

## OPERATOR'S GUIDE

Martindale Abrasion and Pilling Testers  
The 900 Series



Covering Serial Numbers:  
909/10/1001 and upwards  
905/10/1001 and upwards  
902T/10/1001 and upwards

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



Publication 290-909-1\$E  
© 2010

Published by:

JAMES H. HEAL & CO. LTD.  
RICHMOND WORKS  
HALIFAX  
WEST YORKSHIRE  
HX3 6EP  
ENGLAND

TELEPHONE +44 (0) 1422 366355  
FACSIMILE +44 (0) 1422 352440

E-mail [info@james-heal.co.uk](mailto:info@james-heal.co.uk)  
Internet <http://www.james-heal.co.uk>

© 2010

# TABLE OF CONTENTS

TABLE OF CONTENTS.....	3
Background .....	5
Historical Background.....	5
Features and Benefits.....	6
Standards .....	6
Introduction to Getting Started .....	7
The Control Panel .....	7
Using the Control Panel .....	7
Setting the Preset Counter.....	7
Starting and Stopping.....	8
Using the Totalisers.....	8
Changing the Rubbing Motion .....	8
Less Frequently Used Functions / Preferences.....	9
Introduction to Applications .....	10
Abrasion Test.....	10
Pilling Test.....	13
Sock Abrasion Test.....	16
Mounting Easily Stretched Materials .....	19
Cutting Template for Stretch Mounting Device .....	20
Accessories.....	22
Test Materials .....	23
Calibration .....	23
Safety .....	24
Emergency Stop.....	24
Cleaning .....	24
Service and Calibration .....	25
User Servicing.....	25
Service & Calibration Support.....	25
Replacement Parts (Spares).....	25
Unpacking .....	26
Installation .....	26
Identification of Parts .....	27
Compliance Statements .....	29
Product End-of-Life Disassembly Instructions (WEEE).....	29
Items Requiring Selective Treatment .....	29
Required Tools.....	29
Product Disassembly Instructions .....	29
CE Compliance.....	30
Specifications.....	30
Dimensions and Weights .....	30

Electrical Scheme ..... 31  
Exploded Diagrams – Midi-Martindale 905 ..... 32  
Exploded Diagrams – Maxi-Martindale 909..... 33  
Revision History ..... 34

## Background

Thank you for investing in the **Martindale 900 Series** 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 **900 Series of Martindale Abrasion and Pilling Testers** which are the absolute ultimate for flexibility and ease-of-use.

## Historical Background

The 900 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 Eidgenoessische Materialpruefungs- und Versuchsanstalt (EMPA) in Switzerland in 1987. 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 a sample 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 900 Series of Martindale Abrasion and Pilling Testers can also be used for testing socks; the test method is EN 13770. Sock Abrasion Kits are also available.

## 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 900 Series of Martindale Abrasion and Pilling Testers within the reach of the whole Textile Testing Community.

New features and benefits include:

- Suitable for Fabric Abrasion, Fabric Pilling, Glove Abrasion, Sock Abrasion and Leather (Ball Plate) testing
- Can be used for many other applications, including wet and high friction tests
- Complies with all known Martindale standards and test methods
- Versatile and intuitive Key Pad User Interface
- 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
- “Quick lock” clamping rings
- UKAS Calibration by **James Heal Service & Calibration**
- Standard 18 months warranty
- Test Materials: abrasive cloth, woven and nonwoven felts and foam
- Real value for money

## Standards

The 900 Series of Martindale Abrasion and Pilling Testers comply with the following standards:

- ASTM Standard D4966 (Abrasion)
- ASTM Standard D4970 (Pilling)
- BS 5690:1991 (Superseded by EN ISO 12947)
- SFS 4328: 1979 (Superseded by EN ISO 12947)
- BS 3424: Part 24 (Method 27A)
- EN ISO 12947
- EN ISO 12945-2
- EN 15977
- SN 198 525 and SN 198 529
- Indian Standard IS 12673 (Plane Abrasion - Method 1)
- ISO 26082-1 (IUP 53-1)
- IWS/Wool Bureau TM 112 (Abrasion)
- IWS/Wool Bureau TM 196 (Pilling)
- IWTO TM 40
- Japanese Standard JIS L 1096
- M&S P17 and 19
- SATRA PM 31

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

## Introduction to Getting Started

In response to market demand Heals have designed and manufactured the Martindale 900 Series™ of Abrasion and Pilling Testers. The 900 Series comprises three (3) instruments:

- Model 909      Maxi-Martindale                      Nine (9) station instrument
- Model 905      Midi-Martindale                              Five (5) station instrument
- Model 902      Mini-Martindale                                  Two (2) station instrument for special applications

This Quick Start Guide describes the use of Model 909, Model 905 and Model 902 which are primarily designed for the testing of textiles, leather and related materials.

## The Control Panel

The features on the 909, 905 and 902 Control Panels are identical. The only difference being the number of stations shown in the mimic.



## Using the Control Panel

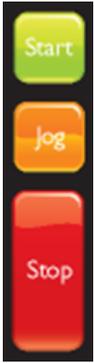
The following gives brief instructions for setting the Preset Counter and using the Totalisers. To use the more advanced features consult the primary Operator's Guide.

## Setting the Preset Counter

The Preset is the number of rubs required for the current interval of testing, in this example 5000 rubs. You can enter a new Preset value at any time the instrument is not running.



## Starting and Stopping



After setting the Preset Counter to the required number of rubs, press the **Start** key. The instrument will run until the Preset value counts down to zero at which point the instrument will stop, ready for inspection.

If required, the **Jog** key is used to make small movements of the Top Plate while replacing felt, abrasive cloth, etc, therefore providing better access to the abrading stations. This removes the need to manually lift the Top Plate.



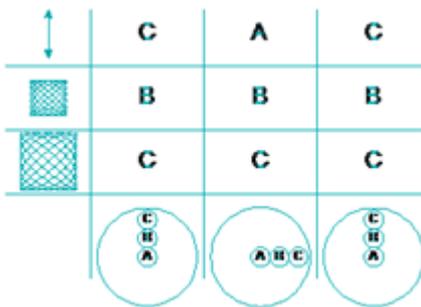
You can stop the instrument at any time by pressing the **Stop** key. The Emergency Stop button will also stop the instrument. The Emergency Stop button must be reset before the instrument will start again.

## Using the Totalisers

This sections illustrates how to Select, Reset, Reset All and Hold the Totaliser Counters.

