

**WLP——205**

**Average Particle Size Testing Device**

**The specification for installation and usage**

**Yuxiang Magnetic Materials Ind. Co., Ltd**

**Overview:**

This apparatus is developed according to the theory of air permeance that could fast measure the average diameter of powder and grain. Its performance is very stable with simple structure, easy to operate and having good repeatability. Therefore it is used widely in magnetic materials, electronic metallurgy, hard alloy, tungsten molybdenum materials, gunpowder, ceramic, leechdom, foodstuff, cement, spaceflight, national defence and other industries..

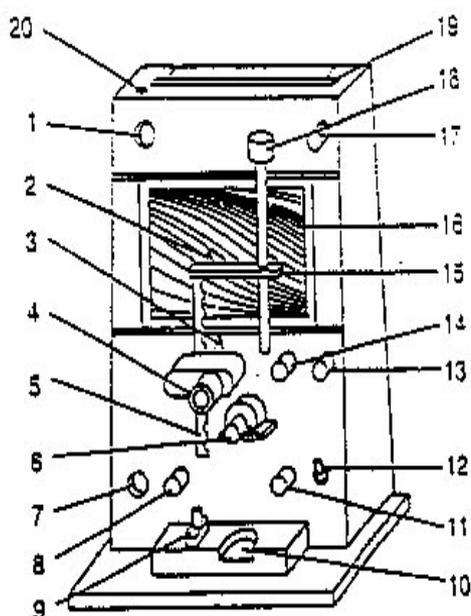
**Main technical index**

1. Measuring range:
  - Option 1: 0.20-20 $\mu$ m (micron)
  - Option 2: 20-100 $\mu$ m (micron)
2. Repeatability:  $\pm 3\%$
3. relative humidity: no more than 80%
4. Environment temperature:  $25 \pm 10^{\circ}\text{C}$
5. Power: 50W
6. power supply:  $220 \pm 22\text{V}$
7. Weight: 18Kg
8. Outlook size:  $735 \times 414 \times 244\text{mm}$

## WLP—205

### Average Particle Size Testing Device

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Sketch 2

Structure and function principle (Sketch 2)

- 1) Window for observing the water level: to observe the water level
- 2) Particle size finger: to indicate the particle size in the reading board.
- 3) Gap size finger: to indicate the gap size in the reading board
- 4) The knob for pressing material: counterclockwise rotate the knob, then the tooth-like bar (5) will be moved downwards, to press the material to the needed level
- 5) Tooth-like bar
- 6) The pressing and sealing knob: clockwise rotate the knob to seal the sample tube and standard tube.
- 7) The window for observing the air bubbles
- 8) Air pressure adjustment knob: rotate this knob to change the exhaust amount of the adjusting pressure valve, to make sure the pressure in the intake of the sample tube is 50 cm water column. When rotating the knob, it is better to observe that the velocity of air bubbles is two or three per second and make sure maintain this velocity in the whole testing course.
- 9) Pressing material pedestal
- 10) Measuring pedestal
- 11) U-shape pressure meter zeroing knob: rotate this knob to make sure the water level of the U-shape pressure meter maintain zero. Clockwise rotate the knob to rise the water level and counterclockwise rotate the knob to decline the water level.

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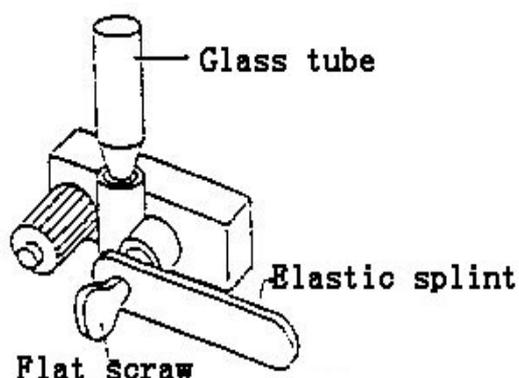
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- 12) Switch of power supply
- 13) High value probe valve: when the operator adjusts the device with the standard tube, he could adjust this valve (13) again and again to get the high value like the standard tube.
- 14) Low value probe valve: when the operator measures the powder whose size is 20-50um, turn the switch to the second option, the high value is adjusted at this time, then he could adjust this valve (14) again and again to get the low value like the standard tube.
- 15) Finger of pressure meter: when the top surface of this finger is tangent with the water level, the value which is indicated by the Particle size finger (2) in reading board (16) is the exact particle size.
- 16) The reading board: to indicate the particle size, the height of the sample and gap size
- 17) The transforming knob of measuring range: turn the knob right to measure the powder whose size is 0.2-20um, i.e. the first option. Turn the knob left to measure the powder whose size is 20-50um, i.e. the second option.
- 18) The glass tube for U-shape pressure meter
- 19) Back cover
- 20) Rubber plug

