

ABONAIR

JAMES H. HEAL & CO. LTD.

ESTABLISHED 1872

REGISTERED OFFICE
RICHMOND WORKS
HALIFAX
WEST YORKSHIRE
E N G L A N D
HX3 6EP

TELEPHONE:
0422 - 66355
TELEX 31450
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OPERATING INSTRUCTION MANUAL FOR MARTINDALE WEAR AND ABRASION TESTER MODEL NO.103

REFER ALSO TO BRITISH STANDARD NO. 5690:1979
FOR FURTHER INFORMATION

1. EXPLODED VIEW OF MARTINDALE WEAR AND ABRASION TESTER

See attached drawing.

2. ERECTION AND ASSEMBLY

1. Stand the machine on a firm level table or surface. Place a layer of thick rubber or felt between the machine and the table so as to eliminate any vibration or noise.
2. Pour a small quantity of thin lubricating oil into each of the three supporting cups.
3. Put ONE 14mm diameter ball bearing in each of the front two cups.
Put TWO 14mm diameter ball bearings in the rear cup.
These bearings support the top plate.
4. Place the plate in position, having ensured that :-
 - (a) It is the correct way up. The upper side is engraved with four numbers 1-2-3-4.
 - (b) It is the correct way round. One of the three rectangular slots is wider than the other two. The correct position for this wider slot is adjacent to the motor. If the plate is the correct way up and the correct way round, the three driving pins can be located in the respective slots without difficulty.

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5. The four sample holders supplied with the machine are numbered 1-4, corresponding to the four marked positions on the upper side of the top plate. Withdraw each sample holder shaft in turn from its head. Take each shaft and push its plain end first through the appropriate ~~driving shaft~~ bush in the plate. Re-locate the plain end of each shaft in the corresponding sample holder head. In this way place all four sample holders into their working positions.
6. Note that all the constituent parts of each sample holder head are stamped with a number. Like numbered parts must ALWAYS be kept together. Failure to observe this point may falsify results.
7. In transit, the machine may have been put out of adjustment and as reproducible results are only obtained when the equipment is in perfect condition, attention at this stage should be paid to the following points :-
 - a) It is of the greatest importance that the four sample holder heads are perfectly parallel to the respective abrading tables. If they are not, uniform wear is not possible.
 - b) This point may be checked by trying to insert at any point a 0.05mm feeler gauge between the sample holder heads and the abrading tables. This test should be carried out in several positions for each sample holder head.
 - c) If the gauge will slide under a head at any point, check :-
 1. That the offending sample holder shaft is completely true.
 2. That the sample holder is firmly seated on the abrading table and that the problem is not being caused by the presence of dirt or other foreign matter on either surface.
 - d) If the problem still persists, slacken the one central bolt located under the base which secures the abrading table. Slacken also the lock nuts on the three jack screws. Adjust these screws to alter the plane of the table. Re-tighten the lock nuts and the central securing bolt. Test again and repeat this procedure until the table is perfectly parallel to the sample holder head.
 - e) Although it is most unlikely that any adjustment will be necessary when a machine is first delivered, it may be required at a later stage. It is, therefore, expedient to check the alignment of machine parts at fairly regular intervals and particularly if and when any unexpected results are obtained.

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8. When delivered, the machine is set up so that in motion it will trace out a 'Lissajous' figure, i.e. a straight line, which becomes a gradually widening ellipse, until it forms another straight line in the opposite direction and traces the same figure again. This motion may be converted, if required, into a regular reciprocating movement in the following way:-
- (a) Remove the sample holders and the top plate from the machine
 - (b) Remove the driving pin from the disc on the centre gear box by slackening and screwing off the securing nut underneath.
 - (c) Replace the top plate
 - (d) Screw the two additional driving pins which are located in terry clips on the machine base, through the centre slot of the top plate and into the two tapped holes in the plate surrounding the driving disc on the centre gear box.
 - (e) The 'straight line' is re-converted to a 'lissajous' motion by simply reversing this procedure.