Select a TOTALISER	Press <b>1</b>	→ <b>#1 123</b>	TOTALISER #1 is displayed
Reset a TOTALISER	Press <b>Reset</b>	→ <b>#1 0</b>	TOTALISER #1 is reset to zero
Reset ALL TOTALISERS	Press <b>Reset</b> 2s	→ <b>#1 0</b>	ALL TOTALISER are reset to zero
Turn a TOTALISER On or Off	Press <b>Hold</b>	↔ <b>1</b> ↔ <b>1</b>	Station key #1 changes colour: Green=On, Red=Off
Turn all TOTALISERS On	Press <b>Hold</b> 2s	→ <b>1 2 3</b> → <b>1 2 3</b>	All Red Station keys turn green

## Changing the Rubbing Motion



The instrument is supplied with the Drive Pegs in position C ready for abrasion testing. To change the motion, remove the Top Plate and set the Drive Pegs as required: Straight Line, 24mm Lissajous or 60.5mm Lissajous.

Typically the 60.5mm Lissajous motion is used for abrasion tests and the 24mm Lissajous motion for pilling tests, however, there are some exceptions so check the test method.

It takes 16 rubs to make a complete Lissajous figure.

## Less Frequently Used Functions / Preferences

The less frequently used functions can be accessed by pressing the alt key followed by a number key 1 - 9.

1. LCD display contrast
2. Rotational Speed
3. Language for sound prompts
4. Type of sound
5. Auto restart after power off
6. (Not used)
7. Current time
8. Current date
9. Finish time for current preset (will give also date if not today)



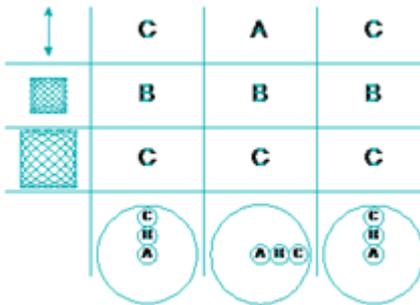
## Introduction to Applications

This information is supplied to aid the user carry out testing in conjunction with standards and test methods. Therefore it is not a replacement for these documents. The information and advice supplied is of a generic form and for more specific and detailed information the standards, test methods and specifications should be consulted. Information is provided for:

Abrasion Test  
Pilling Test  
Sock Abrasion Test

*Typical Standard*  
EN ISO 12947 (parts 1 to 4)  
EN ISO 12945-2  
EN 13770

## Abrasion Test



Set the motion to Abrasion by setting all three (3) the Drive Pegs in position C, large Lissajous.



### Abrading Table Preparation:

Remove the Top Plate or use the Jog key to provide easy access to the Abrading Table.

Remove any material such as yarn or fibrous debris from the Abrading Table.



Place a 140mm diameter piece of Felt centrally on the Abrading Table.

The Felt need only be replaced when damaged or excessively soiled.



Place a 140mm diameter piece of SM25 Abrasive Cloth, face up, and centrally on the Felt.

If the SM25 Abrasive Cloth is creased it should not be used.

The SM25 Abrasive Cloth is replaced after each test. Some standards also state replacing the Abrasive Cloth after each 20000 or 50000 rubs if the test exceeds this number of rubs.



Carefully place the Pressing Weight centrally on to the SM25 Abrasive Cloth, taking care not to move Felt and SM25 Abrasive Cloth.



Place the Quick-Lock Clamp Ring onto the three (3) locking pins and twist in a clockwise manner and with a slight downward force.

Check the edge of the Abrasive Cloth is retained by the Clamp Ring. If the edge protrudes, reposition the Felts and Abrasive Cloth centrally before re-clamping.

Remove the Pressing Weight.

#### **Specimen Holder Preparation:**

Place the Sample Holder Nut in the Block Spanner.



Place the 38mm diameter specimen, face down, centrally into the Sample Holder Nut.

Creased or damaged specimens should not be used.

Avoid excessive handling of the specimen.



Place the 38mm diameter piece of Polyetherurethane (PU) Foam centrally into the Sample Holder Nut on top of the specimen.



Carefully place the Sample Holder Insert in to the Specimen Holder Nut, on top of the PU Foam.



Place the Sample Holder Body on to the Sample Holder Nut and carefully engage the screw threads.

With the screw threads engaged, apply a slight down ward force while at the same turning the Sample Holder Body in the clockwise direction until tight.



Check the specimen is securely held and none of its edge protrudes out of the Sample Holder Nut.

Insert the Spindle into the Sample Holder Body. The end with an o-ring should be inserted.

Add the correct Loading Weight, either 9kPa or 12 kPa, and tighten the grub screw using the tool provided.



Place a loaded Sample Holder on each of the Abrading Tables.

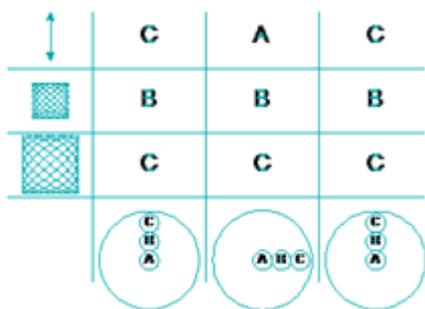
Select the Loading Weight, 9 kPa or 12 kPa, appropriate to the test to be performed and insert the Spindle through the bearing housing in the Top Plate. Locate the Spindle in the Sample Holder bush and press the Spindle down so it is fully located.



A fully loaded Midi-Martindale 905.

Typically, an abrasion test requires four (4) specimens to be tested. The fifth (5<sup>th</sup>) head is provided for additional assessments such as Colour Change or Change in Appearance, for example, Colour Change at 5000 rubs.

## Pilling Test



Set the motion to Pilling by setting all three (3) the Drive Pegs in position B, small Lissajous.



### Abrading Table Preparation:

Remove the Top Plate or use the Jog key to provide easy access to the Abrading Table.

Remove any material such as yarn or fibrous debris from the Abrading Table.



Place a 140mm diameter piece of Felt centrally on the Abrading Table.

The Felt need only be replaced when damaged or excessively soiled.



The pilling test can be carried out in two (2) ways: with Abrasive Cloth or with another specimen from the test sample. In this case we are showing a pilling test for apparel fabric.

Place a 140mm diameter piece of the Sample, free of creases, face up, and centrally on top of the Felt.



Carefully place the Pressing Weight centrally on to the Sample, taking care not to move Felt and Sample.



