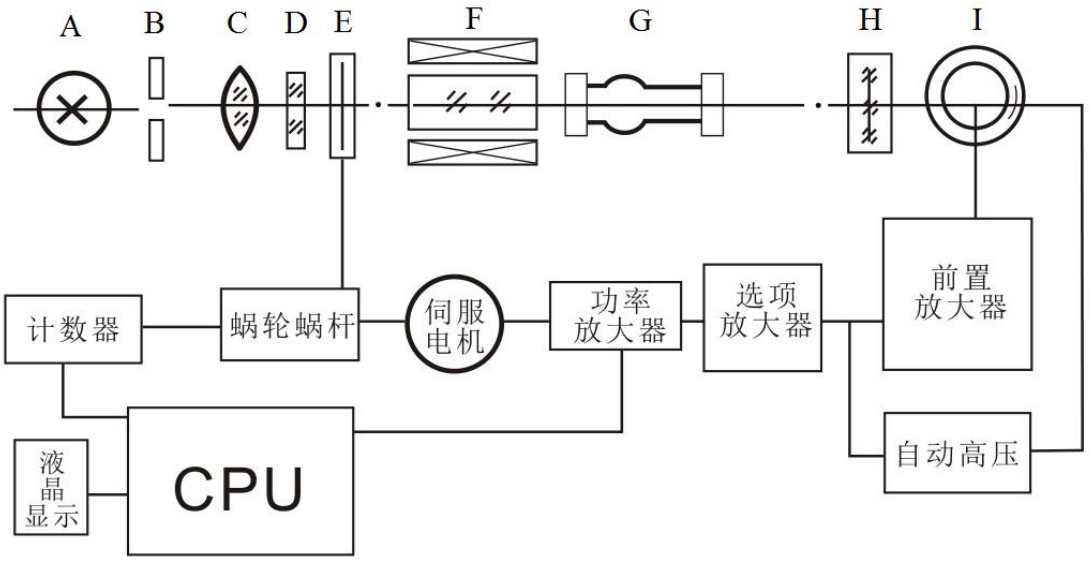


Figure 1

A: Optical Source

B: Small Diaphragm

C: Objective Lens

F: Magnetic Rotation Coil

G: Test Sample

H: Polarizer

D: Optical Filter I: Photomultiplier

E: Polarizer

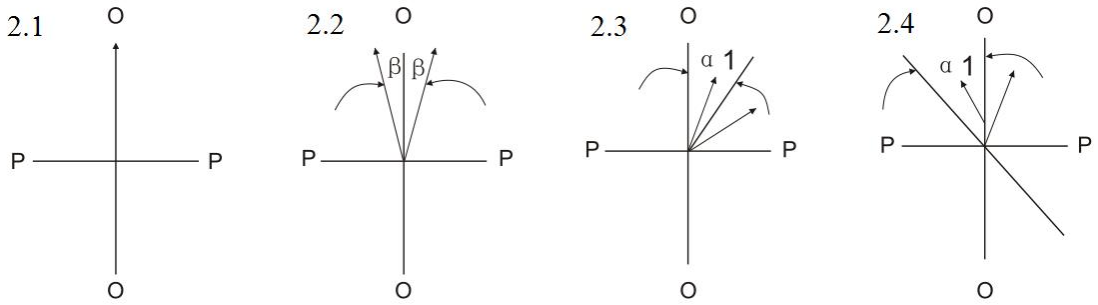


Figure 2

2.1: The polarized light generated from polarizer (E) oscillates on plane OO.

2.2: The polarized light dynamic plane via magnetic rotation coil rotates at an angle β.

2.3: The polarized light dynamic plane through the sample rotates at α 1^0.

2.4: After displaying numerical balance on the screen, polarizer (E) rotates at α 1^0 reversely to offset the optical rotation of sample.

