

**Elcometer 3030 • 3040 • 3034**

**Pendulum Hardness Tester**

**Operating Instructions**

elcometer®



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A copy of this Instruction Manual is available for download on our Website via [www.elcometer.com/downloads](http://www.elcometer.com/downloads)

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**T**hank you for purchasing this Elcometer Pendulum Hardness Tester. Welcome to Elcometer.

Elcometer are world leaders in the design, manufacture and supply of inspection equipment for coatings and concrete.

Our products cover all aspects of coating inspection, from development through application to post application inspection.

The Elcometer Pendulum Hardness Tester, is a world beating product. With the purchase of this product you now have access to the worldwide service and support network of Elcometer. For more information visit our website at [www.elcometer.com](http://www.elcometer.com)

## **1 ABOUT YOUR TESTER**

The Elcometer Pendulum Hardness Tester is a simple-to-use instrument for assessing the hardness of specimens such as coated panels.

Your hardness tester works on the principle that the damping time of a pendulum oscillating on a specimen indicates the hardness of the specimen. The amplitude of the oscillation reduces more quickly on soft specimens than on hard specimens.

The Elcometer Pendulum Hardness Tester can be supplied in one of three model types: Persoz, König, and Persoz and König combined.

The Persoz and König methods differ by the period and amplitude of the oscillation. The Persoz test measures the time taken for the amplitude of oscillation to decrease from 12° to 4°; the König from 6° to 3°. Hence the König will take approximately half the time to test the same sample as the Persoz.

### **1.1 Standards**

The Elcometer Pendulum Hardness Tester can be used in accordance with the following National and International Standards:

ISO 1522 which supersedes ASTM D4355; BS 3900-E5; DIN 53157; NBN T22-105; NF T30-016.

### **1.2 What the box contains**

- Elcometer Pendulum Hardness Tester
- Persoz pendulum (Persoz testers only)
- König pendulum (König testers only)

- Glass calibration plate
- Set of adjustment shims for sensor bracket (03 04 05 06 07 08 09 10 15 20 25 30 40 50 60 70 80 90 and 100)
- Mains lead
- Operating instructions

### **1.3 These instructions**

These instructions describe the operation of the following Elcometer Pendulum Hardness Testers:

- Elcometer 3030 Persoz Pendulum Hardness Tester
- Elcometer 3040 König Pendulum Hardness Tester
- Elcometer 3034 Persoz and König Pendulum Hardness Tester

**To maximise the benefits of your new Elcometer Pendulum Hardness Tester please take some time to read these Operating Instructions. Do not hesitate to contact Elcometer or your Elcometer supplier if you have any questions.**

