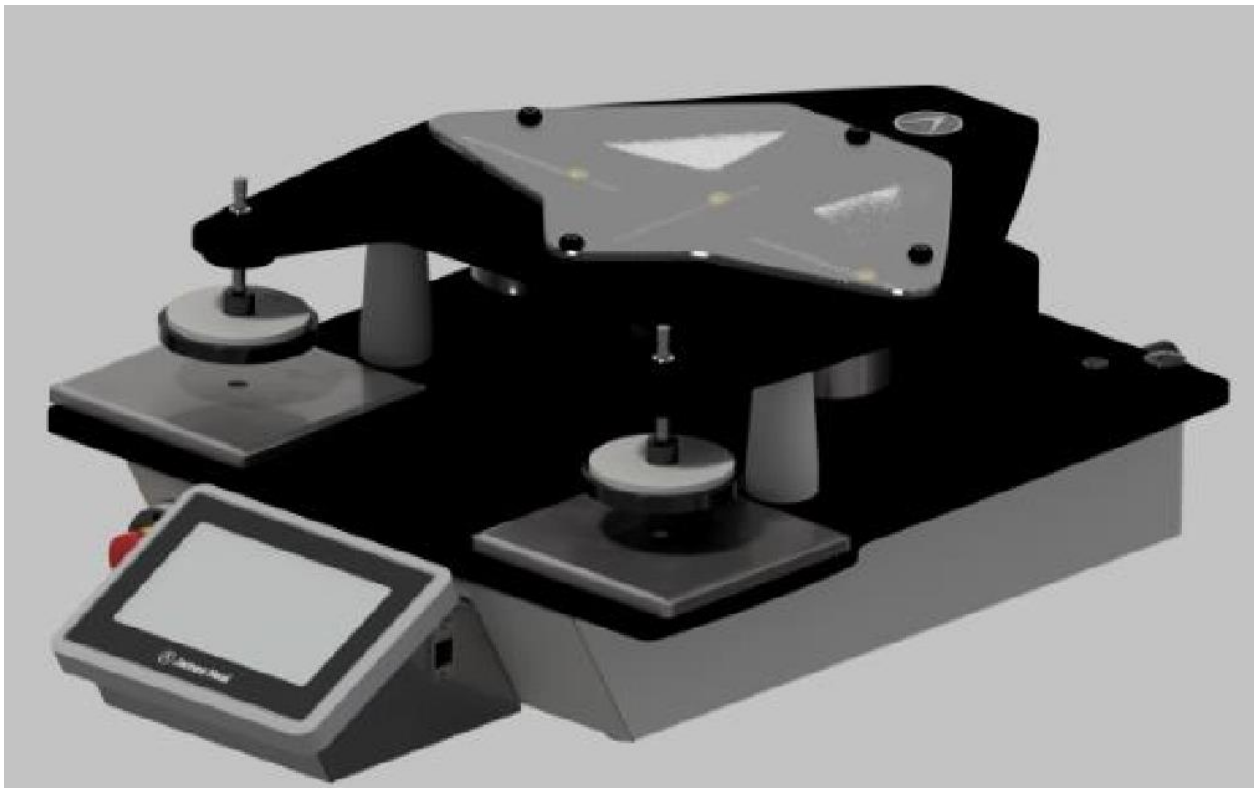
James Heal

OPERATOR'S GUIDE

Martindale Abrasion and Pilling Testers
1602S Wood



1602S Wood Martindale Instruments

James H. Heal & Co. Ltd.
Halifax, England

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Setting the Standard

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Background

Thank you for investing in the **Martindale 1602 Wood** from **James Heal**.

James Heal would like to assure you that we are committed to providing you with first class Instruments, Test Materials, excellent Customer Service and Support. You are part of a growing global community who consider **James Heal** products to be of the highest quality whilst offering excellent value for money.

We were the first to launch a feature-packed, six-station machine, incorporating a unique and patented hinged top plate. Later, we conceived and launched the very successful and versatile, single-station Mini-Martindale. Then the same award-winning team brought you the revolutionary Nu-Martindale 864, copied by many of our competitors worldwide.

Now we bring you the **1600 Martindale Series** which are the absolute ultimate for flexibility and ease-of-use, and feature our intuitive touchscreen user interface.

Historical Background

The 1600 Series of Martindale Abrasion & Pilling Testers are the latest versions of the original Martindale Wear and Abrasion Tester developed by Dr. J.G. Martindale at the Wool Industries Research Association (WIRA) in 1942.

The principle of the Martindale test is that test specimens are rubbed against a standard abradant (a special woven worsted fabric; repp) in a continuously changing pattern, which ensures that the surface fibres of the specimens are flexed in every direction. The wear resistance of the specimens may be assessed by visual comparison after a predetermined number of rubbing cycles; or the test may be allowed to continue until, for example, two threads of the specimen have broken and the number of cycles to reach this point is recorded. Alternatively, the most objective method - but also the most laborious - is to remove the specimens at intervals, then condition and weigh them, so as to measure the rate of mass loss.

Discs of SM25 Abrasive Cloth, 140mm in diameter, are clamped tightly over the abrading tables, cushioned by standard felt backing pads. A test specimen of 38mm diameter is mounted in the sample holder and placed face down on the abrading surface. The weighted spindle is inserted through the top plate to engage with the sample holder below. The sample holder and abrasion table are driven by two reciprocating mechanisms acting at right angles to each other. The resulting relative complex motion carries the test specimens in a constantly changing pattern across the abrading surfaces. The pattern is known as a Lissajous figure.

