

**OPERATOR'S GUIDE**

**Mini-Martindale Abrasion Tester  
The 902PV for Highly Polished Surfaces**



Covering Serial Numbers:  
902PV/11/1001 and upwards

James H. Heal & Co. Ltd  
Halifax, England

**Setting the Standard**



THE QUEEN'S AWARDS  
FOR ENTERPRISE:  
INTERNATIONAL TRADE  
2012

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# Introduction to the Martindale 900 Series

## 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, Quality Assured Consumables, excellent Customer Service and Support. You are part of a growing global community who considers 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.

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



## Features and Benefits

A commitment to continuous investment in the latest design and manufacturing technology enables HEALS 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:

- Can be used for many other applications
- 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)
- UKAS Calibration by HEALINK
- Standard 18 months warranty
- Real value for money

## Standards

The 902PV Mini-Martindale Abrasion Tester complies with the following standard(s):

- PV 3975 December 2010

The 902PV Mini-Martindale is as described in ISO 12947-1 and ISO 12945-2.

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



# Getting Started

## Introduction

In response to market demand Heals have designed and manufactured the Martindale 900 Series™ of Abrasion 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 902PV which is primarily designed for the testing of wood, high-pressure laminates and similar substrates.

## The Control Panel

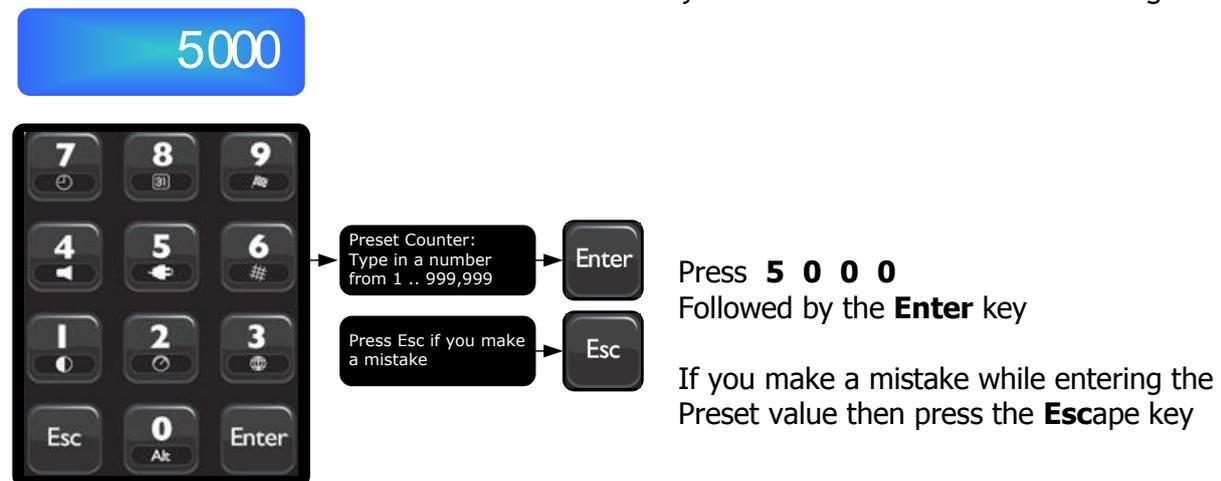


## Using the Control Panel

The following gives brief instructions for setting the Preset Counter and using the Totalisers. To use the more advanced features consult section 4: Detailed Operation in the 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.

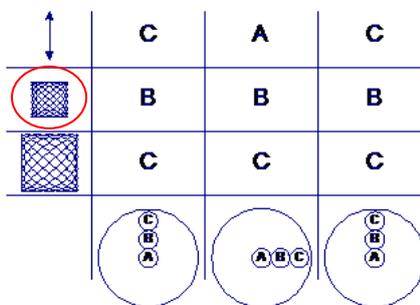


# Using the Totalisers

This section 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 2s</b>	→ <b>#1 0</b>	ALL TOTALISER are reset to zero
Turn a TOTALISER On or Off	Press <b>1</b> ↔ <b>Hold</b> ↔ <b>1</b>		Station key #1 changes colour: Green=On, Red=Off
Turn all TOTALISERS On	Press <b>Hold 2s</b>	<b>1 2 3</b> → <b>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.

It takes 16 rubs to make a complete Lissajous figure.