## 2 GETTING STARTED

### 2.1 The parts of your tester

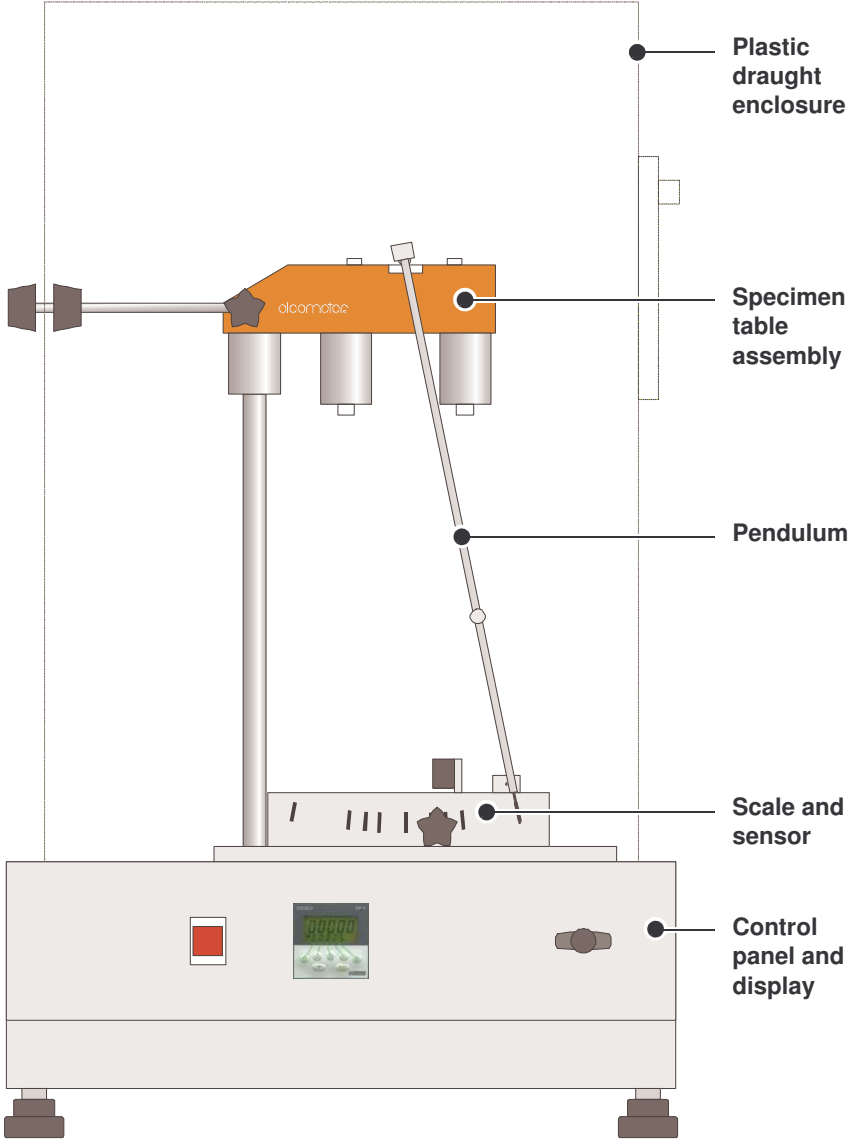


Figure 1. Parts of the tester (Persoz model shown)

## 2.2 Installation

1. Place the instrument on a sturdy table, isolated from vibrations and not in the vicinity of machinery which may cause vibrations.
2. Using the bubble level on the tester as a guide, rotate the adjustable feet to level the instrument.

## 2.3 Power input

The power input panel at the back of the tester is protected by two fuses - see "Technical specification" on page 16 for fuse rating.

## 2.4 Caution

The Elcometer Pendulum Hardness Tester has been manufactured with your safety in mind. However, improper use can result in damage to the tester.

Please observe the precautions discussed in these operating instructions.



To reduce the risk of electric shock do not open the housing of the tester. There are no user-serviceable parts inside.

To reduce the risk of fire or electric shock, do not expose the tester to rain or excess moisture.

The mains plug on your Elcometer Pendulum Hardness Tester may be fitted with a fuse. When replacing this fuse, ensure a fuse of the correct rating is used.

## 2.5 Control panel

Your Elcometer Pendulum Hardness Tester is very simple to operate. All the controls are located on the front panel of the tester (Figure 2).

**Note:** The control panel layout depends upon the model of pendulum hardness tester. Not all the controls shown in Figure 2 may be fitted to your instrument.

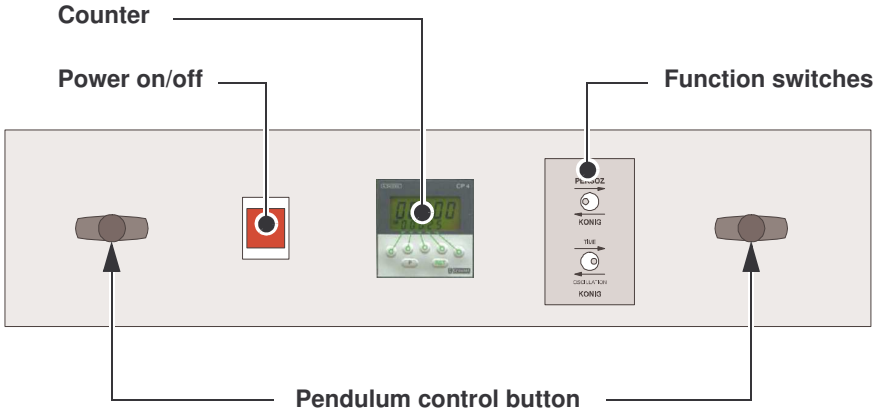


Figure 2. Control panel (Elcometer 3034 Persoz and König model shown)