3. PREPARATION OF MACHINE FOR TESTING

A. Abrasive Material

1. Remove the top plate and sample holders
2. Remove the retaining rings which are held in position by quick release nuts from each abrading table
3. Place a piece of felt $576-678\text{g/m}^2$ approx. 2mm thick, and 140mm diameter on top of each abrading table. This felt need not be renewed until soiled or damaged. The felt may be purchased either by the metre, or ready prepared in packets of four direct from James H. Heal & Co. Ltd.
4. Cut out pieces of the standard abrasive material, 140mm diameter, and place one over each piece of felt. Put the heavy weight provided on top of the abrasive material, taking care to smooth out any wrinkles. Drop the retaining ring over the weight and secure it in position with four nuts. Throughout this entire operation, make sure that the felt and abrasive material are free of creases and folds, and that they are held tightly in position over the top of the tables. The standard abrasive material should be replaced at the start of each test and after 50,000 rubs if a test is continued beyond this point. It may be purchased by the metre (1575mm wide) direct from James H. Heal & Co. Ltd.
5. Replace the top plate.

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B. Specimens

1. Cut or punch 38mm diameter circular specimens from the material to be investigated.
2. For this purpose, Heal's supply:-
 - (a) A small hand-operated lever press incorporating a suitable cutter - by this means specimens can be rapidly and accurately prepared.
 - (b) A cutter, cutting board and mallet - by means of which samples can also be prepared.
3. Take each sample holder in turn and unscrew the head. Remove the metal insert. Place the specimen in the head. Back it with a piece of polyurethane foam of the same size, approx. 3 mm thick and with a density of about 0.04g/cm^3 . This polyurethane foam can be obtained direct from James H. Heal & Co. Ltd.
4. Replace the metal insert in the sample holder head. Screw the head back onto the sample holder body.
5. Make sure that the sample is tautly stretched over the metal insert and that it is free from creases.
6. The sample holder head may be finally tightened by locating its flat sections in the special device situated on the machine base.
7. Repeat this procedure for the other sample holders and put them in their correct positions in the top plate.

C. Weights

1. Two sets of weights are supplied, which give total loadings of 9 and 12 kPa respectively. The weights have masses of 595 and 795g, which, when combined with the mass of the sample holder, give the loadings referred to above. 9 and 12 kPa correspond to imperial values of 21 and 28 oz/in².
2. The weights can be located on that portion of the sample holder shaft which protrudes vertically through the top plate. They are locked in position on the shafts by tightening the grub screw with the allen key provided.

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4. CONTROLS

The control panel mounted on the right-hand side of the machine comprises :-

1. Counter (5 figures)

- a) This counter, which is labelled 'number of rubs', registers the number of machine revolutions i.e. number of rubs.
- b) The desired number of rubs may be pre-set and the machine will stop automatically at that point.
- c) Pre-setting is carried out as follows :-
 1. Depress the red button
 2. Push simultaneously the black button in the direction of the arrow to remove the word "pre-setting" and to reveal a row of digits in the lower counter window.
 3. Still holding the black button, release the red one.
 4. Keep holding the black button and by depressing the row of small rectangular buttons, pre-set the desired number of rubs.

2. Counter (6 figures)

This counter labelled 'totaliser' totalises the number of rubs from successive tests until reset by depressing the red button on its upper face.

3. Yellow Indicator Lamp

When alight, it indicates mains current.

4. Green Button

Depress to commence a test.

5. Red Button

Depress to stop the machine in an emergency or if it is desired to arrest the machine in advance of the preset number of revolutions.

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5. NOTES ON TEST METHOD AND EVALUATION OF RESULTS

a) Foreword

Although plane abrasion of a fabric surface does not necessarily cover all aspects of strains which are important in determining service life, there are occasions when such a test gives useful information.

Results should not be used indiscriminately and particularly not for comparing fabrics of widely different fibre composition or construction. This apparatus was designed to give a controlled amount of abrasion between fabric surfaces at comparatively low pressures and in continuously changing directions.

b) Scope

The test is designed for knitted and woven wool fabrics of all weights but may also be used for other fibre fabrics with the reservations noted in the foreword.

c) Method

Circular specimens of fabric are abraded under known pressure on an apparatus giving a motion which is the resultant of two simple harmonic motions at right angles to each other. The resistance to abrasion is estimated by visual appearance or by weight loss of the specimens.

d) Conditioning and Testing Atmosphere

The atmosphere required for conditioning and testing is the standard atmosphere for testing textiles defined in BS 1051 i.e. a relative humidity of $65 \pm 2\%$ and a temperature of $20 \pm 2^\circ\text{C}$.

e) Preparation of Test Specimens

For the appearance method of assessment cut four specimens. For the weight loss method of assessment cut eight specimens and weigh each one separately to an accuracy of 1 mg. Expose the test specimens to the standard atmosphere for testing textiles for at least 24 hours, or long enough to ensure that changes in mass during a 24 hour period are within the order of accuracy of measurement of mass.

f) Method of Assessment

1. Number of rubs to end point

Continue abrading the specimens until two threads are broken, judging each specimen individually to the nearest 1,000 rubs and record the number of rubs required. In some cases, removal of the surface nap or other stage is a more appropriate end point and this should be used.