## 5. Installation introduction

### 5.1 Installation

- ① Unfolding the carton: Open up the upper cover of the carton, put forward the device, take out the glass tube and other breakables gently, avoiding breaking these accessories.
- ② Installation: Install the device vertically onto the stable table
- ③ Infuse the distilled water into the device
  - a. Draw the back cover (19) (sketch 2) upwards, take down the rubber plug (20) and infuse the distilled water into the manostat until getting the fixed level, then close the cover.
  - b. Take out the glass tube from the sidepiece of the device, loosen the segment screw (sketch 3), avert the elastic splint, connect the glass tube with the rubber tube, infuse the distilled water into the U-shape pressure meter, to make sure the water level of the glass tube in front of the reading board is tangent with the finger of the pressure meter, note that the particle size finger should point to the baseline of the reading board at this time, (sketch 4) check if the water level of the front and back glass tubes of the U-shape pressure meter is the same with each other. If not, try to eliminate the air bubbles. Then screw down the elastic splint and rotate the water level adjustment knob (11) to make sure the water level is tangent with the finger of the pressure meter (15). After all above have been done, the procedure of infusing is O.K.



Sketch 3

## 5.2 Adjustment

1) Adjustment the zero point of the U-shape pressure meter:

Before installation the sample tube and standard tube, rotate the pressure adjustment of water level knob (11) to make sure the water level in the glass tube is the tangent with the finger of the pressure meter (15), at this time, the particle size finger (2) should point to the baseline of the reading board.

2) Adjusting the air pressure: Turn on the switch of the power supply (12) to make sure the pump operates for 15 minutes stably.

Put the empty sample tube on the measuring pedestal (10), clockwise rotate the knob (6) and press the tube on the measuring pedestal (10) tightly, at this time, the water level of U-shape pressure meter rises until get the red point of the front glass tube (18). If the water level is lower than the red point, pump some water from the manostat until getting fitted point.

Note: Don't adjust the water level trough rotating the U-shape pressure meter zeroing knob. The red point in the manostat only could be used to indicate the capacity the water, the above adjustment should be done as the only method.



3) Adjusting the high value probe valve (13)

a. Turn the transforming knob of measuring range left, i.e. the first option 0.2-20um, move the reading board (16) to make sure the gap size finger point to 0.75.

b. Put the standard tube on the measuring pedestal (10), then clockwise rotate the pressing and sealing knob (6), at this time, the water level of the pressure meter rises gradually, when the water level stops rising (about 2 minutes), rotate the pressing material knob to make sure the finger of the pressure meter is tangent with water level, at this time, the finger (2) points to the particle size

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value which is the high value of the standard tube, if not, adjust the high value probe valve (13) until getting fitted point. During this process, the velocity of the air bubbles should be 2 or 3 per second.

4) Adjusting the low value probe valve to transform the measuring range to the second option i.e.20-50um, the gap size finger should point to the 0.75 in the reading board, at this time, the water level of the pressure meter will decline. When it is still, rotate the pressing material knob (4) to make sure the finger of the pressure meter (15) points to the horizontal line. At this time, the particle size finger should point to the value which is the same as the low value of the standard tube. If not, rotate the low value probe valve until fitted point.

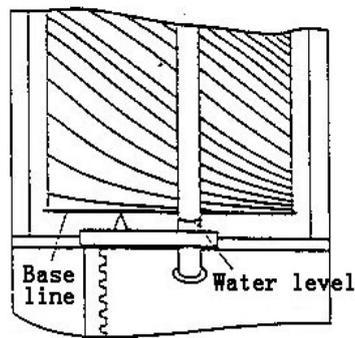
Note:

- a. Firstly adjust the high value probe valve, then adjust the low value probe valve. (adjust iteratively)
- b. when the probe valves is adjusted well, do not rotate them again.