### 2.5.1 Power on/off

To switch on the tester, press the power on/off button. The button will illuminate when the tester is switched on. The tester will emit a series of beeps to indicate that the instrument is operating correctly.

To switch off the tester, press the button again.

### 2.5.2 Oscillation counter

The oscillation counter counts the number of oscillations of the pendulum (Persoz/König) or time (König). Always reset the oscillation counter to zero before starting a test. To reset the counter, press the 'RST' button (Figure 3). The other buttons on the counter do not affect the operation of your tester and can be disregarded.

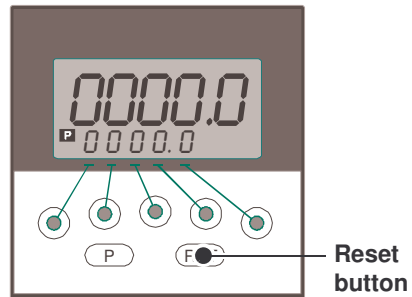


Figure 3. Oscillation counter



### 2.5.3 Pendulum control button

The pendulum control button extends or retracts the pendulum stop rod (Figure 4). The stop rod latches in its extended position; press the release button to release the latch and withdraw the pendulum stop rod.

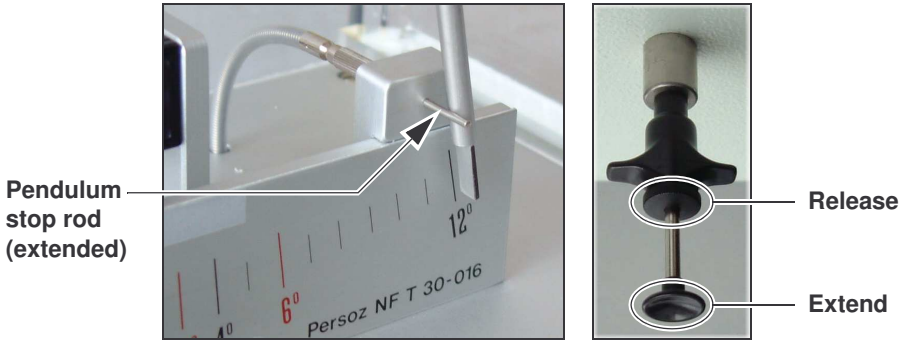


Figure 4. Pendulum stop rod and control button

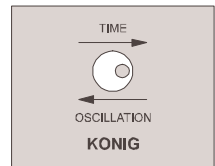
### 2.5.4 Function switches

The instructions in this section do not apply to the Elcometer 3030 Persoz Pendulum Hardness Tester.

#### Elcometer 3040 König Pendulum Hardness Tester

To measure the total time of the test, move the switch to the right.

To measure the total number of oscillations, move the switch to the left.



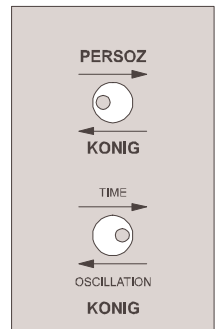
#### Elcometer 3034 Persoz and König Pendulum Hardness Tester

To select a Persoz test, move the top switch to the right.

To select a König test, move the top switch to the left.

To measure the total time of a König test, move the bottom switch to the right.

To measure the total number of oscillations of a König test, move the bottom switch to the left.



