

Gluten Tester

MJ series

User Manual

Please read the manual before operating the instrument.

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MJ series Gluten Tester is a professional instrument for testing gluten content, gluten index and gluten water retention rate in the flour. The whole set includes: host machine, index apparatus, and dryer. It's suitable for accuracy testing of wheat flour and entire wheat flour. Widely used in food and flour processing department, grain and oil scientific research institution, grain storage department, universities, scientific institution etc.

I. Technical parameters

- a) Agitator rotation speed: $120 \pm 2r/\text{min}$
- b) Thin wash mesh size: $80\mu\text{m}$ (200mesh) metal sieve
- c) Thick wash mesh size: $800\mu\text{m}$ (26mesh) metal sieve
- d) Washing liquid flow capacity: $50\text{mL}/\text{min} \sim 56\text{mL}/\text{min}$
- e) Dough mixing time: $1\text{s} \sim 59\text{s}$ (digital, adjustable, adjust start from each second)
- f) Washing time: $1\text{s} \sim 59\text{s}$; $1\text{min} \sim 99\text{mins}$ (digital, adjustable)
- g) Centrifugation time: $1\text{s} \sim 59\text{s}$; $1\text{min} \sim 99\text{mins}$ (digital, adjustable)
- h) Centrifugation speed: $3000\text{ r}/\text{min}$, $6000\text{ r}/\text{min} \pm 5\text{r}/\text{min}$ (adjustable)
- i) Centrifugation mesh box: Aperture is $500\mu\text{m}$
- j) Centrifugation acceleration speed: $2000g$
- k) Repeatability:

Requirement: In the same lab, operate the same machine by the same person, with same test method. And meantime, the same sample should be mutual exclusive tested within a short time.

- 1) **Wet gluten content:** if the absolute difference value between two mutual exclusive testing is greater than the below given value (r), then the value should not exceed 5%.

-----wheat kernels: $r = 1.9g / 100g$;

-----wheat flour: $r = 1.0g / 100g$;

-----Durum wheat / durum wheat granule powder: $r = 1.6g / 100g$

- 2) **Gluten content:** in index $70 \sim 100$, the permitted error of two testing results should less than 11units in index, if under index 70 , then the error should less than 15.
- 3) **Dry gluten content, wet gluten moisture content, and the water absorption of gluten:** if the absolute difference value between two mutual exclusive testing is greater than $r = 0.6g / 100g$, then the value should not exceed 5%.

- l) Dryer temperature: $150^\circ\text{C} \sim 200^\circ\text{C}$
- m) Working voltage: $\text{AC}220\text{V} \pm 5\%$, 50Hz
- n) Working environment: temperature: $0^\circ\text{C} \sim 40^\circ\text{C}$ RH $<80\%$
- o) Shape size and weight: (L*W*H) / kg
 - 1) The machine: $400 * 300 * 240\text{ mm}$ 13kg
 - 2) Index Apparatus: $240 * 240 * 200\text{ mm}$ 4kg
 - 3) Dryer: $220 * 220 * 65\text{ mm}$ 1.5kg

II. Working principle

Add a certain amount of saline water into certain of wheat flour, granule flour, wholemeal flour, mix them in a washing cup with sieve mesh for 20s to get dough. Then through wash the dough with saline water to remove the substance which is soluble in water to get gluten. Under the impact of the centrifuge force, the wet gluten content and gluten index in wheat flour, granule flour and wholemeal flour is able to be calculated. Finally, after drying out the moisture of wet gluten, it gets the result value of dry gluten content and the water absorption by weighing.