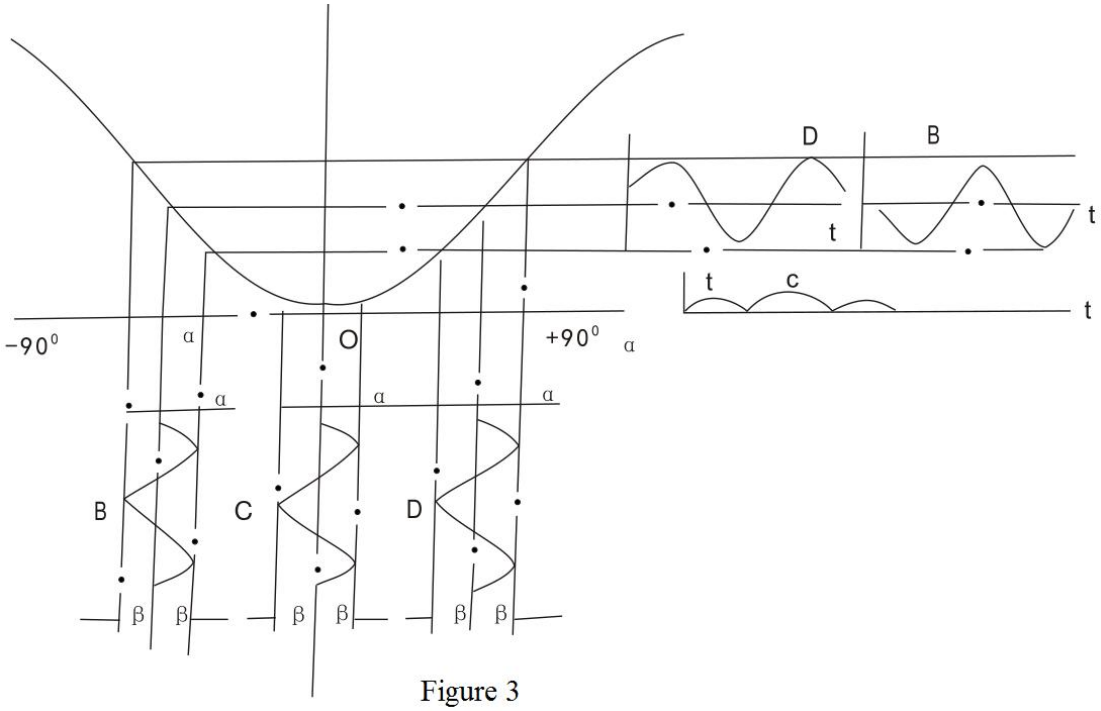


Figure 3

Curve A: luminous intensity is changed with optical rotation

Curve BCD: Faraday effect makes optical rotation change over time (β -angle swing)