## 2.6 Fitting the pendulum

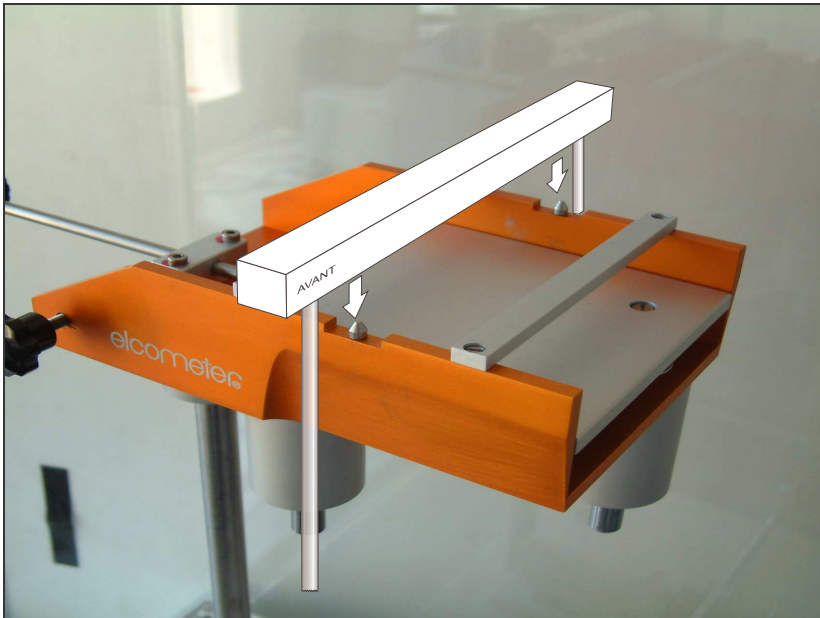


Take great care when handling the pendulum; it is a very important part of your tester and is manufactured to precise standards. Any distortion of the pendulum or other similar damage may affect the readings.

To fit the pendulum on the specimen table:

1. Ensure the specimen table is in its lower position.
2. Clean the pivot balls of the pendulum using a suitable degreasing fluid.
3. The pendulum cross bar is marked 'AVANT' (front) at one edge. The pendulum must be fitted with this marking towards the front of the instrument:

Mount the pendulum on the two locating pins either side of the specimen table; the pins fit into the conical recesses on the underside of the pendulum cross bar (Figure 5).



**Figure 5. Mount the pendulum on locating pins (Persoz shown)**

4. Mount and raise into position the specimen or the glass calibration plate (see “Mounting a specimen” on page 10).
5. Close the front door and the side shutter of the plastic draught enclosure.

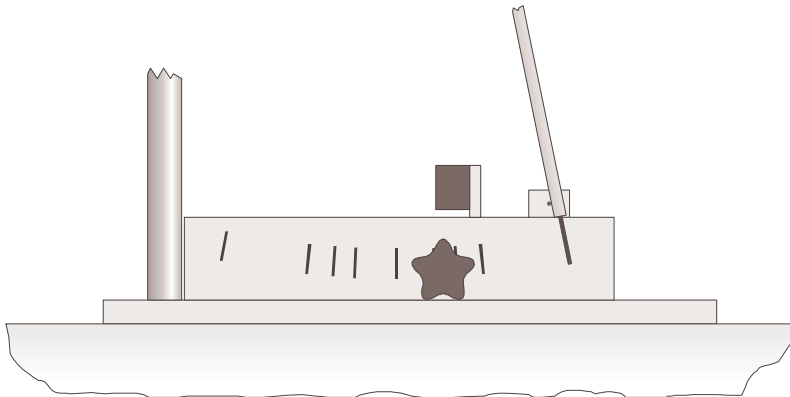
6. Check that the pendulum indicator is aligned with the  $0^\circ$  (zero) mark on the scale. If adjustment is required, use the four adjustable feet of the instrument to obtain a zero (the pendulum is more accurate than the bubble level).