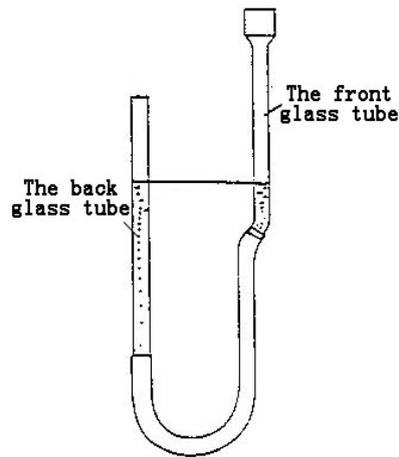
### 5.3 Measuring the particle size

After adjustment as above, measure the particle size as below items:

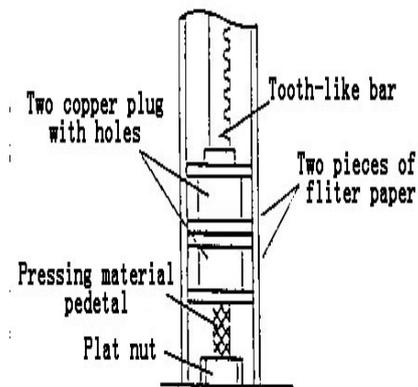
- a) After drying the powder, measure the weight by 1% electronic balance, for example, if the density of the powder is 6.12g/cm<sup>3</sup>, you should measure the 6.12g powder. If the powder is dry, no need to dry.
  - b) Put a piece of filter paper and a copper plug with some holes into the bottom of the sample tube, then insert the tube on the rubber pedestal. (sketch 7)
  - c) Put the powder into the sample tube and press a piece of filter paper and copper plug with some holes on the top.
  - d) Adjust the height of the pressing material pedestal, in general, it is adjusted well before leaving factory, but it should be checked regularly.
- a. Put the sample tube with two filter paper and two copper plugs on the pressing material pedestal (9).
  - b. Counterclockwise rotate the pressing material knob (4) to move the tooth-like bar downwards until the bar meeting the copper plug. (sketch 6)
  - c. At this time, the particle size finger points to the baseline of the reading board. If not, adjust the nut of the pressing material pedestal to move the screw up and down to make sure the finger (2) point to the baseline.



Sketch 4



Sketch 5



Sketch 6



Sketch 7

5.4 Then put the sample tube filled with powder on the pressing material pedestal (9), move the reading board to make sure the gap size finger (3) points to the value of gap size you need. Then counterclockwise rotate the pressing material knob (4) to move the tooth-like bar downwards until it contacts with the copper plug, unceasingly move downwards to make sure the particle size finger points to the sample height line of the reading board, then clockwise rotate the pressing material knob (4) to move the tooth-like bar (5) upwards and put the sample on the testing pedestal, in the end clockwise rotate the pressing and sealing knob (6) to press the sample tube tightly.

Above is the specification of the process of pressing material with the pressing material knob. You also could use the tweaking interval device supplied as accessory to adjust the process in order to make sure the pressure are all the same for each times and the results

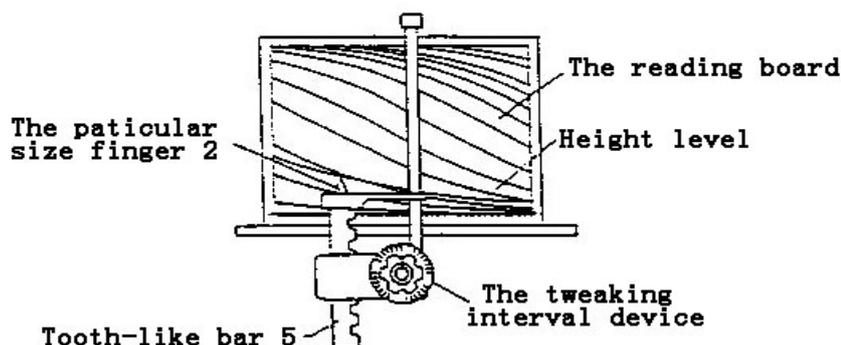
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are more accurate. The detailed process is following. Firstly demount the pressing material knob, then as per the YXQ-100 specification install the tweaking interval devise and put the sample tube filled with powder on the pressing material pedestal (9), counterclockwise rotate the tweaking interval devise to move the tooth-like bar (5) downwards until contact with the copper plug, unceasingly press it to get a fitted point. In the end move the reading board to make sure the particle size finger point to the height line of the sample.