Place the Quick-Lock Clamp Ring onto the three (3) locking pins and twist in a clockwise manner and with a slight downward force.

Check the edge of the Sample is retained by the Clamp Ring. If the edge protrudes, reposition the Felt and Sample centrally before re-clamping.

Remove the Pressing Weight.  
**Specimen Holder Preparation:**

Place the Specimen Mounting Mandrel in the black rubber Retaining Ring.



Place the Specimen face down on the Specimen Mounting Mandrel.

Place a piece of 90mm diameter Felt centrally on the Specimen.



Place the Pilling Sample Holder centrally down on the Specimen and Felt.



Gently press the Sample Holder against the Specimen Mounting Mandrel (use your thumbs to do this) while at the same time rolling up the black rubber Retaining Ring until it grips the Specimen on to the Pilling Sample Holder.

This illustration also shows the Additional Mass, typically only used for testing upholstery fabrics.

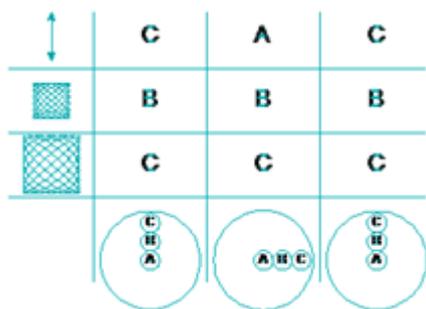




Typically, a piling test requires three (3) specimens to be tested.

The number of rubs is generally very much less than an abrasion test, usually in the range of 125 rubs to 7000 rubs.

## Sock Abrasion Test



Set the motion to Abrasion by setting all three (3) the Drive Pegs in position C, large Lissajous.



### Abrading Table Preparation:

Remove the Top Plate or use the Jog key to provide easy access to the Abrading Table.

Remove any material such as yarn or fibrous debris from the Abrading Table.



Place a 140mm diameter piece of Felt centrally on the Abrading Table.

The Felt need only be replaced when damaged or excessively soiled.



Place a 140mm diameter piece of SM25 Abrasive Cloth, face up, and centrally on the Felt.

If the SM25 Abrasive Cloth is creased it should not be used.

The SM25 Abrasive Cloth is replaced after each test.



Carefully place the Pressing Weight centrally on to the SM25 Abrasive Cloth, taking care not to move Felt and SM25 Abrasive Cloth.



Place the Quick-Lock Clamp Ring onto the three (3) locking pins and twist in a clockwise manner and with a slight downward force.

Check the edge of the Abrasive Cloth is retained by the Clamp Ring. If the edge protrudes, reposition the Felts and Abrasive Cloth centrally before re-clamping.

Remove the Pressing Weight.  
**Specimen Holder Preparation:**

Place the Block Spanner Adaptor on to the fixed Block Spanner.

This is a spring loaded device.



Place the modified Sample Holder Nut on to the Block Spanner Adaptor.



Place the 38mm diameter specimen, face down, centrally into the modified Sample Holder Nut.

Creased or damaged specimens should not be used.

Avoid excessive handling of the specimen.



Place the Pinned Ring, needles first, down through the specimen into the holes in the modified Sample Holder Nut.

PU Foam is not used.





Place the hard rubber Precision Ball with the 20mm diameter end making contact with the specimen.



Place the Sample Holder Body on to the Sample Holder Nut and carefully engage the screw threads.

With the screw threads engaged, apply a slight downward force while at the same time turning the Sample Holder Body in the clockwise direction until tight.



Check the specimen is securely held. Note how the specimen protrudes out of the Sample Holder Nut.



Mounted Sample Holder, complete with Spindle and Loading Weight.

Typically only the Loading Weight marked “12 kPa” is used. This gives an actual pressure on the specimen of 23.86 kPa.

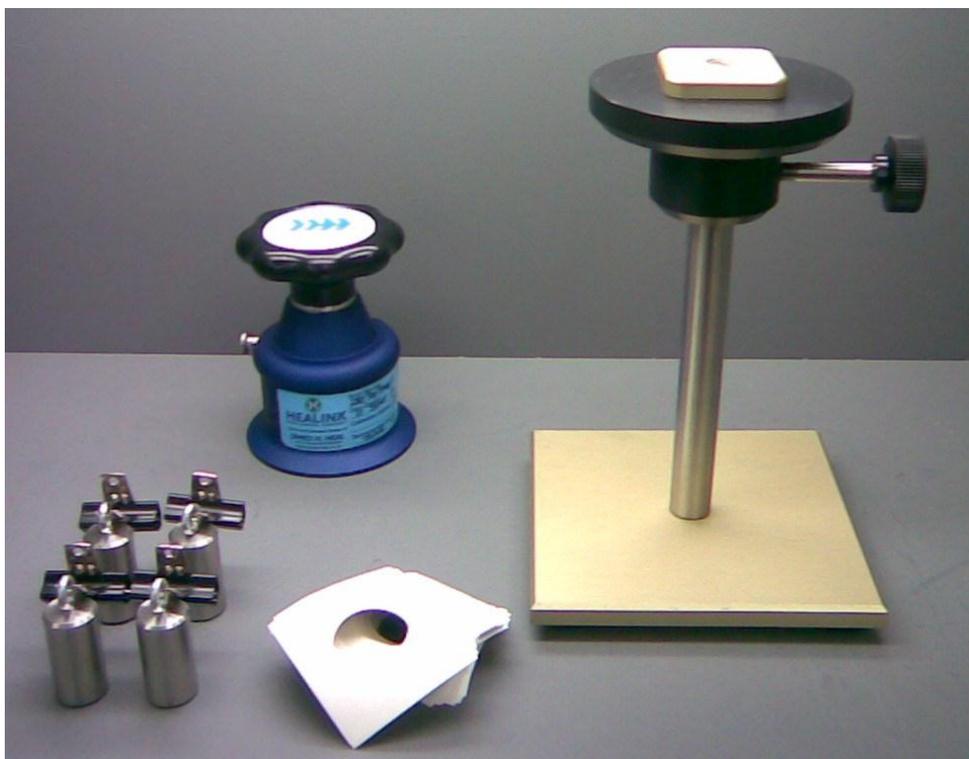
Test four (4) specimens.

## Mounting Easily Stretched Materials

This device and procedure can be used to mount specimens which are easily stretched (and therefore easily distorted) and specimens which curl (or roll up) after cutting.