III. Structure

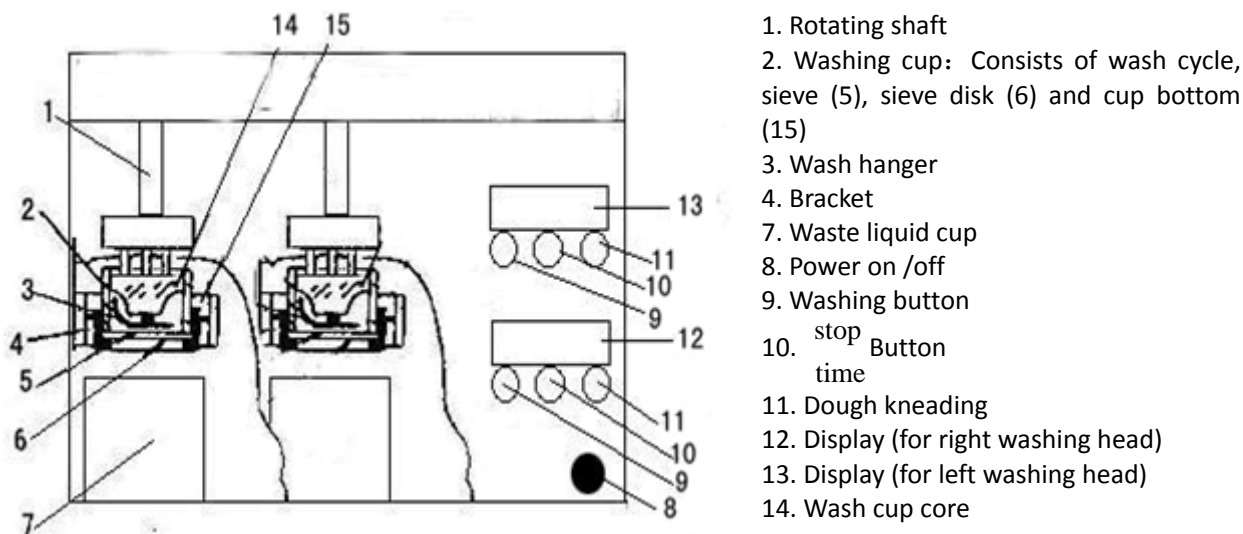


Figure 1 the host machine

IV. Operation

Note: due to the two washing head is made up of two fully independent but same control systems, so in this manual book, here only illustrates the operation of one washing head.

1 preparatory work before operating & instrument examination

- 1.1 Preparing 20g/l sodium chloride (NaCl) solution which its concentration is 10L, and pour it into a plastic bucket; connect the silicone tube (Φ 4) to liquid inlet behind the instrument, and put the other end tube into the sodium chloride solution. The temperature of sodium chloride solution for washing should be $22 \pm 2^\circ\text{C}$.
- 1.2 Turning on the power of instrument, the two displays screen shows default as: "5:20". "5" means washing time (0min~9min), "20" means dough kneading time (0s~59s); press "washing" button or "dough kneading" button to wash or dough knead. During the operation, press ^{stop}time button to stop. And keep press the same button for 3second to set time.
- 1.3 Assembling the washing cup: place respectively the thick and thin wash mesh between sieve plate and washing circle, then clockwise rotate the washing circle to fasten the meshes fasten and flatten.
- 1.4 Placing the washing cup on bracket, and put a 500ml beaker under it to collect waste liquid.

- 1.5 Through the hole of washing cup core, drop some clean water to lubricate the rotating shaft.
 - 1.6 Pressing “dough knead” and “washing” button, the bracket driving the washing cup and moving down, the washing hanger starts rotate and knead dough; the two screens display time. When time up (20s), the bracket moves up, pump runs and supplies water into the washing cup, then it begins wash the dough, when times up, the instrument stops work and washing finished.
 - 1.7 Examining the waste liquid cup, there should be 50mL/min~ 56mL/min washing liquid in it.
- stop
- 1.8 During the washing process, press time button, the instrument stops washing, screen stops timing; press the button again, instrument restart the washing and timing continue.
 - 1.9 Preparing sample: **1)** For wheat flour, after a sufficient mixing, measuring the sample’s moisture first is needed, and then goes to the gluten content test; **2)** for wheat or particle flour sample, grinding the sample to following requirement first, then goes to the gluten content test.

Sieve Mesh/ μm	sieving rate /%
710 (CQ)	100
500 (CQ)	95~100
210~200 (CQ)	≤ 80

2 Sample washing of wheat flour and particle flour

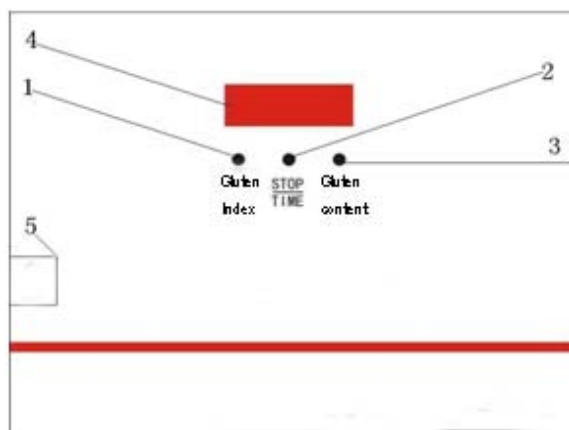
- 2.1 Putting the thin mesh into washing cup, fully wetting the sieve mesh to avoid flour lost, knocking the cup three times and using a dry cloth to remove extra moisture;
- 2.2 Weighing $10.00\text{g} \pm 0.01\text{g}$ sample and pour into washing cup, shake softly to flatten flour layer.
- 2.3 Getting 4.2 ml~5.2mL (4.8mL usually) sodium chloride (NaCl) buffer solution with a Graduated pipettes, and then injecting it slowly but uniformly into sample;
- 2.4 Placing the dry washing cup onto bracket, press “dough kneading” and “washing” button, the instrument starts working, it will stops after 20second dough kneading and 5minutes washing. Normally it will need 250ml~280ml sodium chloride (NaCl) washing liquid;
- 2.5 If errors happens, press stop button. After problem solves, press washing button to work again.
- 2.6 After washing finished, taking down the washing cup, get the wet gluten from cup with tweezers, please make sure there is no any wet gluten left;

3 Wholemeal wheat flour testing

- 3.1 As same as wheat flour and particle flour, dough kneading and washing first
- 3.2 When the screen display the washing time is 2min, press stop button and take the cup out and put it below faucet, sweep the gluten which includes bran carefully to the other wash cup which has an $800\mu\text{m}$ thick mesh; and then place this cup onto bracket, press stop button, the instrument restarts till washing finished.
- 3.3 According the test method of wheat and particle flour, calculate the testing result.