Subsequently, the Martindale abrasion tester - suitably adapted - became the basis of the fabric pilling test developed in conjunction with the Eidgenoessiche Materialpruefungs- und Versuchsanstalt (EMPA) in Switzerland in 1987, now known as Swissatest. This method has now become very widely used for testing the pilling propensity of woven and knitted fabrics made from staple fibre yarns. Specimens are rubbed against each other, or abrasive cloth, and the degree of pilling is assessed by comparison with a written descriptive table assisted by photographs of standard fabrics, prepared by EMPA. The specimen is mounted on a holder that is much larger than that used for the Martindale abrasion test. The amplitude of the reciprocation is reduced in order to accommodate these larger sample holders.

The 1600 Series of Martindale Abrasion and Pilling Testers can also be used for testing socks (EN 13770). The smaller models, as this one, can be modified for wet and damp testing, lacquers, wood, laminates, thick samples, liquids, sprays, powders, straps, ropes and shoelaces.

Features and Benefits

A commitment to continuous investment in the latest design and manufacturing technology enables **James Heal** to bring superior quality and feature-rich instruments such as the 1600 Series of Martindale Abrasion and Pilling Testers within the reach of the whole Textile Testing Community.

Features and benefits include:

- NEW intuitive touchscreen user interface
- Both thick & thin samples can be tested by adding or removing sample holder guide spacers.
- Complies with known Martindale standards and test methods
- Individual station counters and totaliser
- Easy change of motion
- Comfortable and easy access to every station from the front, without removing the top plate
- Finger grips to facilitate (when required) removal of top plate
- Low power consumption
- Higher speed for accelerated testing (x1.5)
- Jog speed (slow speed) for positioning Top Plate
- UKAS Calibration by **James Heal Service & Calibration**
- Standard 18 months warranty
- Real value for money

Standards

The 1602S Wood Martindale Testers comply with the following standards:

- EN 16094
- EN 438-2 Section 30
- CEN/TS 16611
- IKEA

It is essential that reference be made to the appropriate standards as well as to performance specifications issued by your customers/buyers.

Safety

The 1600 Series Martindales have been specifically designed with operator health and safety in mind. These instruments ensure the minimum of operator stress and fatigue, and is virtually silent in operation to suit the laboratory environment.

<table>
<tr><td rowspan="10">  </td><td>The instruments are very heavy, therefore do not attempt to lift without suitable lifting apparatus or use two or more able-bodied people.

Mini-Martindale 1602 = 45 kg
Midi-Martindale 1605 = 65 kg
Maxi-Martindale 1609 & 1609Wet = 85 kg</td></tr>
<tr><td>The 1600 Series Martindales comply with the CE regulations in full. See Compliance Statements.</td></tr>
<tr><td>The operator is advised to conduct a dynamic risk assessment before using the instrument to take into account the use of PPE to:

• Avoid grease contamination on clothing & skin
• Ensure all operators are trained & competent in manual handling
• Avoid incurring wood splinter injuries by wearing appropriate gloves (special Martindales where applicable)
•</td></tr>
<tr><td>Care should be taken when lifting the Top Plate.</td></tr>
<tr><td>Care should be taken to prevent anything heavy (e.g., weights) from impacting on the Control Panel.</td></tr>
<tr><td>Care should be taken to avoid placing the hand between the Abrading Stations and the Top Plate whilst in motion.</td></tr>
<tr><td>Care should be taken to ensure any loose clothing or long hair doesn’t get caught in the machine or clamp rings.</td></tr>
<tr><td>Care should be taken to ensure the machine is switched off at the plug when dressing the machine, this will ensure the machine can’t be switched on accidentally.</td></tr>
<tr><td>Care should be taken as some fabrics can generate heat build-up during the abrading process due to friction.</td></tr>
<tr><td>Sufficient space must be left around the instruments to allow unrestricted and safe operator access. See Installation section.</td></tr>
<tr><td>  </td><td>Avoid grease contamination on skin</td></tr>
</table>

Emergency Stop

This switch is designed to bring the drive mechanism to an immediate halt in an emergency situation.

When pressed the switch will latch in the stop position.

To unlock the switch, twist the red cap in a clockwise direction.

Attempting to start a test with the switch in the stop position will result in a warning message being displayed.

Unpacking

Do not dispose of any packaging material until all standard and optional accessories are accounted for. If there are any discrepancies, please contact your supplier or Local Agent immediately.

Remove any staples, wire strapping and adhesive tape.

Lift out the top box, containing the accessories.
Remove the adhesive tape and ensure that all accessories are present.

Using both hands remove the outer sleeve.
Carefully remove the instrument from its packing case and place it on a firm, flat surface.

The instrument weighs approximately 60 to 80 kg depending on the model, therefore do not attempt to lift without suitable lifting apparatus or use two or more able-bodied people.

Installation

Stand the instrument on a firm, level table or surface (Lifting equipment required).
Lower the top plate so that each of the three (3) Drive Pegs locates into the three (3) Drive Slots.
Ensure the Top Plate is resting on the three (3) Bearing Pads.

Connect the instrument to the correct electrical supply using the mains lead supplied.