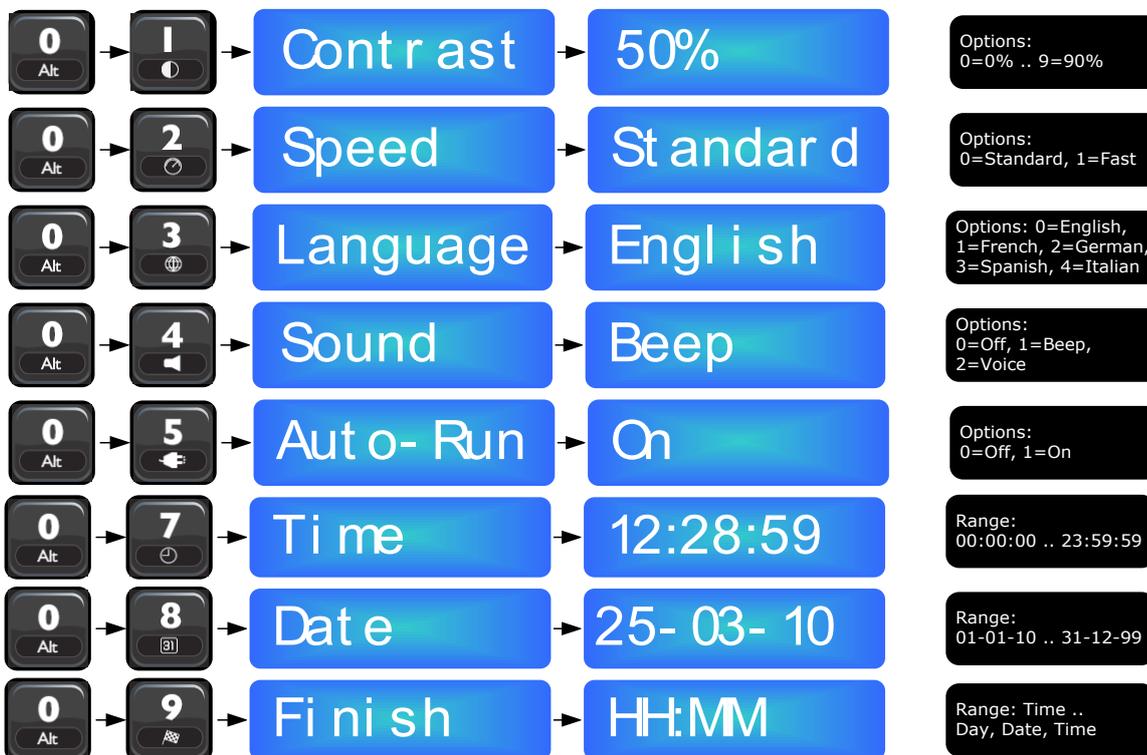


# Detailed Operation

## 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)



## 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 PV 3975 (draft) *Scheuerfestigkeit von Hochglanzoberflächen im Fahrzeuginnenraum*.

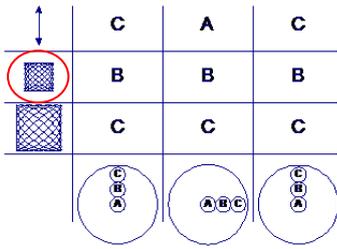
## Scratch Resistance Test

### Summary

The specimen is fixed on a horizontal Abrading Table. A circular polishing cloth fixed in a Holder rubs on the specimen with a defined load/force and motion. The Holder moves perpendicular to the Abrading Table in a translational movement tracing a Lissajous figure. The Holder is additionally free to rotate around its own axis perpendicular to the horizontal plane. The specimen is exposed to the polishing material for a predetermined number of rubs after which any changes to the surface of the specimen are assessed.

### Details

Test Parameter	
Scratch Material - Polishing Cloth 3M reference Colour	281Q WOD Schleifpapier, 9mic, 215,9 mm × 279 mm Blue
Holder for Scratch Material	Abrasion Sample Holder 12 kPa
Width of Lissajous Figure	24 mm
Speed Factor	1
Numbers of Rubs Number of Cycles	160 10
Assessment	Gloss Change using Reflectometer



Assemble the Martindale Abrasion Tester so that all three (3) of the Drive Pegs are in position B indicated in the diagram to the left.

This will produce a large Lissajous with a width of 24mm.

(Position C produces a large Lissajous of 60.5mm).



Ensure the Abrading Tables are free from adhesive residues.



Replace the Top Plate.



Set the Counter to run for 160 rubs.  
This is equivalent to 10 cycles.

Using the Block Spanner, prepare the Holder by inserting the Polishing Paper and Foam.