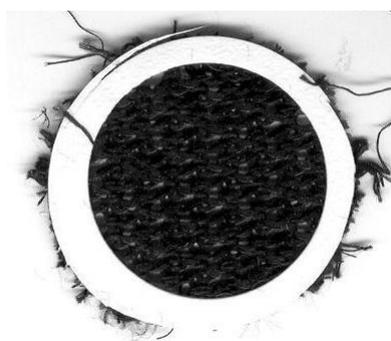
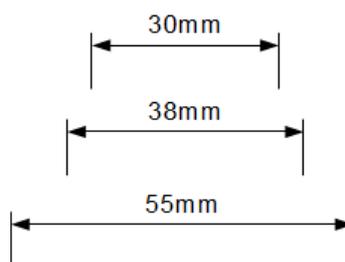
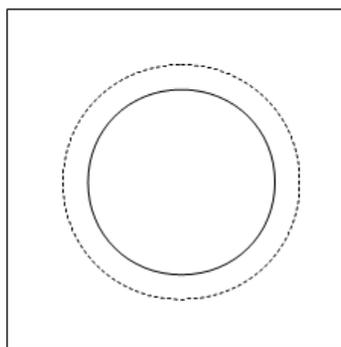
The device is specified in Annex A of ISO 12947-2.

The test specimens of dimensions 60 x 60 mm are cut out or stamped in square shape parallel with the stitches or threads, conditioned and placed on the square table mount measuring 45 x 45 mm of the test bed with the side to be abraded facing downwards. A clip of 30 mm edge length is placed on each of the four sides of the test specimen hanging over the table, secured and a weight hung on each clip without stretching the specimen. The four weights are placed on the bracket that can be lowered. The mass of each weight complete with clamp is 100 g. The clamps and weights are then lowered and raised three times in quick succession so that the test specimen is subjected to loading (extended) three times by the four weights and the load released. The bracket is then lowered again with renewed loading (extension) of the test specimen. In this state a square foil measuring about 55 x 55 mm and which has a 30 mm diameter hole in the centre is pressed on to the extended test specimen and affixed to it by means of the adhesive. The bracket is then raised again. The weights are removed from the specimen, the specimen is removed from the mounting device and the test specimen size of 38 mm stamped or cut out for the abrasion test. Care is to be taken that the hole of 30 mm diameter stamped in the foil is precisely centred so that the stamped out specimen is held in the lightly extended state by a foil circle 4 mm wide. To prevent the circular adhesion area loosening, the test specimen is mounted in the specimen holder immediately after stamping or cutting.



794-512 Specimen Mounting Device and 902-222 Sample Cutter 38mm

## PVC clear foil



Example of prepared specimen

## Cutting Template for Stretch Mounting Device

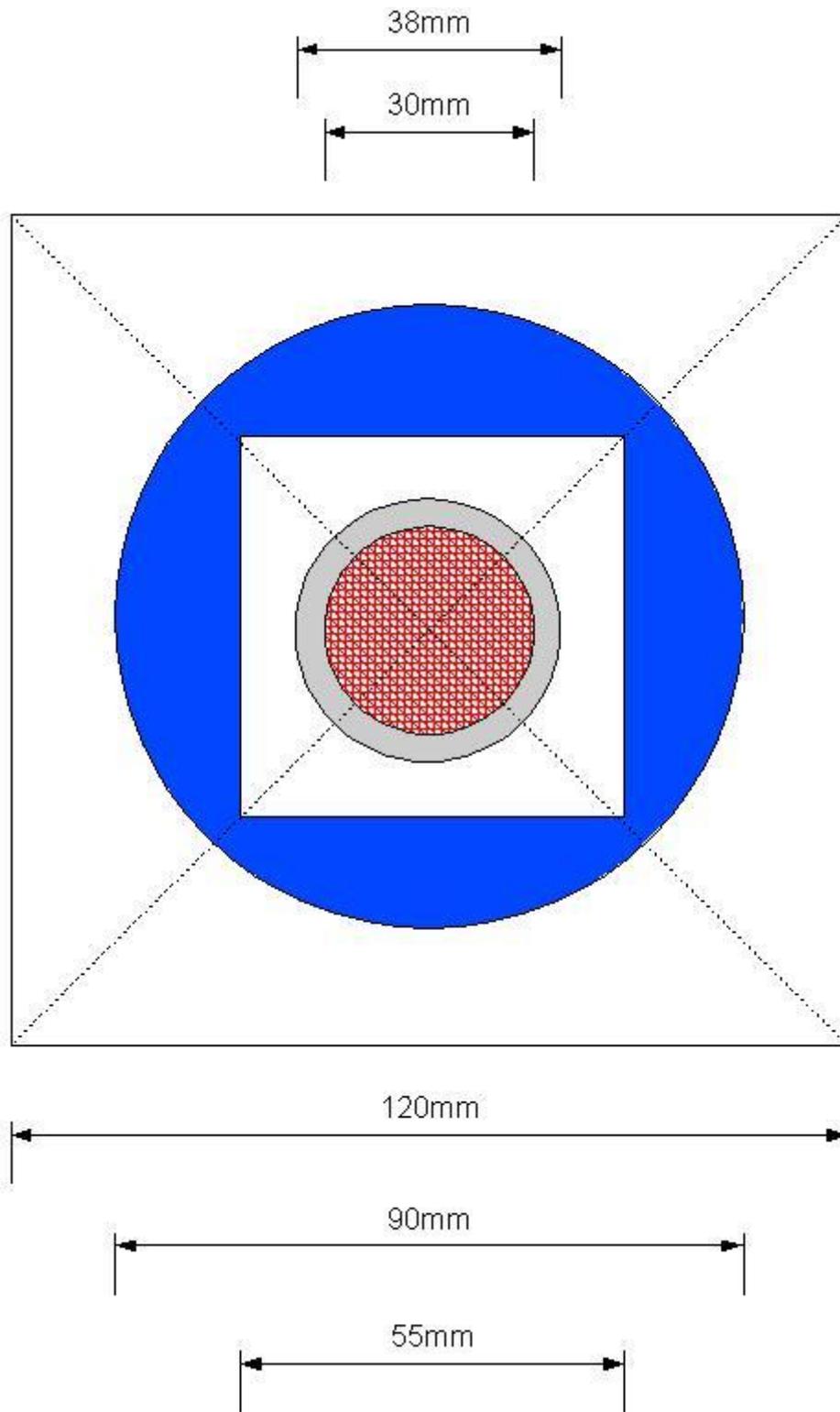
See next page for template for printing.