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2. Average rate of weight loss

Abrade two specimens to end point as in (1) and then abrade further pairs of specimens to three intermediate stages of approximately 25%, 50% and 75%, chosen to a convenient number of rubs. Re-condition the specimens and weigh.

Plot a graph of the weight loss of each specimen against the number of rubs and if the points lie about a straight line draw a line by eye and determine the average rate of weight loss in mg/1000 rubs. If the points lie about a curve, draw a curve by eye and read off the weight losses at each of the three stages.

(g) Report

1. State the pressure used and the criterion for judging the end point.
2. State the individual values of each number of rubs to end point and the average of these.
3. If applicable, state the average rate of weight loss or the weight losses at three stages taken from a smooth curve through the points.

6. MAINTENANCE AND CARE OF MACHINE

1. Keep the machine scrupulously clean. Remove accumulated debris from all parts of the machine at frequent intervals.
2. Clean the three supporting cups and the ball bearings and replenish the oil WEEKLY.
3. Apply a drop of thin oil to the three driving pins PERIODICALLY.
4. Keep the sample holder shafts clean.
5. Top up and repack the three gear boxes with SHELL ALVANIA No. 3 grease or equivalent every 12 months.

7. SPARES, SUPPLIES OF CONSUMABLE MATERIALS AND SERVICING ARRANGEMENTS

1. Spare parts are always available from Heals at short notice. The machine serial number (located at the bottom of the control panel) i.e. 103-1... must always be quoted.
2. Supplies of felt, abrasive cloth, and polyurethane foam, in the forms indicated previously, are always maintained in stock and requirements are fulfilled without delay.

ADDENDUM

This addendum concerns machines having a serial number 103-1386/2 upwards corresponding approx. to those delivered from November, 1982 onwards.

1. SECTION 2
ERECTION AND ASSEMBLY
PAGE 2, POINT 8

The straight line motion (regular reciprocating motion) becomes an optional extra. It is only supplied if specifically ordered. It can, however, be ordered later. The machine is designed to accept the straight line motion conversion parts.

2. SECTION 6
MAINTENANCE AND CARE OF MACHINE
PAGE 6, POINT 5

The three gearboxes are lubricated for life with Shell TCA 30 and do not require any maintenance.

3. SECTION 4
CONTROLS
PAGE 4, POINT 1. (c)

Pre-setting is carried out as follows:

- (a) Depress the black button
- (b) Push the white button downwards in the direction of the arrow
- (c) Holding the white button in the 'down' position, depress the individual black buttons located beneath the lower window, to register and pre-set the desired number of rubs
- (d) Note that the pre-set figure remains static for ready reference in the lower window.

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SECTION 4
CONTROLS
PAGE 4, POINT 2

This counter labelled 'totalisor' totalises the number of rubs from successive tests until reset by depressing the BLACK button.

4. EXPLODED VIEW OF MARTINDALE WEAR & ABRASION TESTER

Part No. 14 : Totalisor Type 464.4
Part No. 17 : Pre-settable counter Type 486.4

Exploded View Of Martindale Wear & Abrasion Tester

1	Motor	
2	Top Plate	
3	Shaft	
4	Body	Sample Holder
5	Insert	
6	Head	
7	Holes For Straight Line Motion Driving Pins	
8	Rear Bearing Cup	
9	Quick-Release Nuts	
10	Retaining Rings	
11	Abrading Table	
12	Weights	

13	Indicator Lamp
14	Totalisor F114/6
15	Start
16	Stop
17	Pre-settable Counter FE114/5
18	Block Spanner
19	Driving Pins For Straight-Line Motion
20	Gear Boxes
21	Driving Pins For Lissajous Motion
22	Front Bearing Cups

Place Retaining Ring in correct position as shown.