## Accessories and Consumables

### Consumables

786-256 Pre-cut Discs of Foam (38mm diameter) - per pack (approx. 2000)

### Calibration

202-411 UKAS Certificate of Calibration for Mini-Martindale Abrasion Tester (up to 2 positions) - PV3975

### Optional Accessories

788-761 Lissajous Figure Marker Pen  
For checking the Lissajous Figure according to EN ISO 12945-2

788-760 Lissajous Figure Recording Paper - per pack (50)



## Safety and Maintenance

- 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

- Periodically apply a small trace of grease to the drive slots.
- Wipe clean any oxidised or contaminated grease and reapply with fresh general purpose grease.
- Periodically apply one or two drops of light machine oil into the top of the drive pegs.
- 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 and Calibration Support

The Martindale 900 Series of Martindale Abrasion and Pilling Testers are world-class products, fully supported by Service & Calibration Support - our world-leading Maintenance and Calibration Service - covering installation, operator training, regular maintenance, UKAS Calibration and on-line technical and applications support.

Servicing and calibration are available Worldwide - Contact our Service & Calibration Support department for further details.

Service & Calibration Support email : [support@james-heal.co.uk](mailto:support@james-heal.co.uk)

## Replacement Parts (Spares)

130-825	Fuse 1A (2)
130-853	Fuse 2A (2)
195-425	Voltage Surge Suppressor (1)
526-101	Spindle Guide Assembly with needle bearings (2)
304-663	Liner Bush (3)
383-400	480T Timing Belt (2)
383-405	720T Timing Belt (1)
526-007	Drive Pin (3)
526-009	Bearing Pad (3)



# Installation

## 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 40 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)
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	<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 Mini-Martindale 902PV.



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 Towers with Bearing Pads (support for Top Plate)

Block Spanner



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

Drive Towers

Spare Bearing Pads

Motor Housing (do not cover the ventilation slot)

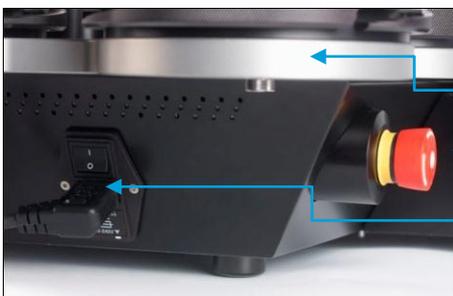


Top Plate

Spindle Bearing (Inverted)

Abrading Tables (Low Profile)

Control Panel



Left-hand side view of instrument.

Base Plate

Emergency Stop Button (front left hand side)