Curve BCD: photoelectric current changes over time -- photoelectric signal

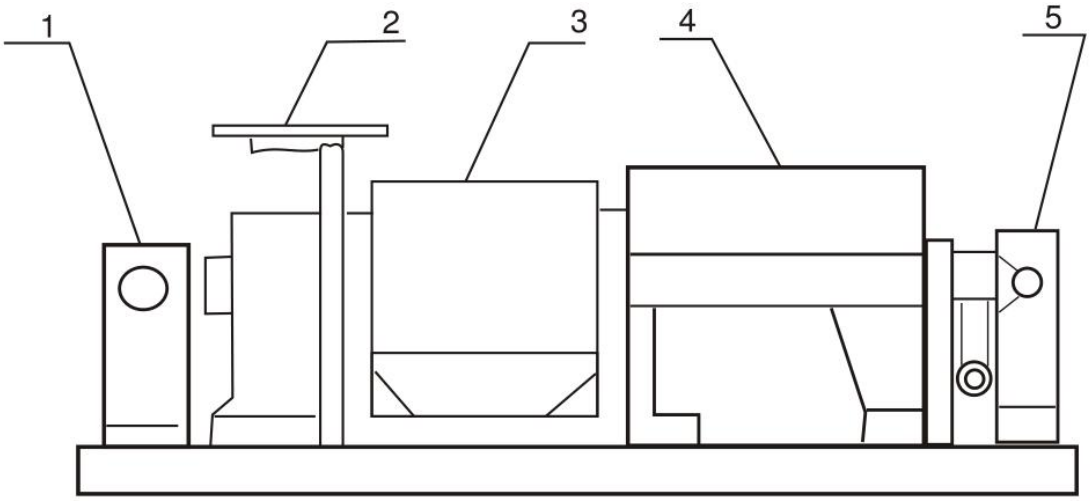


Figure 4

1: Optical Source

2: Counting Plate

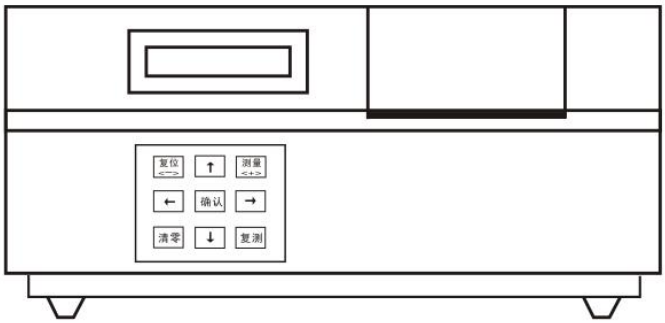
3: Magnetic Rotation Coil

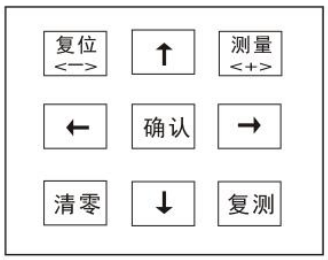
4: Sample Chamber

5: Photomultiplier

IV How to Use

4.1 Working Methods





1. Plug the instrument into 220V AC power (AC electronic voltage stabilizer is required) with reliable grounding.
2. Turn on the switch on the right to launch sodium-vapor lamp, and then the lumination is stable after 5min. The screen will display “Preheat for 5min”, and then “Turn on DC optical source and press the “Measure” button” will be displayed on the screen with a sound prompt.
3. Pull the optical switch on the right up to DC position. (If the sodium-vapor lamp goes out after pull-up, pull the optical switch up and down for one or two times so as to illumine it.)
4. Click the “Measure” （测量 <+>） button to enter “Options” as shown in

the figure.

5. Select the projects required to be measured and click the "Confirm" （确认） button, and then there will be two situations shown as following:

A. Choose optical rotation or Brix and click "Confirm" （确认） button to enter "Measure Menu" on the screen.

B. Choose specific rotation or concentration, and then the inputting data menu will be displayed on the screen as shown in Figure〈A〉and〈B〉.

★ Click〈↑〉and〈↓〉button to choose cuvette length or concentration (specific rotation) with indications.

★ Input cuvette length data and click〈←〉and〈→〉button to choose 1 or 2.

★ Input the data of concentration (specific rotation) and click 〈←〉 and 〈→〉 button to choose digits and click "Reset" （复位 <—>） and "Measure" （测量 <+>） button to add or subtract numbers. After selecting two lines of numbers, click "Confirm" （确认） button to enter "Measure Menu" on the screen as shown in the figure.

6. Enter "Measure Menu" to select retest times 1, 3 or 6. Press "Clear"

（清零）and "Confirm" （确认）button, and then put the sample inside to test. The concrete operations are as follows:

A. Choose retest number 1, and then press "Clear" （清零）and "Confirm" （确认）button, and then put the sample inside. When the instrument is stable, there will be a "beep" prompt, indicating the measurement result is recorded, and then take the sample out, and then the screen is back to "Measure Menu". Press 〈 ↑ 〉 to view the measurement result for once and press〈 ↓ 〉to return to "Measure Menu" on the screen for the next measurement selection.