Power Requirements	110-230 V ± 10%, 50/60 Hz, 60 W (mains electricity must be free from spikes and surges exceeding 10% of nominal voltage) (Universal Voltage & Frequency)

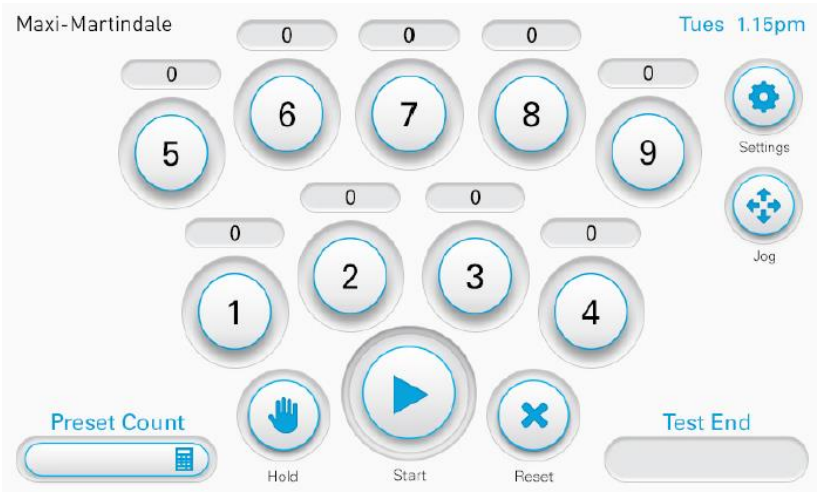
	Depth	Height	Width	Weight
Mini-Martindale 1602	730 mm	246 mm	500 mm	45 kg
Mini-Martindale 1602S	748mm	246mm	498mm	Dependent on application
Midi-Martindale 1605	637 mm	246 mm	674 mm	65 kg
Maxi-Martindale 1609	670 mm	309 mm	877 mm	85 kg

Getting Started

Intuitive Touchscreen User Interface

The 1600 series Martindale features the NEW intuitive touchscreen user interface. The functions for the 1602 are near-identical, the only difference being the number of stations.

1609 Home Screen



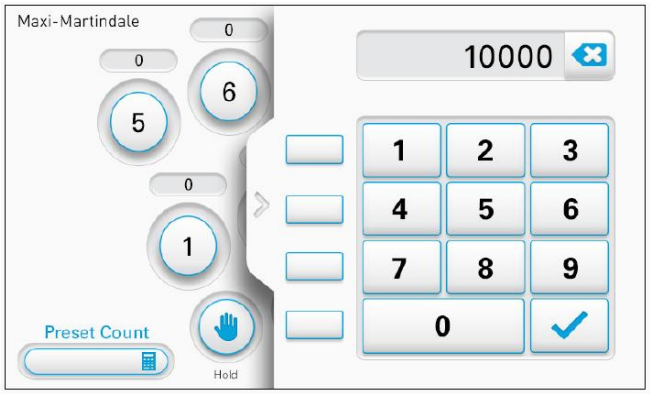
1605 Home Screen

1602 Home Screen

Using the Touchscreen User Interface

1. Home page

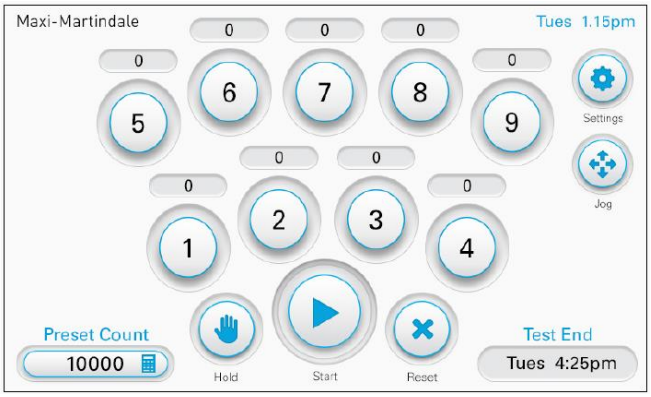
To start a test, press the Preset Count button with the keypad icon to input rubs required.



2. Keypad

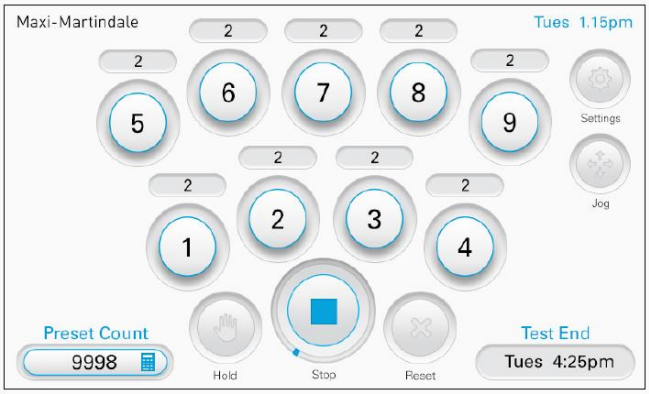
Enter the amount of rubs required using the keypad followed by pressing the ✓ button.

Favourites can be stored by entering the required number of rubs and holding down on one of the rectangular preset tabs to the left of the keypad. This can then be selected easily, followed by the tick.



3. Test is set up

Once the test has been set up, the Preset Count will display the amount of rubs and the Test End display will show when the test will be complete. The test can be started by pressing the start button.

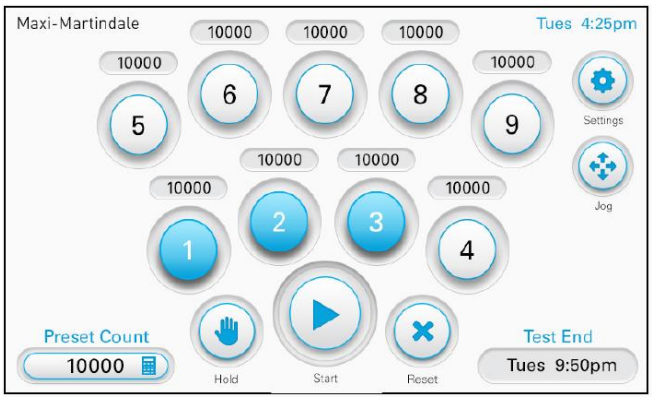


4. Test running

Whilst the test is running, the Preset Count will count down the rubs and the displays on each station will count up the number of rubs.
The hold, reset, settings and jog buttons will be greyed out once the test is running.
The Play button will also change to a stop button whilst running with a cyan ring around it to show the progress of the test.