**It is very important that the pendulum is aligned EXACTLY with the zero mark.**

7. Rotate the pendulum setting lever gently so that it pushes the bottom of the pendulum away from the  $0^\circ$  mark on the scale. When the pendulum indicator has passed the  $12^\circ$  (Persoz) or  $6^\circ$  (König) mark on the scale, press the pendulum extend button (Persoz or König) to extend the pendulum stop rod until it latches.

**Always rotate the pendulum setting lever SLOWLY and SMOOTHLY; erratic movement may cause the pendulum to become misaligned on the specimen.**

8. Rotate the pendulum setting lever gently in the opposite direction until it has returned to its resting position.
9. Check that the pendulum indicator is aligned exactly with the  $12^\circ$  (Persoz) or  $6^\circ$  (König) mark on the scale (Figure 6).
10. The pendulum is now fitted and ready for the start of a test.



**Figure 6. Pendulum held by stop rod (at  $12^\circ$ ), ready for start of Persoz test**

## 2.7 Mounting a specimen

The specimen table clamps the specimen in place during the test (Figure 7). To mount a specimen:

1. Rotate the table operating wheel until the table is in its lower position.
2. Ensure the specimen is flat and clean; use a suitable degreasing fluid to remove surface grease if necessary.
3. Place the specimen on the table.
4. Rotate the table operating wheel until the specimen is clamped firmly against the two clamp bars.
5. Rotate the locking wheel to lock the table in position.

To remove a specimen, repeat steps 1 to 5 in reverse sequence.

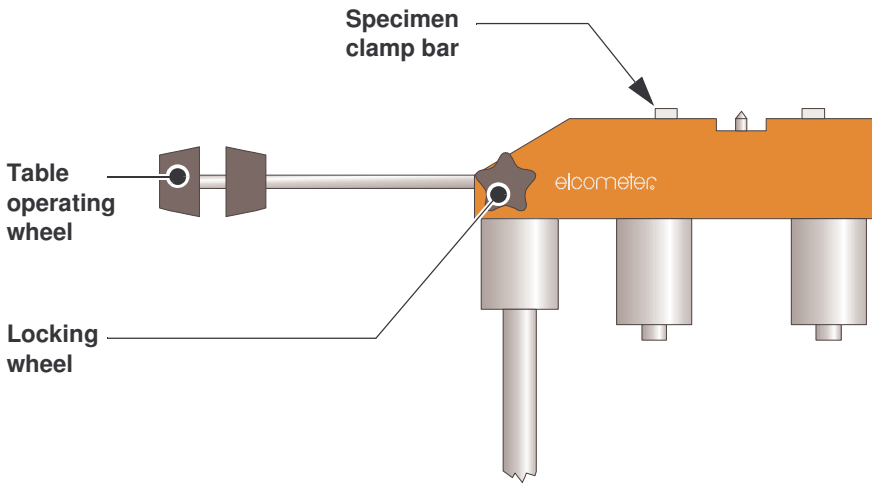


Figure 7. Specimen table assembly

## 3 TESTING A SPECIMEN

### 3.1 Before you start

- Ensure the instrument is mounted on a sturdy table and is isolated from sources of vibrations.
- Ensure the specimen is flat and clean; use a suitable degreasing fluid to remove surface grease if necessary.

### 3.2 Procedure

1. Connect the tester to the mains supply and switch on the tester (See “Control panel” on page 6).
2. Fit the pendulum (See “Fitting the pendulum” on page 8).
3. Mount the specimen (See “Mounting a specimen” on page 10).
4. Set the pendulum to the start position (See “Fitting the pendulum” on page 8).
5. Select PERSOZ or KÖNIG on the function switch (**Model 3034 only**).
6. Select TIME or OSCILLATIONS on the function switch (**König tests only**).
7. Reset the counter (press ‘RST’).
8. Press the pendulum release button.

The pendulum will then start to oscillate.

The counter will increase by one digit for each oscillation (**Persoz tests**).