B. Choose retest number 3, and then press "Clear" （清零）and "Confirm" （确认）button, and then put the sample inside. When the screen displays the first measurement value and then it will show retest 2 and retest 3 and stop at retest 3 position. After a sound prompt, it means three data values are recorded. Take the sample out and the screen is back to "Measure Menu". Press 〈 ↑ 〉 to display three measurement values and one mean value on the screen. Press 〈 ↓ 〉 to return to "Measure Menu" on the screen for the next measurement selection.

C. Choose retest number 6, and then press "Clear" （清零）and

"Confirm" （确认）button, and then put the sample inside. When the screen displays the first measurement value and then it will show retest 2, retest 3, retest 4, retest 5 and retest 6. After a sound prompt, it means six data values are recorded. Take the sample out and the screen is back to "Measure Menu". Press 〈↑〉 to display the first four measurement values. Press 〈↓〉 to display the latter two measurement values and the mean value and root-mean-square of six numbers (only optical rotation has root-mean-square and the other measurement values are test temperatures). Press 〈↓〉 again to return to "Measure Menu" on the screen for the next measurement selection.

D. In "Measure Menu", choose retest n and press "Confirm" （确认） button to record n data values. At this time, the sample must be put inside to read its value. In case of misoperation, press "Reset" （清零） button to back to "Options".

E. In "Measure Menu", press "Retest" （清零） button for manual retest.

7. If measuring the other projects, press "Reset" （清零） button in "Measure Menu" to back to "Options" on the screen to re-select projects to measure.

8. If the sample exceeds measurement range, the instrument oscillates within ±450 and then take cuvette out to return to null position. At this time, it can retest after diluting the sample.
9. After use, turn off optical source and power switch.
10. In case of saving data in PC, install the incidental software and connect the instrument and PC COM interface with RS232 cable to run the software.

Note: A. Specific rotation formula is [α]=100 α /LC

Where: α = optical rotation (degree)

C = weight of substance to be measured per 100ml solution (g)

L = solution length (dm)

Measure specific rotation according to method 4.4.

B. Figure out the purity of sample based on the measured specific rotation:

Purity = measured specific rotation / theoretical specific rotation

C. Rule to measure Brix:

According to international Brix standard, make 100ml solution with 26g pure sugar, and use 2dm cuvette to measure with sodium-vapor under 20℃, resulting in +34.626 optical rotation and 100Bx. The instrument can display Brix according to method 4.3.

D. Measurement temperature unit is℃ for temperature reference during measurement.

11. Five steps to measure the sample:

Step One: Enter “Options” menu.

Step Two: Enter “Measure” menu.

Step Three: Zero calibration solution.

Step Four: Measure and record the sample.

Step Five: Check measurement result.

Introduce determination methods respectively as follows:

4.2 Determine Optical Rotation

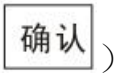
A. Determination method for solution zero calibration sample

Step One: Enter “Options” menu

Turn on power→standby for 5m→pull DC optical source switch up to DC position(refer to the third article in working methods)→press “Measure” （ 

）button→”Options” menu. As shown in the figure.

Step Two: Enter “Measure” menu

Choose optical rotation in “Options” menu, and press “Confirm” （ 

）button to enter “Measure” menu.

Step Three: Zero calibration solution

Choose retest time 1→press “Clear” （ 

）button→add zero calibration

solution→press "Clear" （清零）button since reading is stable→take out solution→enter "Measure" menu. (the measurement value maybe have a reading at this time)

Step Four: Measure and record the sample

Choose retest time(1 or 3 or 6)→press "Confirm" （确认）button→put the sample to be measured inside→after a sound prompt, it indicates that n-time measurement data has been recorded.

Step Five: Check measurement result

Take out the measured sample→click 〈↑〉 or 〈↓〉 button to check measurement result as shown in the figure.