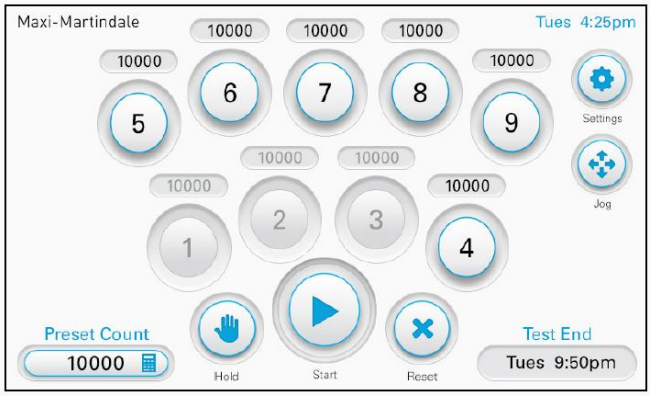
5. Test complete

Once the test has completed, the progress ring will glow and the Test End will show a tick symbol.
The buttons previously greyed out are now active and available for use.



6. Hold stations

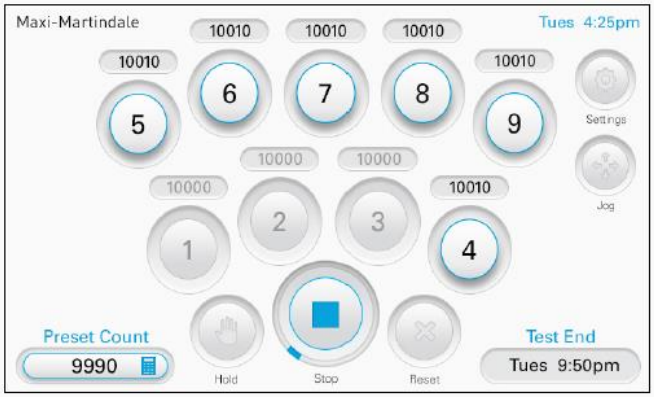
To hold stations, select the stations you wish to hold.
Once pressed, the stations light up to show they have been selected, then press the hold button.



7. Held stations

The stations on hold will grey out to show they are being held.

To start the test, press start button.

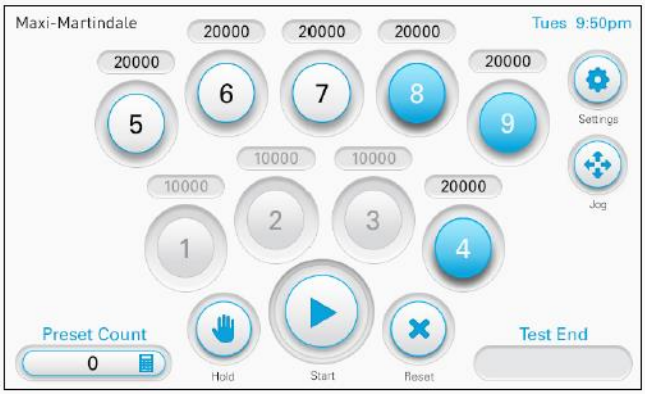


8. Test running

When the test is running, the stations on hold will still be greyed out and not increase in count.

9. Test complete

Once the test has completed, the held stations will stay held and greyed out.



10. Reset stations

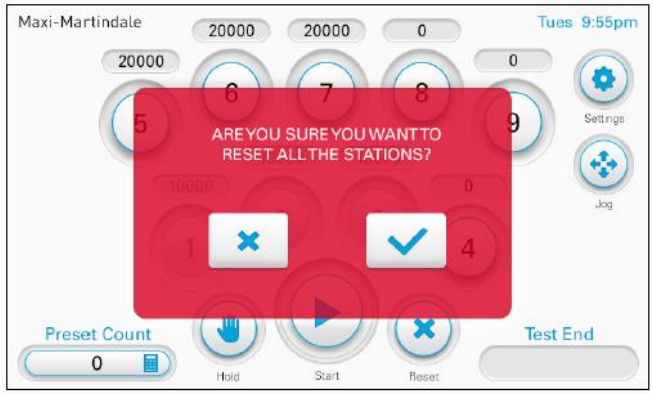
Press the stations that you would like to select. The selected stations will light up cyan. Once you have made your selection press the ‘x’ button.

11. Reset selected stations

A warning box will appear to ensure you are wanting to reset the count on the selected stations.
To confirm the reset press the ✓ button.

12. Reset stations

The reset stations will clear their counts back to zero.

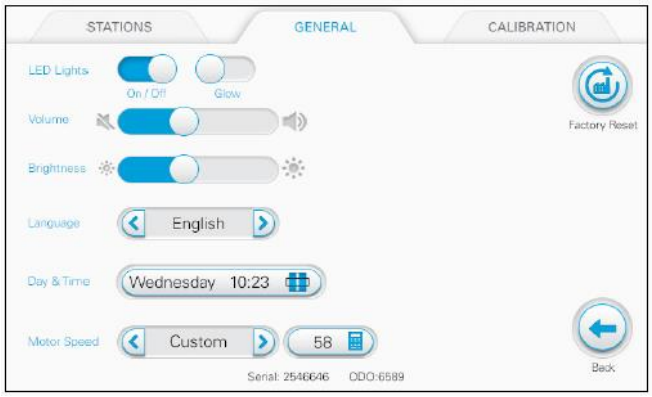


13. Reset all stations

To reset all stations hold and press the button ‘x’for 2 seconds.
A warning box will appear to ensure you are wanting to reset the count on all the stations.
To confirm the reset press the ✓ button.