At this time, the gap size finger point to the value which is the gap size of the powder, then keep the reading board still, clockwise rotate the tweaking interval devise to move the tooth-like bar (5) out and put the sample tube on the testing pedestal (10), then clockwise rotate the pressing and sealing knob (6) to press the sample tube tightly.

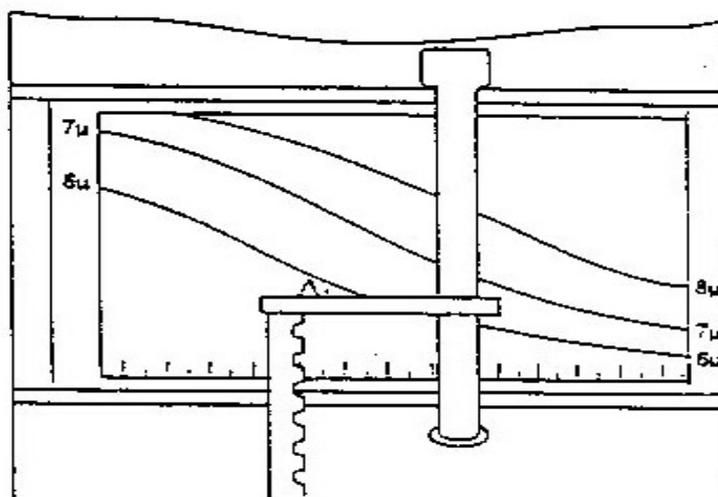


#### 5.5 Select the measuring range

If particle size of the powder is not bigger than 20um, turn the knob (17) to the first option, if the particle size of the powder is bigger than 20um, turn the knob (17) to the second option.

#### 5.6 Read of the particle size value

When the measuring range is fixed, the water level of the pressure meter rises or declines gradually, when it is still, rotate the knob (4) to make sure the finger of the pressure meter point to the water level, at this time, the value indicated in the reading board is the particle size of the powder. (Sketch 8, the particle size is 6um.)



Sketch 8

Note: When you select the second option, the actual value of the particle size is the twice as the value indicated in the reading board.

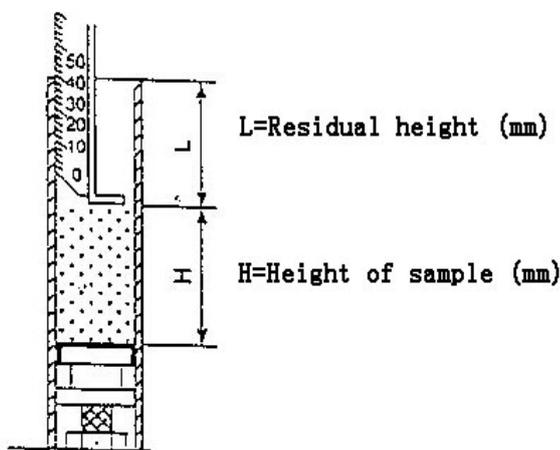
5.7 The definition of the gap size

What is the gap size?

Due to there is some gap among the powder, the actual volume of 1cm<sup>3</sup> powder is bigger than 1cm<sup>3</sup>. For example, if the actual volume is 1.25cm<sup>3</sup>, the solid rate is 1/1.25, thus the gap size is 1-0.80=0.20.

The initial estimate of gap size

To make sure the test progresses well, for the untested power, you should test it in the beginning with the highest gap size value. In order to find the highest gap size quickly you could measure the size L with the squared paper and find out the gap size from below list.