B. Determination method for non-zero calibration solution sample

Step One: Enter "Options" menu as A.

Step Two: Enter "Measure" menu as A.

Step Three: Nothing to do.

Step Four: Measure and record the sample as A.

Step Five: Check measurement result as A.

4.3 Determine Brix

A. Determine the zero calibration solution sample

Step One: Same as "Determine Optical Rotation".

Step Two: Choose Brix and press "Confirm" （确认）button.

Step Three: Same as “Determine Optical Rotation”.

Step Four: Same as “Determine Optical Rotation”.

Step Five: Same as “Determine Optical Rotation”.

B.Determine the non-zero calibration solution sample

Step One: Same as A.

Step Two: Same as A.

Step Three: Nothing to do.

Step Four: Same as A.

Step Five: Same as A.

4.4 Determine Specific Rotation

A. Determine the zero calibration solution sample

Step One: Same as “Determine Optical Rotation”.

Step Two: Choose “Specific Rotation” in “Options” menu and press “Confirm” （确认） button → display “Input Data” menu, choose the length of cuvette (1 or 2), write in the concentration value in accordance with 5-B in “Working Methods”. After data confirmation, press “Confirm” （确认） button to enter “Measure” menu.

Step Three: Same as “Determine Optical Rotation”.

Step Four: Same as “Determine Optical Rotation”.

Step Five: Same as “Determine Optical Rotation”.

B.Determine the non-zero calibration solution sample

Step One: Same as A.

Step Two: Same as A.

Step Three: Nothing to do.

Step Four: Same as A.

Step Five: Same as A.

4.5 Determine Concentration

A. Determine the zero calibration solution sample

Step One: Same as “Determine Optical Rotation”.

Step Two: Choose “Concentration” in “Options” menu and press “Confirm” （确认） button → display “Input Data” menu, choose the length of cuvette (1 or 2), write in the specific rotation value, press “Confirm” （确认） button to enter “Measure” menu.

Step Three: Same as “Determine Optical Rotation”.

Step Four: Same as “Determine Optical Rotation”.

Step Five: Same as “Determine Optical Rotation”.

B.Determine the non-zero calibration solution sample

Step One: Same as A.

Step Two: Same as A.

Step Three: Nothing to do.

Step Four: Same as A.

Step Five: Same as A.

V Maintenance

1. The instrument ought to be stored in a ventilated and dry place free from humidity, and operate the instrument under 20℃ environment as far as possible. Move the instrument with care and avoid vibration.