Paper Template 120mm x 120mm, with 90mm diameter circle surrounding a 55mm square about a common centre, drawn on it.

Outer case diameter of Cutter is 90mm.

Inner diameter of foil 30mm.

Sticky foil square 55mmx55mm.



(Actual size for printing)

## Accessories

<b>Abrasion</b> 794-516	<b>EN ISO 12947</b> <b>Abrasion Station Kit</b> , comprising: 1 x Sample Holder 1 x 9 kPa Weight 1 x 12 kPa Weight 2 x Spindle	} Recommended minimum order quantity: 4
902-222	<b>Circular Sample Cutter</b> , 38mm diameter For the rapid and accurate preparation of 38mm diameter test specimens	
766-200	<b>HEAL'S Grey Scale for Assessing Colour Change</b> , ISO 105-A02 For assessing the change in colour of test specimens during the abrasion test	
788-761	<b>Lissajous Figure Marker Pen</b> For checking the Lissajous Figure according to EN ISO 12947-1	
788-760	Lissajous Figure Recording Paper - per pack (50)	
794-512	<b>Mounting Device for Easily Stretched Fabrics</b> Supplied complete with 4 weights and 50 foils	
785-507	Additional Foils - per pack (50)	
<b>Pilling</b> 794-517	<b>EN ISO 12945-2</b> <b>Pilling station Kit</b> , comprising: 1 x Sample Holder 1 x Sample Retaining Ring 1 x Ring Weight 1 x Spindle	} Recommended minimum order quantity: 3
525-256	<b>Specimen Mounting Mandrel</b> This is an essential accessory for mounting specimens for the pilling test	
766-451	<b>Full Set EMPA Photographic Standards</b> This complete set contains 3 x 4 mounted photographs for woven fabrics and 3 x 4 for knitted fabrics	
<b>Sock Abrasion</b> 794-518	<b>EN 13770 Method 1</b> <b>Sock Abrasion Station Kit</b> , comprising: 1 x Sock Sample Holder 1 x Pinned Ring 1 x Precision Ball 1 x Spindle	} Recommended minimum order quantity: 4
525-311	<b>Block Spanner Adaptor</b> (for Sock Abrasion - one per instrument)	
526-041	<b>12 kPa Weight (one per kit)</b> - per weight	
<b>Abrasion &amp; Pilling</b> 902-221	<b>Sample Cutter</b> , 140mm diameter For the rapid and accurate preparation of 140mm diameter upper and lower specimens for the pilling test	

## Test Materials

### Abrasion

701-202	Pack (5m) SM25 Abrasive Cloth
701-203	Roll (50m) SM25 Abrasive Cloth
701-207	Pack (100) Pre-cut Discs of SM25 Abrasive Cloth
714-602	Pack (20) Nonwoven Felt Pads (140mm diameter)
714-612	Pack (20) Woven Felt Pads (140mm diameter)
786-256	Pack (2000) Pre-cut Discs of Polyetherurethane Foam (38mm diameter)

### Pilling

714-602	Pack (20) Nonwoven Felt Pads (140mm diameter)
714-612	Pack (20) Woven Felt Pads (140mm diameter)
714-601	Pack (20) Nonwoven Felt Pads (90mm diameter)
714-611	Pack (20) Woven Felt Pads (90mm diameter)
356-301	Pack (10) Sample Retaining Rings
701-202	Pack (5m) SM25 Abrasive Cloth

### Sock Abrasion

393-254	Pack (2) Spare Precision Balls
701-202	Pack (5m) SM25 Abrasive Cloth
714-612	Pack (20) Woven Felt Pads (140mm diameter)

## Calibration

### Sock Abrasion

202-409	UKAS Certificate of Calibration for Martindale (up to 10 stations) - Textile
201-828	ISO Certificate of Calibration for Sock Abrasion Station Kit (up to 4 kits)
201-920	ISO Certificate of Calibration for Sock Abrasion Station Kit (up to 8 kits)

## Safety

- 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 902	40 kg
Midi-Martindale 905	59 kg
Maxi-Martindale 909	80 kg

- The 900 Series Martindales comply with the CE regulations in full. See Compliance Statements.
- The 900 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.
- Care should be taken when lifting the Top Plate.
- Care should be taken to prevent anything heavy (e.g., weights) from impacting on the Control Panel.
- Care should be taken to avoid placing the hand between the Abrading Stations and the Top Plate whilst in motion.
- Leave sufficient space around the instruments to allow unrestricted and safe operator access. See Installation section.

## 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.

## 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 900 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 a 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.



### Service & Calibration Support

The Martindale 900 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 : [support@james-heal.co.uk](mailto:support@james-heal.co.uk) for further details.

### Replacement Parts (Spares)

130-825	Fuse 1A
130-853	Fuse 2A
195-425	VDR Assembly
526-100	Spindle Guide Assembly (with Needle Roller Bearings fitted)
525-258	Spindle fitted with o-ring
304-663	Liner Bush
526-007	Drive Peg
526-009	Bearing Pad
383-400	480T Timing Belt
383-399	560T Timing Belt
383-398	880T Timing Belt
786-707	900 Series Martindale Grease - per pot (approx. 50 g) (includes plastic spatula)

## 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.

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

	<b>Depth</b>	<b>Height</b>	<b>Width</b>	<b>Weight</b>
<b>Mini-Martindale 902</b>	670 mm	320 mm	460 mm	40 kg
<b>Midi-Martindale 905</b>	670 mm	320 mm	700 mm	59 kg
<b>Maxi-Martindale 909</b>	670 mm	320 mm	890 mm	80 kg

## Identification of Parts



This illustration shows a Midi-Martindale 905. Parts on the Maxi-Martindale 909 look identical.

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.



Support Bars have been removed and fitted to rear of instrument.