4 Index Apparatus

The Index Apparatus is special used for testing gluten content, and evaluating the pulling force of gluten. It consists of centrifuge, turntable, sieve case which lined with sieve plate and control machine etc.



1. Gluten index button (6000times)
2. stop Button time
3. Gluten content button (3000times)
4. Display screen
5. Power

Figure 2 Index Apparatus

- 4.1 Place the Index Apparatus on a smooth workbench
- 4.2 Turn on the power of instrument, the screen displays as "1:00". "1" means minutes (1min~ 9min), "00" means seconds (0s~ 59s).For testing the gluten quality, press "gluten index" button, the default time is 1min, press "stop time" button to stop instrument if needed; for testing gluten content, press "gluten content" button, the default time is 2mins. Keep pressing the same "stop time" button for 3sec to time setting.
- 4.3 Open the Index Apparatus cover, and place the 2 gluten samples which collected from washing process into 2 sieve case, close the cover and press "gluten index" button, the instrument starts centrifuge. (**Note:** during the centrifuge processing, do not open the cover). After 1min, instrument stops.
- 4.4 Take out the sieve case, collect the gluten which pass the case with a scraper blade; weigh it with a 0.01 balance. The result is marked as gluten quality as: m_2 (g); also collect gluten which do not pass case and weight those two gluten together, the results is marked as total weight as: m_1 (g)
- 4.5 After calculating, we get the wet gluten content and gluten index.

5 Drying

Switch on the dryer, after 10min preheating, open its cover, place the wet gluten on the dry plate and close the cover. Heating for $300s \pm 5s$; And then take out the dry gluten and weigh it immediately with a 0.01 balance, the result is marked as: m_3 (g). final calculate the gluten content and gluten water retention rate.

6 Results calculating.

6.1 Wet gluten content:

$$G_{wet} = m_1 \times 10\% \dots \dots \dots (1)$$

G: wet gluten content of the sample.

m_1 : Wet gluten quality of the sample, the unit is g.

If the repeatability meets the requirement of **Technical parameters- k)-1)**, then take the average value of the two results as final test result, keep one decimal place

6.2 Gluten Index:

$$\text{Gluten Index} = \frac{m_1 - m_2}{m_1} \times 100 \dots \dots \dots (2)$$

If the repeatability meets the requirement of Technical parameters- k)-2), then take the average value of two results as final test result. Otherwise it should be test the third time, and take the average value of the three tests as final result. Keep integer.

6.3 Dry gluten content:

$$G_{dry} = \frac{m_3}{m} \times 100\% \dots \dots \dots (3)$$

G: dry gluten content of sample.

M: the original wheat flour's quality, unit is (g)

The moisture content of original wheat flour sample can be measured by GB/T21305 Method. Considering this factor, the dry gluten content of wheat flour's dry basis should be calculated:

$$G_{dm} = \frac{100 \times m_3}{m \times (100 - w)} \times 100\% \dots \dots \dots (4)$$

G: dry gluten content of sample's dry basis

W: moisture content of original wheat flour.

Take the average value of two tests as final result.

6.4 Moisture content of wet gluten:

$$W_G = \frac{m_1 - m_3}{m_1} \times 100\% \dots \dots \dots (5)$$

6.5 Gluten water retention rate:

$$W_A = \frac{m_1 - m_3}{m_3} \times 100\% \dots \dots \dots (6)$$

7 The operation testing finished

7.1 Instead of sodium chloride (NaCl) solution, clean the water system with tap water,

7.2 Turn off the power.

V. Maintenances

- The instrument must be strictly grounded.
- Prevent sodium chloride solution from splashing down on the instrument, if it happens, clean in time.
- Clean the washing cup: water cleaning the sieve mesh with soft brush
- After centrifuge, water cleaning the turntable and the sieve case with soft brush
- After finishing the operation, using tap water to clean wash cup core and water supply system.
- Preparing the sodium chloride solution that very day.
- Wash time depends on flour machining precision and bran content.
- When replacing Fuse (3A): Pull out the small box under power socket, you can see two fuses, Take out one fuse (work) near inner machine, push-in the outer fuse inside (spare), and then close the box.
- Dryer: there are two pieces of high temperature film inside the dryer. Do not scratch it.

VI. Packing list

Name	Quantity
Main instrument	1
MJZ Gluten index apparatus	1
Dryer	1
Washing cup	4
Power line	2
Sieve mesh (800 μ m)	20
Sieve mesh (26 μ m)	4
Silicone tube (Φ 3.6mm)	2m
Plastic tube (Φ 4mm)	1m
Tweezers	1
Stainless steel scraper	1
socket head wrench	1
snap ring	2
synchronous belt	2
5ml Syringe	1
User Manual	1