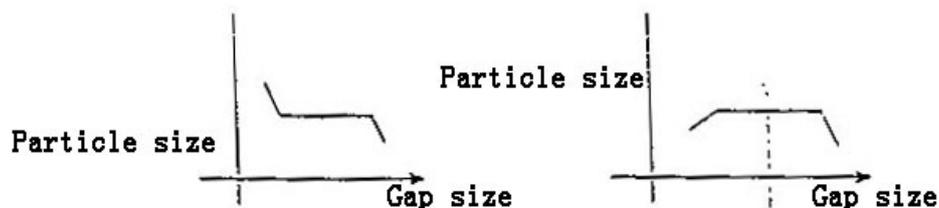


Sketch 9

L	61.8	69.8	74.8	78.8	81.8	83.8	85.3	86.8	87.8
H	39.5	31.5	26.5	22.5	19.5	17.5	16.0	14.5	13.5
Gap size	0.80	0.75	0.70	0.65	0.60	0.55	0.50	0.45	0.40

5.8 The optimal gap size for sphere powder and other symmetrical powder

When you measure the powder with some gap sizes, the optimal gap size is the value which indicated the same or similarly in several times, view the below sketch, you could select a value in the middle of the platform as the optimal gap size.



Regarding the powder with the other sharp, maybe there is no the platform, you could

measure the particle size with the fitted gap size. Because the repeatability of the device is very excellent, it also could be applied in all kinds of industrial production and researching.

The usage of the accessories:

The standard tube: It is the standard tool to adjust the device, please note the direction of the tube in the process of testing, avoiding being polluted and shaking drastic, otherwise the accuracy will be damaged. Adjust the device under the gap size being 0.75.

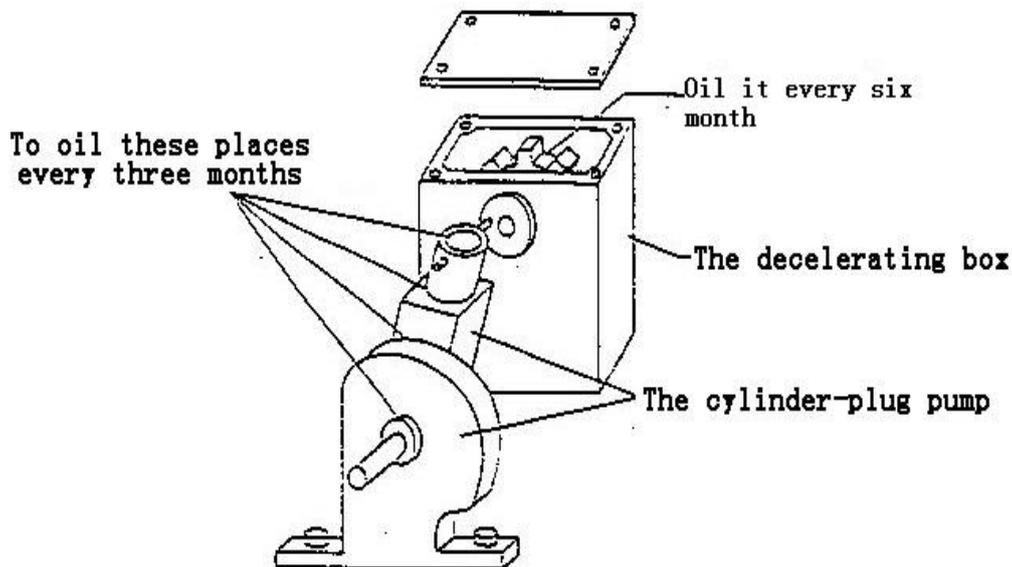
Sample tube: to be used to load the powder, the two ends could not be damaged.

Handspike: be a tool which is used to pull or push the copper plug with some holes.

Filter paper: thickness is 0.1mm, be used to put into the sample tube together with the copper plug.

#### 6. Maintenance

The pump of the device is composed of motor, decelerating box, cylinder-plug pump. The decelerating box, cylinder-plug pump and other mobile accessories should be greased regularly.



Sketch map of oiling

#### 7. Accessories

- 1) A standard tube
- 2) A sample tube
- 3) A pair of copper plugs with some holes
- 4) A rubber pedestal
- 5) A bag of filter paper
- 6) A funnel
- 7) A handspike
- 8) A brush
- 9) 100g drier
- 10) Two pieces of fuse (1A)
- 11) A indicator light