Abrading Tables

Clamp Rings

Support Towers with Bearing Pads (support for Top Plate)

Block Spanner



Control Panel

Motor Housing (do not cover the ventilation slot)

Drive Pegs (position can be 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



Instruments fully loaded with Sample Holders:

Loading Weight (on Spindle)

Finger Grips (to aid lifting Top Plate)

Top Plate with Perspex Guard Plate

Bearing Housing (Needle Bearing)

Sample Holder



Control Panel of Midi-Martindale 905



Control Panel of Maxi-Martindale 909

## 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 905 and 909		
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 <sup>2</sup>	
Batteries	All types including standard alkaline and lithium coin or button style batteries	
Mercury containing components	e.g. mercury in lamps, display backlights, switches, batteries	
Liquid Crystal Displays (LCD) with a surface greater than 100cm <sup>2</sup>		
Cathode Ray Tubes		
Capacitors/condensers (containing PCB/PCT)		
Electrolytic Capacitors/Condensers measuring greater than 2.5cm in diameter or height		
External electrical cables and cords		
Gas Discharge Lamps		
Plastics containing Brominated Flame Retardants		
Components and waste containing asbestos		
Components and parts containing toner and ink, including liquids, semi-liquids (gel/paste) and toner		
Components parts and materials containing refractory ceramic fibres		
Components parts and materials containing radioactive substances		

#### Required Tools

The table lists the tools that would typically be required to disassemble the product to a point where components and materials requiring selective treatment can be removed.

Tool Description	Notes

#### Product Disassembly Instructions

The table lists the basic steps that you should follow to remove components and materials requiring selective treatment.

Step	Process
1	
2	
3	

## CE Compliance

The 900 Series of Martindale Abrasion and Pilling Testers are CE marked. It therefore complies with the following directives:

- Machinery Directive 2006/42/EC
- Low Voltage Directive 2006/95/EC
- Electromagnetic Compatibility Directive 2004/108/EC

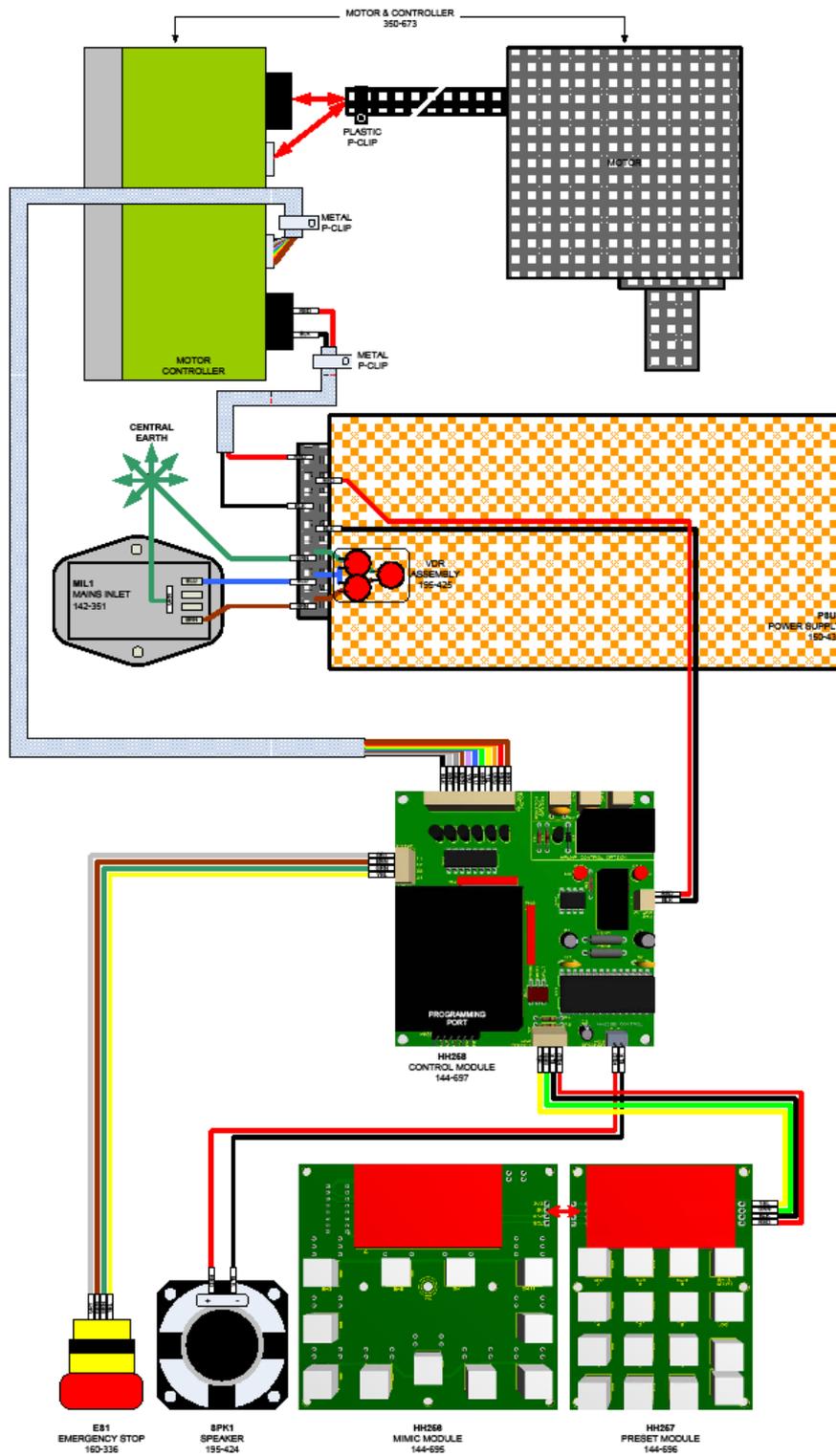
## Specifications

Mode of Operation	Abrasion	Pilling	Sock Abrasion
Standard	EN ISO 12947	EN ISO 12945-2	EN 13770
Number of specimens	Model 902T - up to 2 Model 905 - up to 5 Model 909 - up to 9		
Exposed area of test specimen	6.45 cm <sup>2</sup>	64.5 cm <sup>2</sup>	3.14 cm <sup>2</sup>
Working pressure on test specimen	9 kPa (apparel) 12 kPa (upholstery)	2.5 cN/cm <sup>2</sup> (knitted) 6.5 cN/cm <sup>2</sup> (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