14. Reset stations

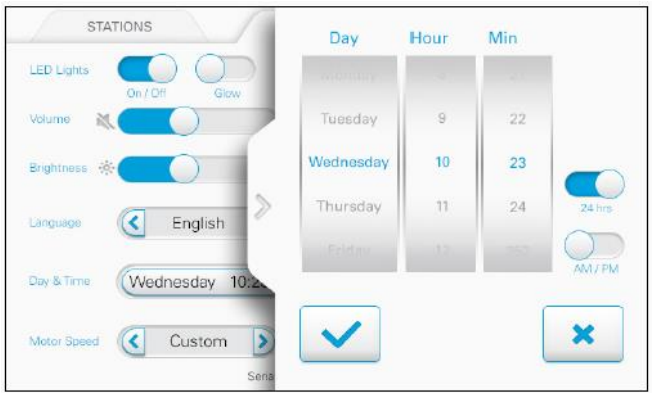
All the stations will clear their counts back to zero and any stations on hold will no longer be on hold.



15. Settings – General

The following settings can be controlled by pressing Settings on the home page and then the GENERAL tab:

- Lights
- Volume
- Brightness
- Language
- Day & Time
- Motor speed



16. Setting the day and time

A roller wheel controller will appear once the Day & Time button is pressed.
The day and time can be set by rolling the wheels around to the correct setting.
AM/PM or 24 hour clock can also be selected.
Once selected, press ✓

Scratch Resistance Testing

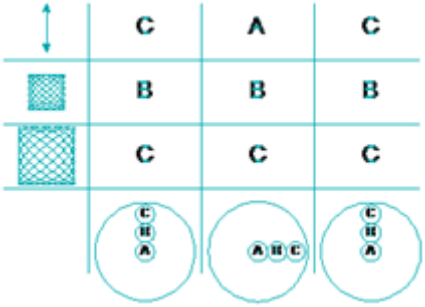
The circular motion of the Lissajous pattern provides multi directional scratching, offering results more representative of the actual end-use than other methods in the market which scratch the surface in a straight line only. The following scratch resistance standards can be performed on a range of materials including wood floors, high pressure laminates and furniture surfaces:

- EN 16094
- EN 438-2
- CEN/TS 16611
- IKEA

The information below describes two procedures from EN 16094, Procedure A for assessing changes in gloss, and Procedure B for assessing scratch resistance.

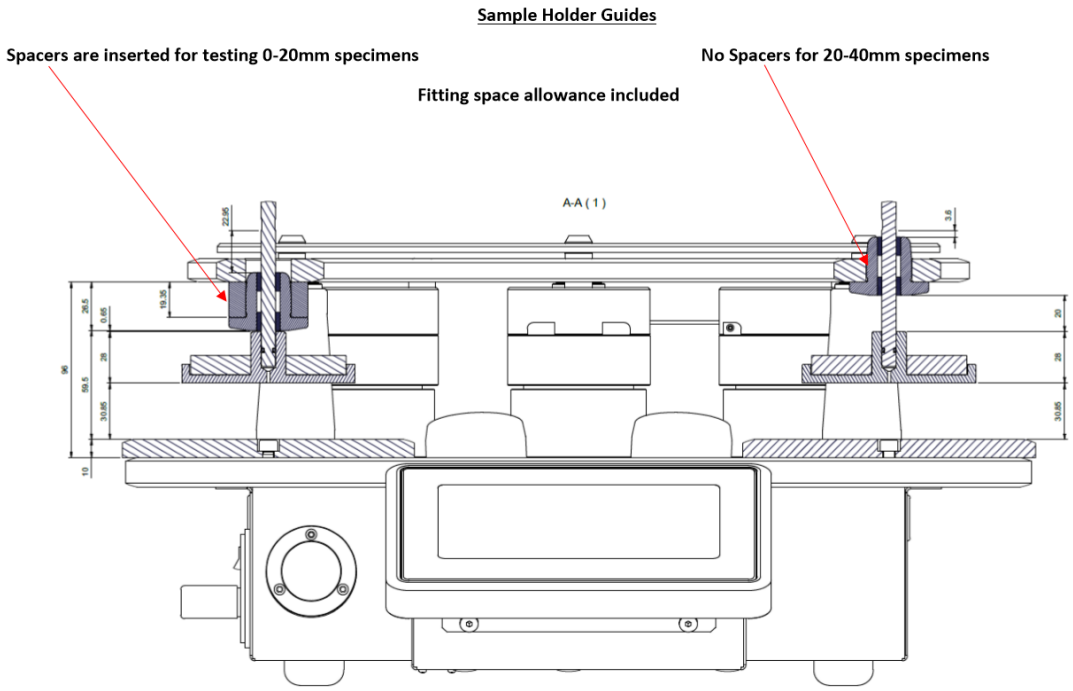
Test Parameter	**Procedure A**	**Procedure B**
Scrub Material 3M reference James Heal stock code	Very Fine Maroon SB 7447+ 789-672	Medium Fine Brown SB 7440 789-671
Holder for Scrub Material	Version 1 6N Holder + 6N ring weight	Version 2 4N Holder + 4N ring weight
Speed Factor	1	1
Assessment	Gloss change using a Reflectometer	Visual assessment to scheme in Annex B of EN 16094

Assemble the Martindale so that all three (3) of the drive pegs are in position C to create a large lissajous with a width of 60.5mm.



It takes 16 rubs to make a complete Lissajous figure.

Drive Pegs can also be set at: Straight Line (A) or 24mm Lissajous (C). However, these are not generally required for wood testing.



The table is designed to allow for both thick & thin samples to be tested.