Power Lead connection with Power Switch above



## Technical Data

### 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

Model 902PV		
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

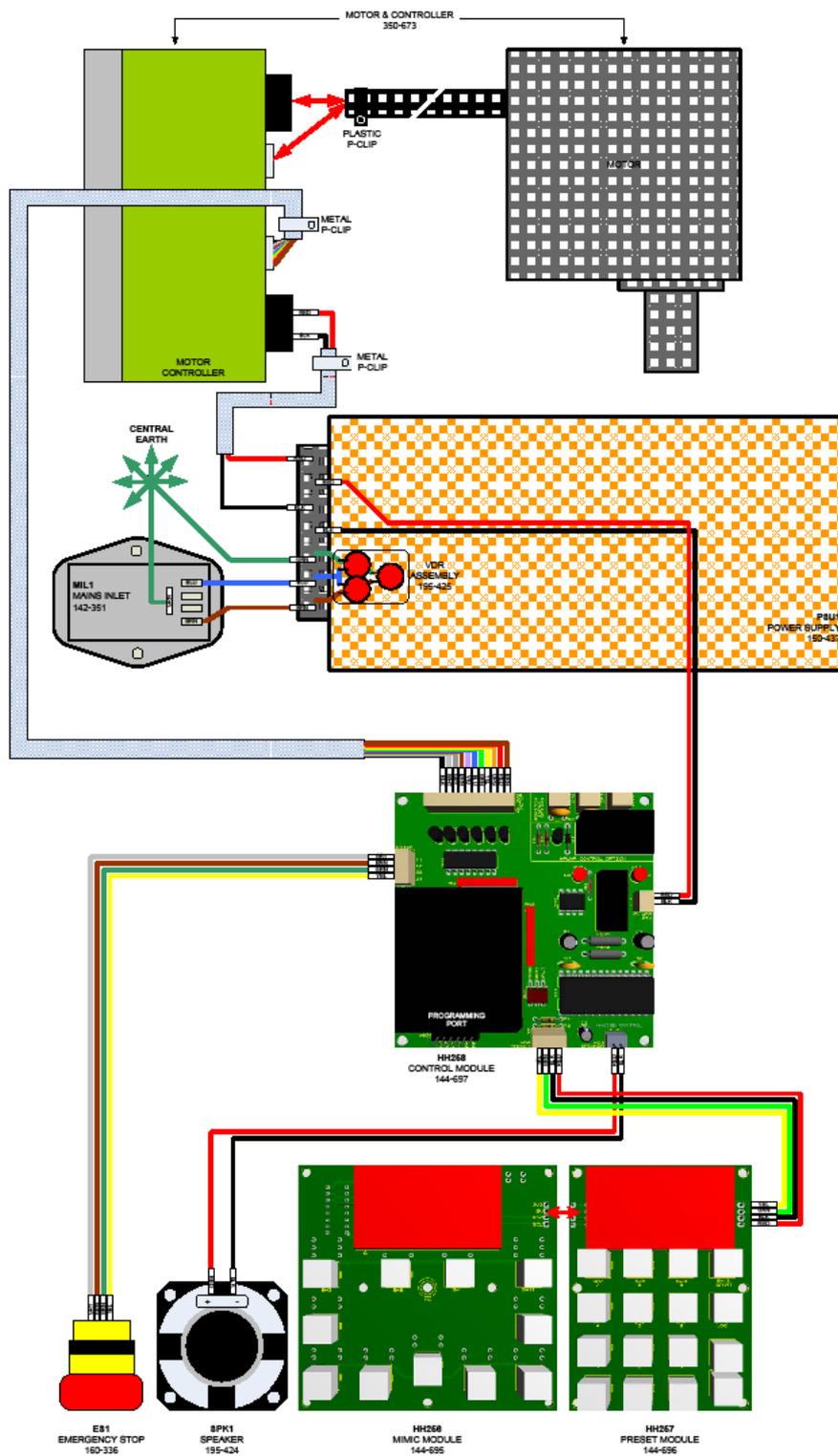
## Specifications

Standard	PV 3975 (draft)
Number of specimens	Up to 2
Exposed area of test specimen	27.72 cm <sup>2</sup>
Working pressure on test specimen	12 kPa
Rotational Speed	47.5 ± 2.5 rpm (optional non-standard x1.5 speed available)
Total stroke of drive units	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
<b>Mini-Martindale 902</b>	670 mm	320 mm	460 mm	40 kg
<b>Midi-Martindale 905</b>	670 mm	320 mm	700 mm	60 kg
<b>Maxi-Martindale 909</b>	670 mm	320 mm	890 mm	80 kg

# Electrical Scheme



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# Exploded Diagrams - Mini-Martindale 902PV

