Fruit Hardness Tester

Instruction Manual

FRUITS & VEGETABLES
MULTIPLE DISPLAY UNIT-KG, LB, N & Pa
EASY ZERO ADJUSTMENT.
ACCURACY VERIFICATION

Thank you for your selection of this Fruit Hardness Tester. To ensure that you get the most out of the instrument, we strongly recommend you read and follow the instructions in this manual carefully.

Accurate Fruit Testing Requires:
Controlling tip penetration.
Providing a means to verify gage accuracy.
Controlling the speed of tip penetration.

1. FEATURES

* The Ripeness Tester is a hand-held compact penetrometer for fruit firmness and some vegetable hardness testing, the universally accepted measure of ripeness.
* The FHT series is the growers' indispensable tool for knowing when to pick and ship.
* The FHT Fruit Tester measures the force required to push a plunger tip of specified size into the fruit pulp. The force reading assists in determining the appropriate picking time or monitoring fruit softening during storage.
* Because of the number of fruit and vegetable varieties, geographical locations and other variations, the appropriate firmness for harvesting will vary. Therefore FHT users must combine experience and expertise to establish the firmness value that applies to their specific variety and locale.
* Automatic power off to conserve power.
* Can communicate with PC for recording, printing and analyzing by the optional software and cable for RS232C interface.

2. A GUIDE TO SELECT THE MODEL

the model of FHT Fruit Testers to chose from 3 models is used with specific size penetrometer tips for testing ripeness of specific fruit.

FHT-801
(3.5mm) Small Fruits, Soft Fruits,

FHT-802
(3.5mm) Small & Large Fruits, Firm Fruits, Hard Fruits

FHT-803
(7.9mm) Larger Fruits, Firm Fruits ,Hard Fruits
(11.1mm) Apple, Firm Fruits

Small Fruits: e.g. Strawberry, Cherry, Grape , Berries

Soft Fruits: e.g. Peach, Banana, Apricot, Plum, Melon, Citrus, Persimmon

Firm Fruits: e.g. Pear, Nectarine, Kiwi

Hard Fruits: e.g. Avocado

3. SPECIFICATIONS

Display 4 digits, 10 mm LCD
Range:
☐ Model FHT-801
0.2-5.0 kgf/cm^2
Tip size 3.5mm
☐ Model FHT-802
0.5-15.0 kgf/cm^2
Tip size 3.5mm
☐ Model FHT-803
0.2-11.0 kgf/cm^2 Tip size 11.1mm
0.4-22.0 kgf/cm^2 Tip size 7.9mm
Tip size can be interchanged after tip size is chosen.
Resolution:
0.01 if reading<10
0.1 if 10<reading<99.9
1 if reading>100
Unit conversion:
kgf (kgf/cm^2)
lbf (lbf/cm^2)
N (N/cm^2)
Pa
Accuracy: $\pm (1\%H+0.1)$ kgf/cm^2
Power supply: 4x1.5 AAA size

Power off : 2 modes
    Manual off at any time
    Auto power off after 5 minutes from last key operation

Operating conditions:
    Temperature : 0-45℃
    Humidity : below 90% RH

Dimensions:
    204x62x33mm or
    8.0x2.4x1.3 inch

Weight:
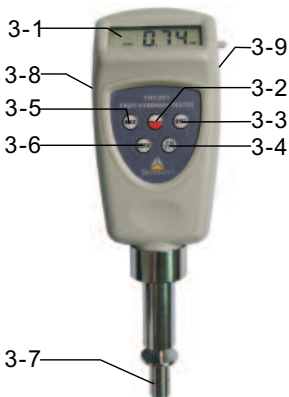   230g (not including batteries)

Standard accessories included :
  Carrying case ………………1 pc.
  Operation manual………….1 pc.

Optional accessory:
    Cable and software for RS232C and USB

4. FRONT PANEL DESCRIPTIONS

3-1 Display
3-2 Power key (Multifunctional)
3-3 Unit conversion
3-4 Tip selection (FHT-803 only)
3-5 Max hold key
3-6 Zero
3-7 Plunger tip
3-8 RS-232C interface
3-9 Battery compartment

Larger Fruits

A. Select an appropriate plunger tip for the commodity to be tested. See "**A GUIDE TO SELECT THE MODEL**".

B. Select a random sample of 10 to 15 fruits of uniform size and the same temperature or 3% of the lot to be sampled. For best results, suggest one person should test the lot.

C. Remove a disc of skin on opposite cheeks of the fruit midway between the stem and bottom on sun and shade sides. Then proceed with puncture test.