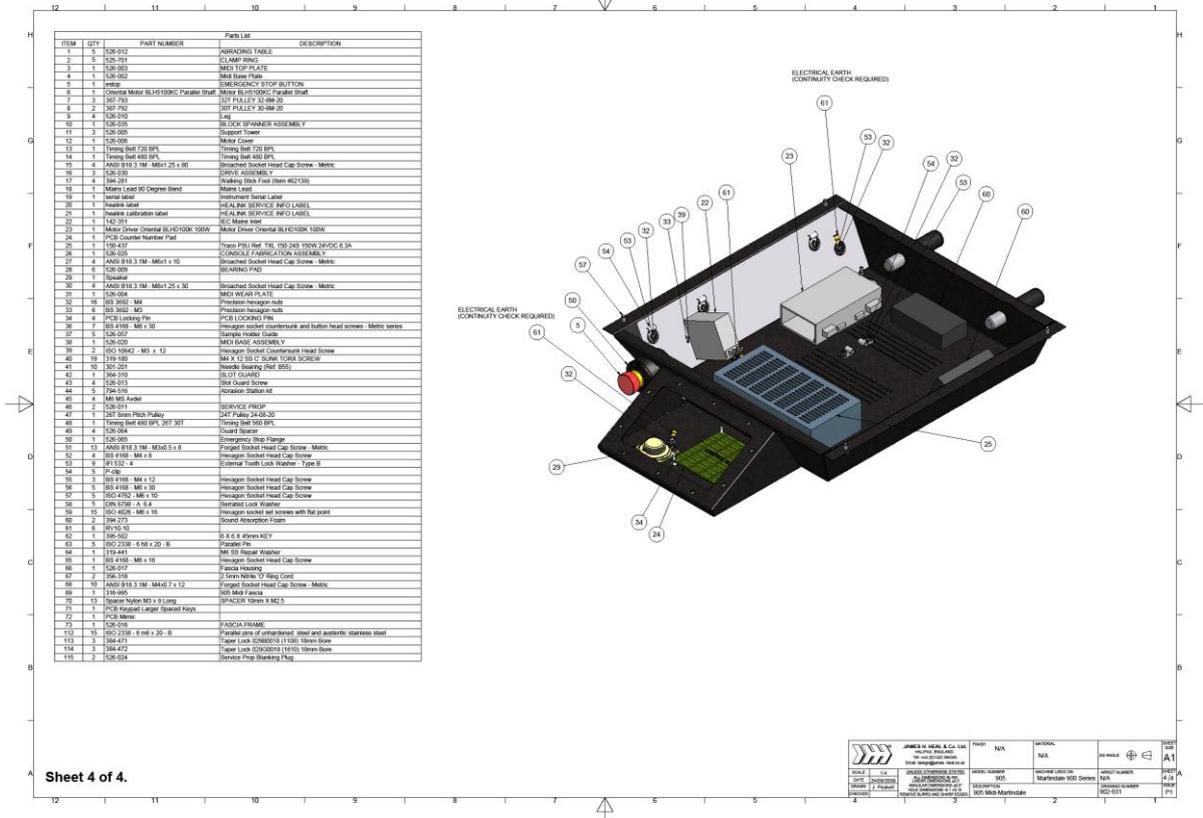
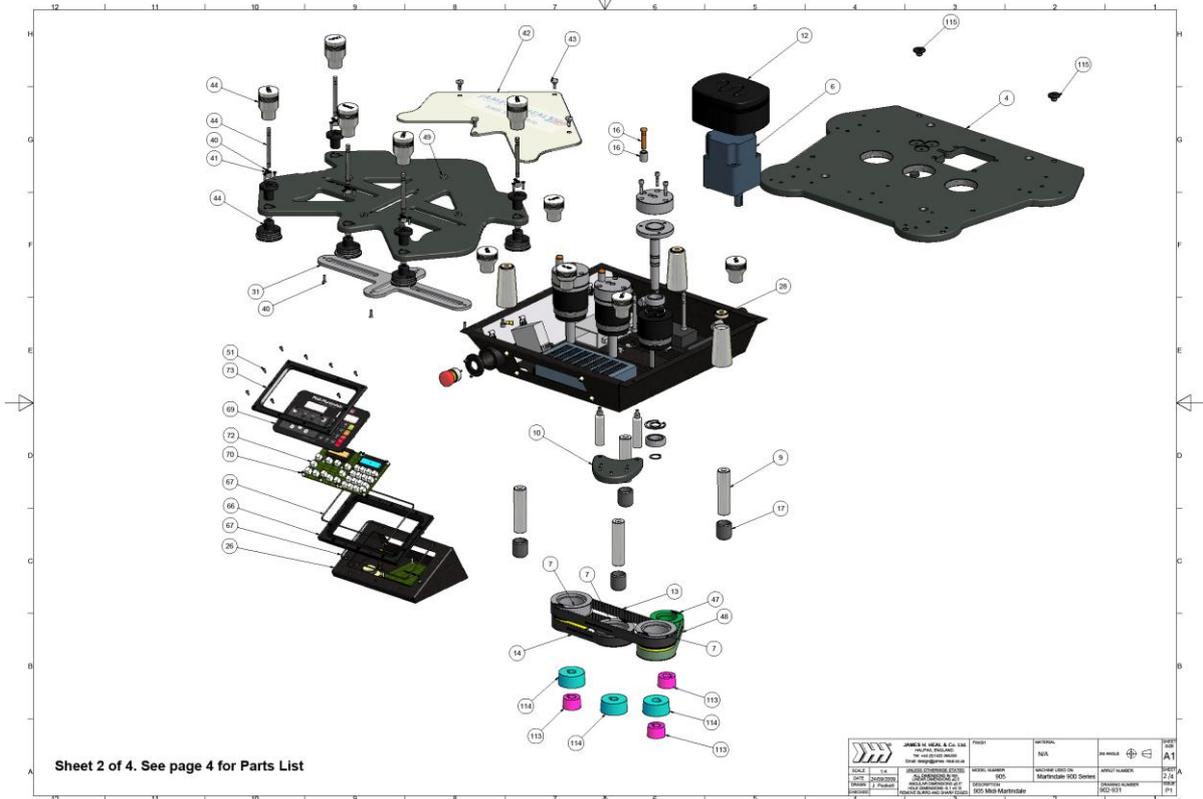
	Depth	Height	Width	Weight
Mini-Martindale 902	670 mm	320 mm	460 mm	40 kg
Midi-Martindale 905	670 mm	320 mm	700 mm	60 kg
Maxi-Martindale 909	670 mm	320 mm	890 mm	80 kg