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

ITEM	QTY	PART NUMBER	Part's List	DESCRIPTION
1	1	126-000		Support Tower
2	6	126-009		BEARING PAD
3	1	126-030		DRIVE ASSEMBLY
4	1	126-036		Motor Cover
6	1	126-025		CONSOLE FABRICATION ASSEMBLY
7	1	1095		EMERGENCY STOP BUTTON
8	1	142-011		IC Means Base
9	1	Means Lead 90 Degree Bend		Means Lead
10	1	Healtek Label		HEALTEK SERVICE INFO LABEL
11	1	Healtek Information Label		HEALTEK SERVICE INFO LABEL
12	1	Serial Label		Instrument Serial Label
13	4	126-010		Top
14	2	126-011		SERVICE WINDOW
15	1	Omron Motor BLH5100AC Parallel Shaft		Motor BLH5100AC Parallel Shaft
16	3	101-793		20T PULLEY 32-68-20
17	1	Timing Belt F20 BPL		Timing Belt F20 BPL
18	2	101-792		20T PULLEY 30-48-20
19	1	Timing Belt 480 BPL		Timing Belt 480 BPL
20	1	126-017		Traco PSU Unit, TA, 150-245 150W 24VDC 6.3A
21	1	Motor Driver Oriental BLH2100K 100W		Motor Driver Oriental BLH2100K 100W
22	1	Timed 01 Switch Base		06T Output
23	1	104-312		06T Output
24	4	126-015		06T Output Screw
25	1	BSI 4168 - M6 x 30		Hexagon Socket Head Cap Screw
27	1	20T 5mm Pitch Pulley		20T Pulley 24-60-20
28	1	Timing Belt 480 BPL 26T 26T		Timing Belt 480 BPL
29	1	126-016		Emergency Stop Lamp
30	13	ANSI B11.3 - M6 - M6x0.5 x 8		Forged Socket Head Cap Screw - Metric
31	3	104-071		Upper Lock 12000018 (110) 10mm Base
32	1	119-041		M6 100 Dipper Washer
33	1	BSI 4168 - M6 x 16		Hexagon Socket Head Cap Screw
34	3	104-072		Upper Lock 12000018 (110) 10mm Base
35	1	105-502		6 x 6 x 45mm KTY
36	4	104-081		Making Tool Foot (used 48C150)
37	1	126-017		Fascia Housing
38	1	126-016		FASCIA FRONT
39	1	119-066		06T M6x Fascia
40	13	Spacer Nylon M3 x 9 Long		SPACER Nylon x M3 x 9
41	1	PCB Metric		PCB Metric
42	1	PCB Keypad Larger Spaced Keys		2.5mm Nylon V Ring Cord
43	2	126-018		Quartz Spinner
44	4	126-044		Needle Bearing (Dial 852)
45	1	109-011 Scotch Brite Brick		Scotch Brite Sanding Pad
47	4	101-201		Needle Bearing (Dial 852)
48	2	126-044		Scotch Brite Sanding Pad
51	1	Laminated Floor Sample Large		06T Base Plate
52	1	Laminated Floor Sample Trim		06T BASE ASSEMBLY
53	1	126-313		06T Top Plate
54	1	126-314		06T Top Plate
55	1	126-312		06T Top Plate
56	1	126-064		06T WOOD PLATE
61	2	126-300		Platen (Wood Test)
62	7	BSI 4168 - M6 x 30		Hexagon socket countersunk and button head screws - Metric metric
64	4	BSI 4168 - M6 x 8		Hexagon Socket Head Cap Screw
65	4	ANSI B11.3 - M6 - M6x1.25 x 30		Brass Socket Head Cap Screw - Metric
66	3	ANSI B11.3 - M6 - M6x1.25 x 30		Brass Socket Head Cap Screw - Metric
67	2	126-036		Brushed Lock Washer
68	2	BSI 4168 - M6 x 30		Hexagon Socket Head Cap Screw
69	6	ISO 4026 - M6 x 16		Hexagon socket set screws with flat point
70	2	ISO 2738 - 6.3 x 20 - B		Paralle Pin
71	4	ISO 4762 - M6 x 10		Hexagon Socket Head Cap Screw
72	4	119-180		MM x 12 SS "C" SLANK TORX SCREW
73	4	PCB Locking Pin		PCB LOCKING PIN
74	1	104-070		PCB Locking Pin
75	17	BS 8002 - M6		Precision hexagon nuts
76	1	PCB Counter Number Pad		PCB Counter Number Pad
77	4	06T10-16		External Tooth Lock Washer - Type B
78	8	06T10-4		External Tooth Lock Washer - Type B
79	4	MM M6 Axial		Hexagon Socket Head Cap Screw - Metric
80	4	ANSI B11.3 - M6 - M6x1 x 30		Brass Socket Head Cap Screw - Metric
81	10	ANSI B11.3 - M6 - M6x0.7 x 12		Forged Socket Head Cap Screw - Metric
82	2	104-071		Upper Lock Washer
83	2	ISO 10642 - M3 x 12		Hexagon Socket Countersunk Head Screw
84	2	ISO 9602 - M3		Precision hexagon nuts
85	5	P-06T		06T Standoff (used 1 laminated)
87	1	126-314		06T Standoff (used 1 laminated)
88	6	ISO 4762 - M6 x 20		Hexagon Socket Head Cap Screw
89	2	104-019		Torx Machine Washer Kit (Laminated)
94	3	BSI 4168 - M6 x 12		Hexagon Socket Head Cap Screw

	<b>JAMES H. HEAL &amp; Co. Ltd.</b> 100, Park Road The H.A. Centre, Walsby Great Northwood, Walsby	PART THE 902PV	MATERIAL METAL	DRAWING NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY 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902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1	SCALE 1:1	DATE 10/05/2011	DRAWN BY JH	CHECKED BY JH	APPROVED BY JH	TITLE 902PV	SHEET NO. 1 OF 1	PART NO. 902PV	REVISED 1
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## Revision History

See front cover for Publication number, e.g., 290-902PV-1\$A.  
The letter following the dollar symbol shows the revision status of the document.

Rev	Date	Originator	Details of revision
A	31-05-11	PG	First release
B	22-08-12	PG	Rebranded