D. Zero adjustment
Hold the FHT vertically with the plunger tip hanging in the air, the reading on the display should be 0. If not, depress the 'ZERO' key to make the FHT tester display '0'.

E. Hold the fruit against a hard surface and force the tip vertically into the pulp at a uniform speed (take about 3 seconds).

F. The tip should consistently penetrate to the break in tip diameter or to the scribed line on some tips.

G. Record reading on the display.

H. If a maximum reading is needed, just press the key 'MAX' till the mark 'Max' shows on the display before taking measurements. The appearance of mark 'Max' is controlled by the key 'MAX'.

I. To take the next measurement, just depress the 'ZERO' key and repeat steps from E to G.

J. Unit conversion is controlled by depressing the key 'UNIT'.

K. For the model FHT-803, make sure the plunger tip is in accordance

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with the tip size on the display. If not, press the key '7.9/11.1' to choose.

Smaller Fruits

Similar to large fruit testing except:
A. Make a puncture test on only one cheek midway between the stem and the bottom.
B. Removal of the skin is unnecessary.
C. Penetration should be sufficient to obtain peak reading. Repetitive testing is a perfect testing technique for small fruits.

6. BATTERY REPLACEMENT

A. When the battery symbol appears on the display, it is time to replace the batteries.
B. Slide the Battery Cover away from the tester and remove the batteries.
C. Install batteries paying careful attention to polarity.

7. MAINTENANCE

A. Before daily use, exercise the plunger in and out for 10 seconds to ensure the mechanism functions freely.
B. After daily use, clean the penetrometer tips. Carefully hold the tester with the load shaft pointing down under a slowly flowing water faucet for a few seconds, dry with a towel and allow to dry further by standing it with shaft pointing down.
C. The FHT tester should never be lubricated with oil since this will accumulate dust causing increased friction and decreased accuracy.

⚠ WARNING
PART 8 AND 9 ARE ONLY FOR SKILLED AND PROFESSIONAL PERSONNEL ONLY.
Users are not suggested to try to carry out the operations in part 8 and part 9. Improper operation will lead to the FHT tester inaccurate, even could not work.

8.HOW TO SET THE TIME OF AUTO POWER OFF

The default setting for auto power off at the factory is 5 minutes. That means the tester will auto power off 5 minutes from the time of last key operation. Users can change it to any value between 0-9 minutes by following steps. Depress the POWER for about 4 seconds, release it after "OFF" shows on display, then press the key 'MAX' to preset the time as desired. To disable the function of auto power off, just preset the time to 0. the tester will only be shut down manually in such a case.To quit the time setting, just press the key ZERO.

9.ACCURACY VERIFICATION

Prior to use, the FHT tester accuracy should be verified by testing with weights.

FHT accuracy can be easily verified by the following formula.

$$P=N/S$$

Here P is FHT reading

N is the force applied to the plunger tip

S is the area on which the force is applied.

Based on the above formula, coefficients are given for different models below.

Model	Tip	Coefficient
FHT-801	3.5mm	k=10.399
FHT-802	3.5mm	k=10.399
FHT-803	7.9mm	k=2.041
	11.1mm	k=1.053

Apply a force N to the tip. When readings are almost unchanged, press the key 'MAX' to hold the reading P which should satisfy the equation below.

$$P = k \times N$$

e.g. if applying 0.4 kgf to FHT-801 or 802, the reading should be

$$0.4 \times 10.399 = 4.16$$

Max. deviation is

$$\pm(4.16*1\%+0.1) = \pm0.14$$

so correct reading should lie in 4.16±0.14

$$= 4.02\text{-}4.30\text{kgf}$$

But if applying 11.0 kgf to FHT-803 (7.9mm) the reading should be

$$11 \times 2.041 = 22.45$$

Max. deviation is

$$\pm(22.45*1\%+0.1) = \pm0.32$$

so correct reading should lie in 22.45±0.32

$$= 22.13\text{-}22.77\text{kgf}$$

If the deviation is beyond its accuracy, Depress Power key and not release it till 'CO' appears on the Display. It takes about 6 seconds from starting depressing Power key. Then adjust the reading P by the 'MAX' key (increase) or 'UNIT' key (decrease) to the desired value. store that value and quit by pressing Zero key.

10. COMMUNICATE WITH PC

A. Install the optional RS232C software to the PC.

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B. Connect the tester to the COM or USB port of the PC with the optional RS232 cables. To connect to a USB port, a USB adaptor is required.

C. Run the software on the desktop and select the COM port or USB port in the system settings.

D. Click the button of data collection, then click the button of Begin/Continue.

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