2. If the optical source (sodium-vapor lamp) is accumulated with dust or broken, open the shell to wipe up or exchange.

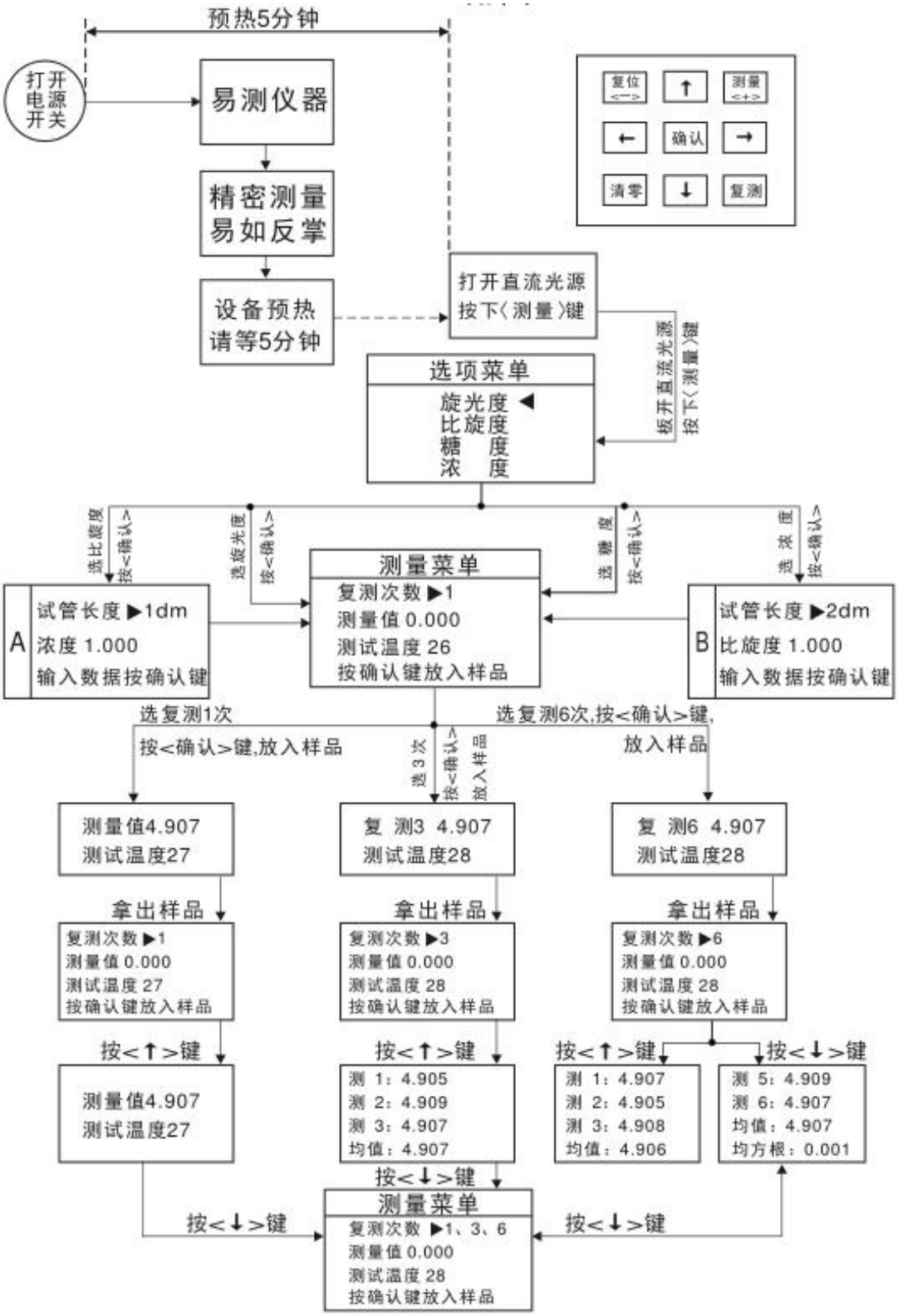
3. If the frictional resistance of mechanical part increases, open the panel and add some clock oil on the umbrella-shape gear worm.

4. In case of stalling or breakdown on other elements, invite professionals to check or inform our company to send maintenance personnel to repair.

VI Common Malfunctions and Troubleshooting Methods

Malfunction	Cause Analysis	Troubleshooting
Optical source (sodium-vapor lamp) darkening	Dust accumulation or breakdown	Open the shell to wipe up or exchange
Friction noise increasing	Frictional resistance of mechanical part increasing	Open the panel and add some clock oil on the umbrella-shape gear worm
Stalling	Elements breakdown	Inform our company to send maintenance personnel to repair
Sodium-vapor lamp is dead	The fuse is broken	Check the fuse

VII Appended Drawings



Drawell International Technology Limited

Chongqing Drawell Instrument CO,.Ltd

Add:Suite 2705,Building No.12,Shiyou Road No.1,Yuzhong District, Chongqing,China
Tel: 0086-023-63268643

Shanghai Drawell Scientific Instrument Co.,Ltd

Add : Suite 1117,Lane561 XiuChuan Rd.,PuDong New Area,Shanghai,China

Web : www.drawell.com.cn
Email : sales05@drawell.com.cn