Spacers are supplied with the sample holder guides.

If a sample of up to 20mm is to be tested, unscrew the sample holder guide and remove, place the spacer over the guide neck, select the longer screws supplied in the kit & screw the guide back into place.

Similarly if a 20-40mm sample is to be tested, unscrew the sample holder guide, remove the spacer from the guide neck, change the screws for the shorter ones and replace the guide without the spacer.
Ensure the abrading tables are free from adhesive residues, then replace the top plate.

Station Kit

Station Kit

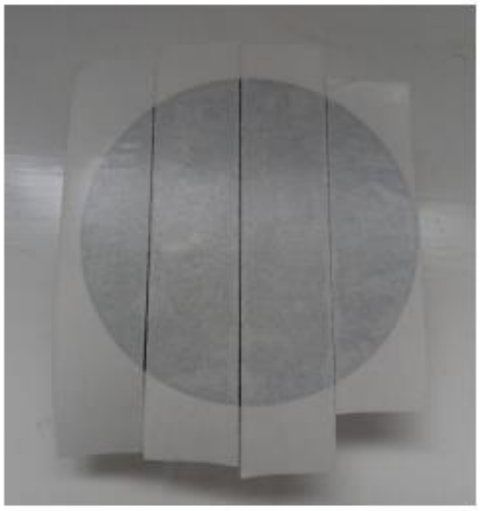
Spindle, Abradant Holder 90mm diameter & Weight for 4N loading

The station kit consists of a spindle 90mm abradant holder & 4N load weight.

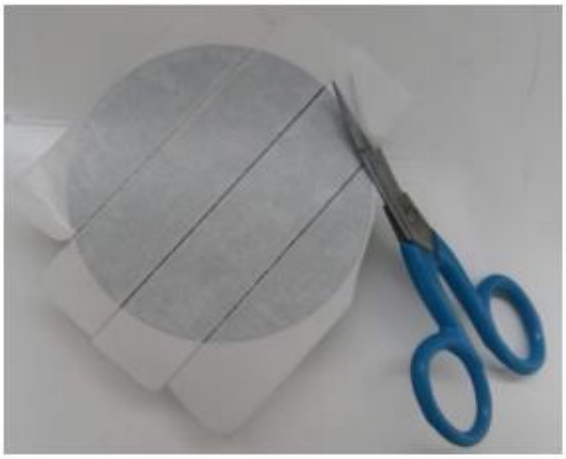
Attaching the abrasive scrub to the abradant holder

Double Sided Tape is needed to adhere the abradant onto the holder

Stick tape onto the base of the abradant holder



Cut round the tape around edge of the holder

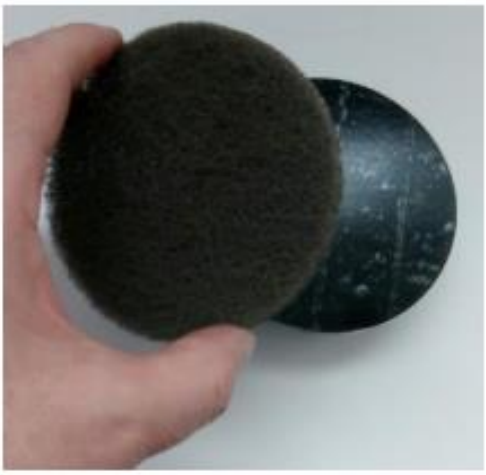


Peel the backing of the tape

Scotch Brite Abradant – There are 3 types: 789-671 Medium/789-674 Very Fine & 789-678 Ultra Fine

Scotch Brite Pad 89mm Diameter

Place abradant on top of the taped holder



Press down firmly to ensure the abradant is fully adhered to the holder

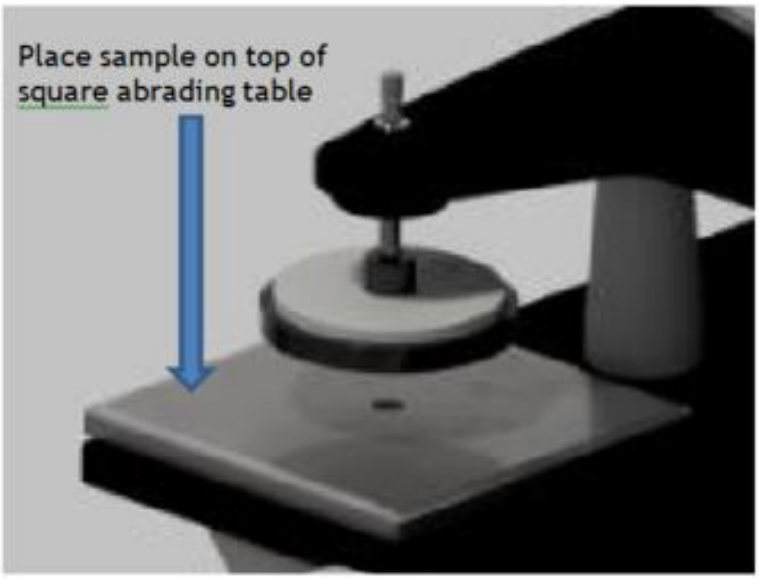
Turn abradant and abradant holder over

If using a ring weight, place it on top of the abradant holder

The assembly is now ready to place on top of the sample on the machine to be tested.