# Electrical Scheme



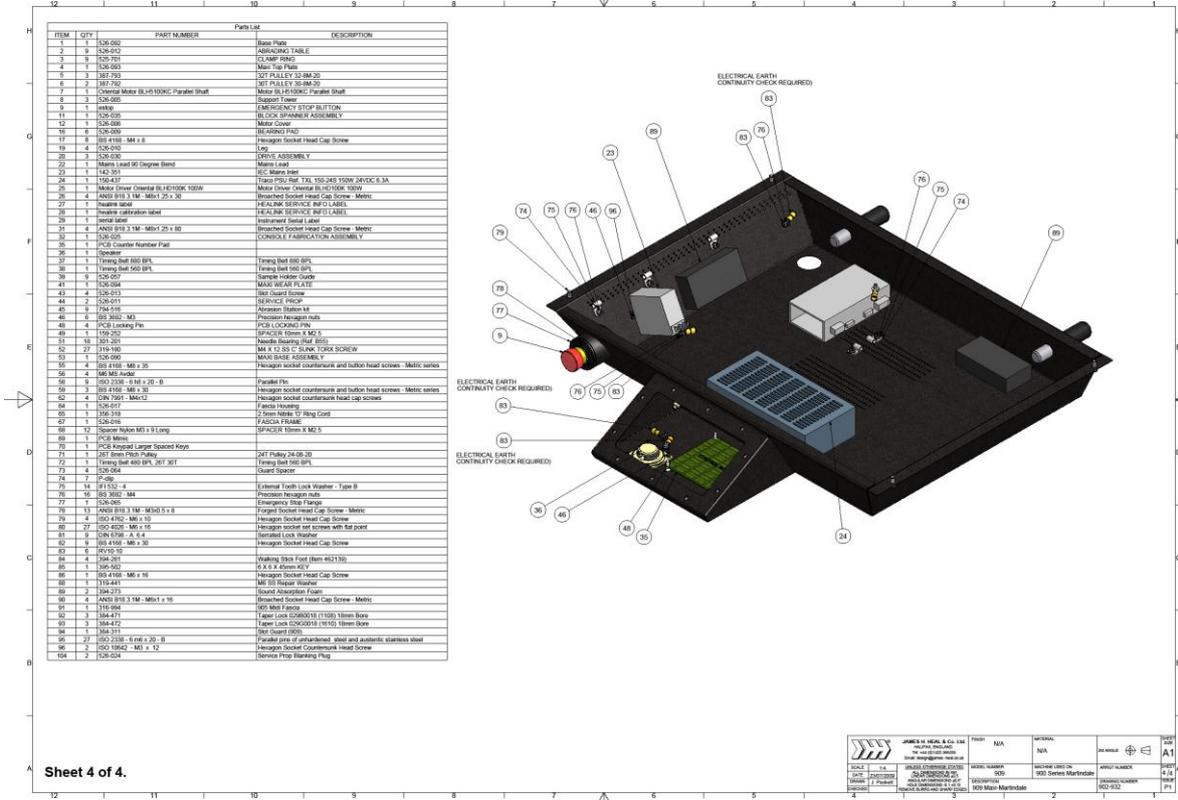
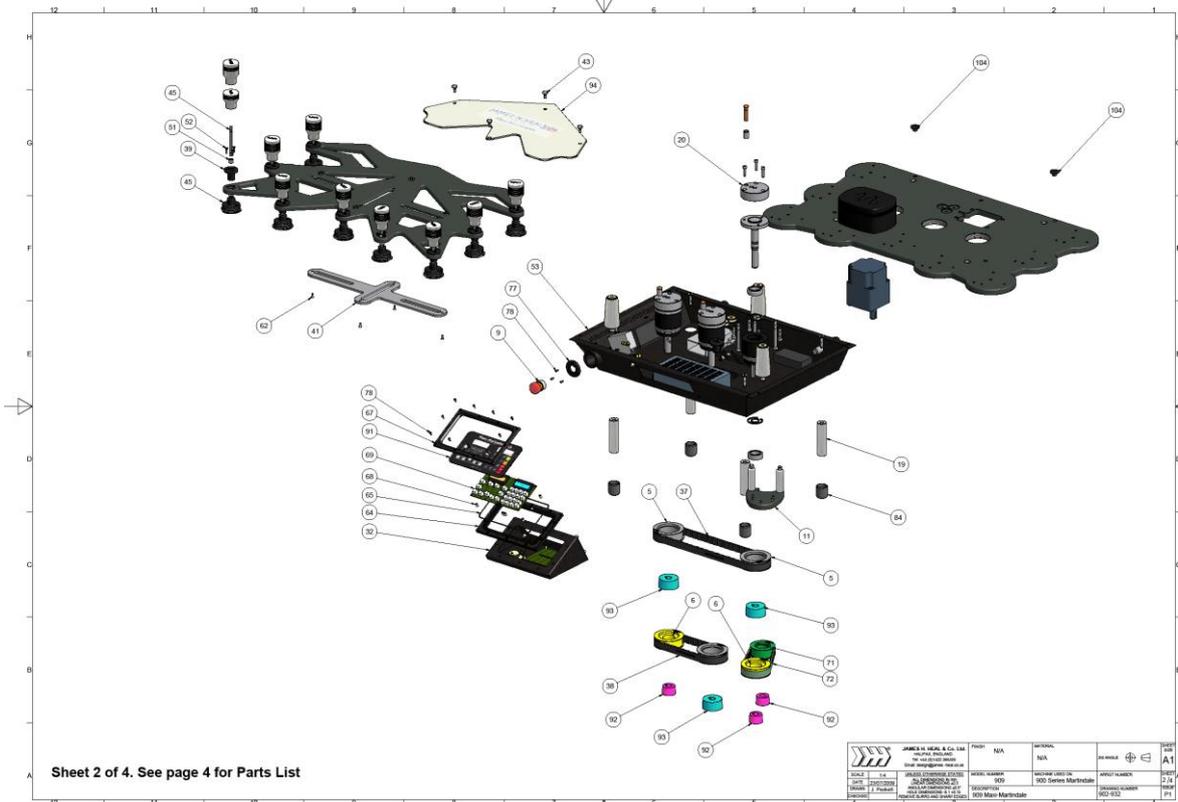
# Exploded Diagrams - Midi-Martindale 905

In electronic format, use the zoom feature to see in greater detail.



# Exploded Diagrams - Maxi-Martindale 909

In electronic format, use the zoom feature to see in greater detail.



## Revision History

See front cover for Publication number, e.g., 290-909-1\$A.

The letter following the dollar symbol shows the revision status of the document.

Rev	Date	Originator	Details of revision
A	11-06-10	PG	First release
B	03-12-10	PG	Updated to include 902T Standards list updated
C	17-05-11	PG	New graphic page 8, change to Speed options
D	10-04-12	PG	Service & Calibration / User Servicing Replacement Parts (Spares)
E	01-06-12	PG	Major update to document appearance (rebranded).