The counter will increase by one digit for each oscillation or second, depending upon the setting in step 6 above. (**König tests only**).

When the test is complete, the tester will emit a series of beeps.

9. Record the Persoz or König value shown on the counter at the end of the test.

## 4 OPERATIONAL CHECKS

### 4.1 Checking the condition of the pendulum pivot balls

Follow the instructions given in “Testing a specimen” on page 11 to test the glass calibration plate supplied with your instrument.

At the start of the test, when the pendulum release button is pressed, start a stop watch.

The stop watch and the pendulum must be synchronised to a maximum tolerance of  $\pm 1.5\%$ . Stop the stop watch at the end of the test.

For Persoz testers, the total oscillation period must be a minimum of 420 s.

For König testers, the total oscillation period must be  $250 \text{ s} \pm 10 \text{ s}$  and the number of oscillations must be between 172 to 185.

If the pendulum does not reach these values on the glass calibration plate check that the following conditions have been met:

- The glass calibration plate and the pivot balls are free of grease.
- The pendulum is aligned exactly with the  $0^\circ$  (zero) mark on the scale.
- The instrument is mounted on a sturdy table in a draught free area.
- The temperature of the room is  $23^\circ\text{C} \pm 2^\circ\text{C}$ .
- The relative humidity must be  $50\% \pm 5\%$ .

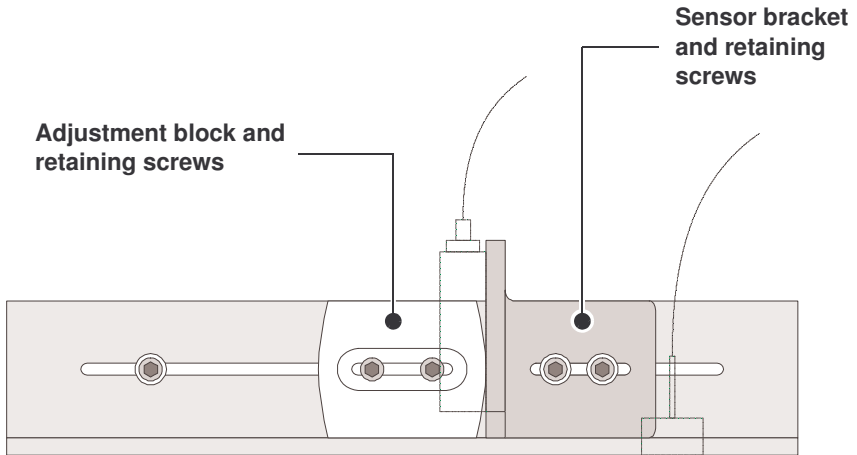
If all the above conditions have been met and the pendulum still does not reach the values stated above, the two pivot balls on the pendulum have become worn and must be replaced. Contact Elcometer or your local Elcometer supplier for further details.

### 4.2 Adjustment - Persoz testers

Carry out the check described in paragraph 4.1 on page 12. If the value displayed on the counter differs from the time on the stop watch, the sensor bracket must be moved towards or away from the  $0^\circ$  mark on the scale by a small amount. This can be done by the user with the aid of the adjustment block and sensor bracket adjustment shims provided with your instrument (Figure 8).

If the value displayed on the counter is **less than** the time on the stop watch:

1. Loosen the two adjustment block screws and then push the adjustment block away from the sensor bracket.
2. Insert the 0.1 mm sensor bracket adjustment shim (marked "10") between the adjustment block and the sensor bracket.
3. Push the adjustment block against the shim and then tighten the two adjustment block screws.



**Figure 8. Sensor bracket and adjustment block - Persoz testers**

4. Loosen the two sensor bracket screws and then remove the shim.
5. Push the sensor bracket up against the adjustment block and then tighten the two sensor bracket screws.

The sensor bracket has now been moved towards the 0° mark on the scale by 0.1 mm. This will result in an increase in the counter reading of 4 to 8 units.