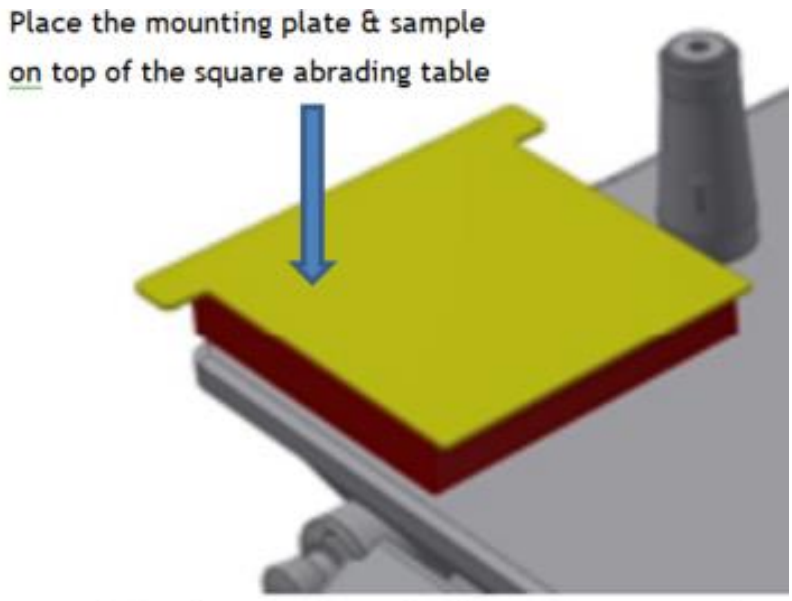
Attaching the sample to the square table

Using double-sided low tack adhesive tape for easy removal, fix the specimen to the abrading table.



If the sample is very thin, use low tack double sided tape to adhere it to the specimen mounting plate, then adhere the mounting plate on to the square abrading table:

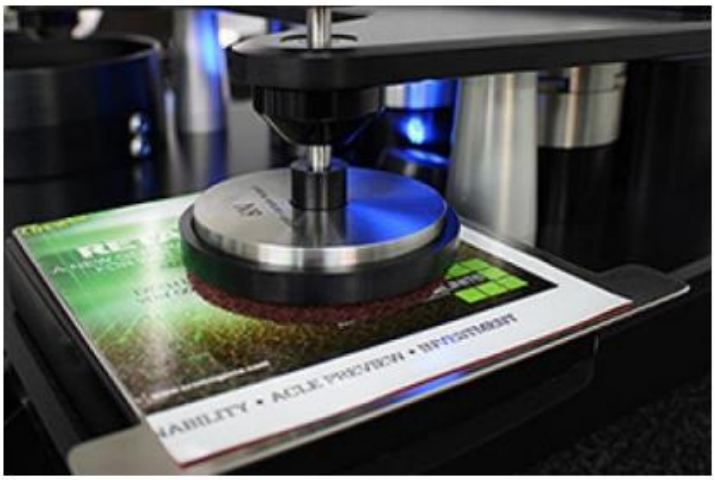
Specimen on specimen mounting plate



(Top plate not shown for illustrative purposes)

Replace the top plate of the machine, put the abradant holder loaded with abradant & ring weight (if needed) on top of the specimen.

Then push the spindle through the guide from the upper side of the top plate down through the guide and into the abradant holder.



(Please note: The table and sample holder guide pictured are slightly different to the ones you will have received)

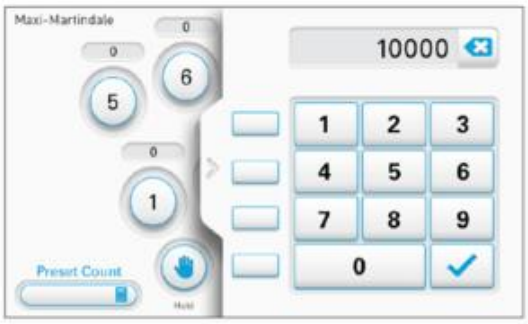
Start the test using touch screen

On the touch screen, set the chosen abradant rubs on the specimen with a predetermined load and number of rubs.

Using the Touchscreen User Interface

1. Home page

To start a test, press the Preset Count button with the keypad icon to input rubs required.



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Favourites can be stored by entering the required number of rubs and holding down on one of the rectangular preset tabs to the left of the keypad. This can then be selected easily, followed by the tick.

3. Test is set up

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4. Test running

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The hold, reset, settings and jog buttons will be greyed out once the test is running.
The Play button will also change to a stop button whilst running with a cyan ring around it to show the progress of the test.

5. Test complete

Once the test has completed, the progress ring will glow and the Test End will show a tick symbol.
The buttons previously greyed out are now active and available for use.

The holder travels in a lissajous pattern and rotates around its own axis perpendicular to the horizontal plane.

When the test is complete, any changes to the surface of the specimen are either assessed using a Glossmeter, or compared with images contained in the standards.

Microscratch reference black high gloss HPL (JH701-501) are available for checking every new lot of scrub materials.

Where weights are required, they are available to provide pressures of 4N and 6N.

Scratch Resistance	EN 16094 / EN 438-2 / CEN/TS 16611 / IKEA
794-519	Station Kit (diameter 95mm) including weight for 4N loading (**NOT** CEN/TS 16611 / IKEA)
794-517	Pilling Station Kit (Inner diameter 90mm) including weight for 4N (for CEN/TS 16611 / IKEA additional 6N weights required)
525-688	Additional weights for 6N loading (CEN/TS 16611 / IKEA)
701-501	Microscratch reference plates for checking every new lot of scrub material
789-674	Very fine maroon 7447+ (CEN/TS 16611 & IKEA)
789-671	Brown 7440 (**NOT** CEN/TS 16611)
789-678	Ultra-fine grey/brown 7448+ (CEN/TS 16611)

Cleaning

- Periodically inspect Abrading Tables for indents. Damaged Abrading Tables should be replaced.
- Periodically inspect the Sample Holders and Spindles for signs of damage. Damaged or worn parts should be replaced.
- Keep the instrument scrupulously clean. Remove accumulated debris from all parts. Clean up oil and grease stains immediately.
- Keep the Spindles clean. A trace of light oil applied via a cloth is recommended in a high humidity environment.
- Keep the Drive Slots and the Drive Pegs free from debris.
- Use only a dry soft cloth when cleaning the Control Panel. DO NOT use any solvents or abrasive cleaning agents.

Service and Calibration

User Servicing

- At approximately monthly intervals, clean away any oxidised or contaminated grease from the Drive Pins, Bushes, Drive Slots and Wear Plates and re-apply fresh 1600 Series Martindale Grease to the same areas using the Plastic Spatula provided. See Replacement Parts (Spares), below.
- Mains electrical fuses are located in the power inlet socket, located at the left-hand side of the instrument.
- To replace the fuses, remove the mains cable from the power inlet. Open the fuse drawer to expose the fuse cartridge. Fit new 2A and 1A 20mm anti-surge fuses. The 2A fuse is fitted to the 110V side and the 1A is fitted to the 220V side of the carrier. NB – For 1609W the mains cable cannot be removed as it is wired directly into the instrument.

Service & Calibration Support

The Martindale 1600 Series of Martindale Abrasion and Pilling Testers are world-class products, fully supported by our world-leading Maintenance and Calibration Service - covering installation, operator training, regular maintenance, UKAS Calibration and on-line technical and applications support.

James Heal Service & Calibration is available Worldwide – Contact our Service & Calibration Support email for further details: support@james-heal.co.uk

Identification of Parts

This illustration shows a Midi-Martindale 1605. Parts on the Maxi-Martindale 1609 look identical, the 1602S may look as depicted or have square wood or laminate tables with wood/laminate sample holders.

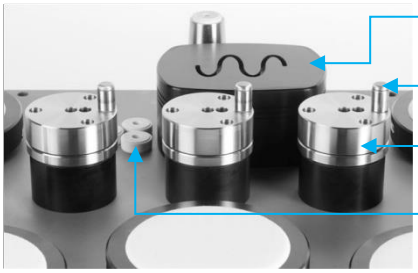
Unscrew the two (2) Support Bars and screw into the rear of the instruments. In this way they act as spacers giving adequate clearance at the rear of the instrument.

Abrading Tables – round on the 1600 W they are square.

Clamp Rings

Support Towers with Bearing Pads (support for Top Plate)

Touchscreen User Interface



Motor Housing (do not cover the ventilation slot)

Drive Pegs (position can changed to allow different types of motion)

Drive Towers

Spare Bearing Pads

Left-hand side view of instrument.

Base Plate

Emergency Stop Button (front left hand side)

Power Lead connection with Power Switch above

Finger Grips (to aid lifting Top Plate)

Top Plate with Perspex Guard Plate

Bearing Housing (Needle Bearing)

Compliance Statements

Product End-of-Life Disassembly Instructions (WEEE)

The **Waste from Electric and Electronic Equipment (WEEE)** disassembly instructions are intended for use by end-of-life recyclers or treatment facilities. They provide the basic instructions for the disassembly of this product to remove the components and materials requiring selective treatment.

Items Requiring Selective Treatment

Models 1602, 1605 and 1609		
Item Description	**Notes**	**Qty. of Items included in Product**
Printed Circuit Boards (PCB) or Printed Circuit Assemblies (PCA)	With a surface area greater than $10cm^2$	3
Batteries	All types including standard alkaline and lithium coin or button style batteries	1
Mercury containing components	e.g. mercury in lamps, display backlights, switches, batteries	0

EU Conformity

- Machinery Directive 2006/42/EC
- Low Voltage Directive (LVD) 2014/35/EU
- Electromagnetic Compatibility (EMC) Directive 2014/30/EU
- Waste Electrical and Electronic Equipment recycling (WEEE) Directive 2012/19/EU
- Restriction of Hazardous Substances (RoHS) Directive 2011/65/EU

Specifications

Mode of Operation	**Abrasion**	**Pilling**	**Sock Abrasion**
Standard	EN ISO 12947	EN ISO 12945-2	EN 13770
Number of specimens	Model 1602 – up to 2 Model 1605 – up to 5 Model 1609 – up to 9		
Exposed area of test specimen	6.45 cm^2	64.5 cm^2	3.14 cm^2
Working pressure on test specimen	9 kPa (apparel) 12 kPa (upholstery)	2.5 cN/cm^2 (knitted) 6.5 cN/cm^2 (woven)	23.86 kPa
Rotational speed	47.5 ± 2.5 rpm (optional but non-standard x1.5 speed)		
Total stroke of drive units	60.5 ± 0.5 mm	24.0 ± 0.5 mm	60.5 ± 0.5 mm
Parallelism of top plate to abrading tables	0.05 mm		
Maximum circumferential parallelism of sample holders to abrading tables	0.05 mm		

Dimensions and Weights

	Depth	**Height**	**Width**	**Weight**
Mini-Martindale 1602	730 mm	246 mm	500 mm	45 kg
Mini-Martindale 1602S	748mm	246mm	498mm	Dependent on application
Midi-Martindale 1605	637 mm	246 mm	674 mm	65 kg
Maxi-Martindale 1609 & 1609W	670 mm	309 mm	877 mm	85 kg

Revision History

See front cover for publication number, e.g., 290-1600-1$A.
The letter following the dollar symbol shows the revision status of the document.

Rev	Date	Originator	Details of revision
A	23/05/19	SEW	1600W Series New
B	03/12/19	SEW	RA Amendment
C	23 01 20	LK	Page 23 - Station Kits Amended (Microscratch)
D	09/03/22	SEW	Microscratch amended