6. Carry out another check as described in paragraph 4.1 on page 12 and record the result.
7. Repeat steps 1 to 6 if necessary until the value displayed on the counter is the same as the value on the stop watch.

If the value displayed on the counter is **greater than** the time on the stop watch:

1. Loosen the two adjustment block screws, push the adjustment block against the sensor bracket and then re tighten the screws.
2. Loosen the two sensor bracket screws and then push the sensor bracket away from the adjustment block.
3. Insert the 0.1 mm sensor bracket adjustment shim (marked "10") between the adjustment block and the sensor bracket.
4. Push the sensor bracket against the shim and then tighten the two sensor bracket screws.

5. Loosen the two adjustment block screws, remove the shim and then re-tighten the screws.

The sensor bracket has now been moved away from the 0° mark on the scale by 0.1 mm. This will result in a decrease in the counter reading of 4 to 8 units.

6. Carry out another check as described in paragraph 4.1 on page 12 and record the result.
7. Repeat steps 1 to 6 if necessary until the value displayed on the counter is the same as the value on the stop watch.

## 4.3 Adjustment - König testers

### 4.3.1 Adjustment of oscillation period

The period of one oscillation must be 1.4 s. To check this, time the pendulum over 100 oscillations.

The time taken for 100 oscillations should be  $140 \text{ s} \pm 2 \text{ s}$ .

- If the time taken is **greater** than 140 s, move the cylindrical weight on the top of the pendulum **down** by a small amount and test again. Repeat as necessary until the oscillation period is correct.
- If the time taken is **less** than 140 s, move the cylindrical weight on the top of the pendulum **up** by a small amount and test again. Repeat as necessary until the oscillation period is correct.

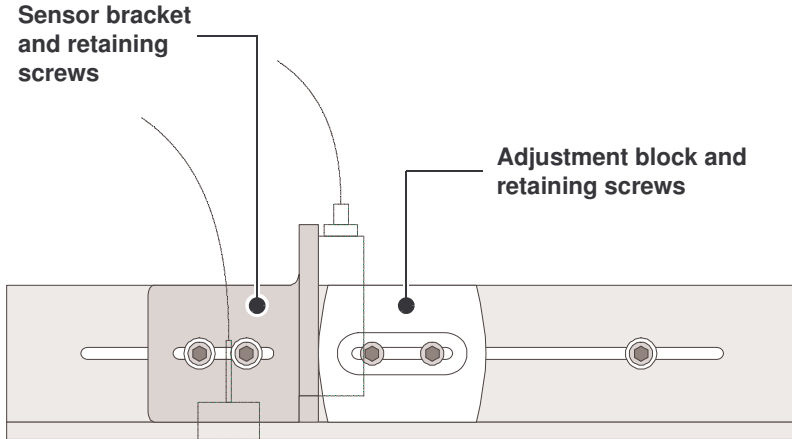
### 4.3.2 Adjustment of the sensor

Set the function switch to measure TIME and then carry out the check described in paragraph 4.1 on page 12. If the value displayed on the counter differs from the time on the stop watch, the sensor bracket must be moved towards or away from the 0° mark on the scale by a small amount. This can be done by the user with the aid of the adjustment block and sensor bracket adjustment shims provided with your instrument (Figure 9).

If the value displayed on the counter is **less than** the time on the stop watch:

1. Loosen the two adjustment block screws and then push the adjustment block away from the sensor bracket.
2. Insert the 0.1 mm sensor bracket adjustment shim (marked "10") between the adjustment block and the sensor bracket.
3. Push the adjustment block against the shim and then tighten the two adjustment block screws.
4. Loosen the two sensor bracket screws and then remove the shim.





**Figure 9. Sensor bracket and adjustment block - König testers**

5. Push the sensor bracket up against the adjustment block and then tighten the two sensor bracket screws.

The sensor bracket has now been moved towards the  $0^\circ$  mark on the scale by 0.1 mm. This will result in an increase in the counter reading of 3 to 6 units.

6. Carry out another check as described in paragraph 4.1 on page 12 and record the result.
7. Repeat steps 1 to 6 if necessary until the value displayed on the counter is the same as the value on the stop watch.

If the value displayed on the counter is **greater than** the time on the stop watch:

1. Loosen the two adjustment block screws, push the adjustment block against the sensor bracket and then re tighten the screws.
2. Loosen the two sensor bracket screws and then push the sensor bracket away from the adjustment block.
3. Insert the 0.1 mm sensor bracket adjustment shim (marked "10") between the adjustment block and the sensor bracket.
4. Push the sensor bracket against the shim and then tighten the two sensor bracket screws.
5. Loosen the two adjustment block screws, remove the shim and then re tighten the screws.

The sensor bracket has now been moved away from the 0° mark on the scale by 0.1 mm. This will result in a decrease in the counter reading of 3 to 6 units.

6. Carry out another check as described in paragraph 4.1 on page 12 and record the result.
7. Repeat steps 1 to 6 if necessary until the value displayed on the counter is the same as the value on the stop watch.

## 5 MAINTENANCE

The Elcometer Pendulum Hardness Tester is designed to give many years reliable service under normal operating and storage conditions.

At regular intervals, check the condition of the pendulum pivot balls - see paragraph 4.1 on page 12.

The tester does not contain any internal user-serviceable components. In the unlikely event of a fault, the Elcometer Pendulum Hardness Tester should be returned to your local Elcometer supplier or directly to Elcometer.

Details of Elcometer offices around the world are given on the outside cover of these operating instructions. Alternatively visit the Elcometer website, [www.elcometer.com](http://www.elcometer.com)

## 6 TECHNICAL SPECIFICATION

Specimen dimensions:	200 mm x 110 mm x 15 mm (maximum) (7.85" x 4.33" x 0.6")
Oscillation period:	1 second (Persoz) 1.4 seconds (König)
Measurement deflection:	12° to 4° (Persoz) 6° to 3° (König)
Measurement time:	minimum 430 s ± 10 s (Persoz) minimum 250 s ± 10 s (König)
Number of oscillations:	430 ± 10 (Persoz) 172 to 185 (König)

Measurement method:	Oscillations (Persoz) Time (König) Oscillations or time (Persoz and König)
Operating voltage:	UK, 240 V AC 50 Hz EUR, 220 V AC 50 Hz US, 110 V AC 60 Hz
Power consumption:	20 W
Fuse rating - plug (if fitted):	4 A
Fuse rating - machine:	4 A (2 off)
Dimensions:	825 mm x 460 mm x 410 mm (32.5" x 18" x 16")
Weight:	23 kg (50 lb)

The Elcometer Pendulum Hardness Tester is packed in a cardboard, wood and foam package. It is recommended that this packaging is retained and reused in the event that the instrument needs to be transported.

If the packaging materials are disposed of, please ensure that this is done in an environmentally sensitive manner. Consult your local Environmental Authority for further guidance.

## 7 SPARES

The Elcometer Pendulum Hardness Tester is complete with all the items required to get started, however over the life of the tester replacements may be required.

The following replacement items and optional accessories are available from your local supplier or direct from Elcometer:

<b>Description</b>	<b>Part Number</b>
Persoz pendulum	KT003030P001
König pendulum	KT003040P001
Glass calibration plate	KT003045P009

## **8 RELATED EQUIPMENT**

In addition to the Elcometer Pendulum Hardness Tester, Elcometer produces a wide range of other equipment for determining the physical characteristics of surface coatings.

Users of the Elcometer Pendulum Hardness Tester may also benefit from the following Elcometer products:

- Elcometer Scratch Testers
- Elcometer Washability, Brushability and Abrasion Testers
- Elcometer Elasticity and Resistance Deformation Testers
- Elcometer Appearance Meters

For further information contact Elcometer, your local supplier or visit [www.elcometer.com](http://www.elcometer.com)