

## OPERATOR'S GUIDE

Mini-Martindale Abrasion Tester  
The 902W for Wood, HPL and Similar Substrates



Covering Serial Numbers:  
902W/10/1001 and upwards

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

Setting the Standard



THE QUEEN'S AWARDS  
FOR ENTERPRISE:  
INTERNATIONAL TRADE  
2012

Publication 290-902W-1\$D  
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Published by:

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## Background

Thank you for investing in the **Martindale 900 Series** from **James H Heal & Co Ltd**.

Heal's 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 Heal's 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
- 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)
- UKAS Calibration by HEALINK
- Standard 18 months warranty
- Real value for money

## Standards

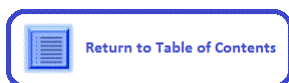
The 902W Mini-Martindale Abrasion Tester complies with the following standards:

- prEN 16094
- 10/30216947 DC (UK equivalent of prEN 16094 from BSI)
- IHD-W-445

The 902W Mini-Martindale is as described in ISO 12947-1.

The Holder for scrub material is as described in ISO 12945-2 and is able to provide a force of 4N or 6N.

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 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 902W 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.

The diagram illustrates the steps to set the preset counter. At the top, a blue display shows '5000'. Below it, a numeric keypad is shown. A callout box says 'Preset Counter: Type in a number from 1 .. 999,999' with an arrow pointing to the 'Enter' key. Another callout box says 'Press Esc if you make a mistake' with an arrow pointing to the 'Esc' key. To the right of the keypad, the text reads: 'Press 5 0 0 0 Followed by the Enter key' and 'If you make a mistake while entering the Preset value then press the Escape key'.

# 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.

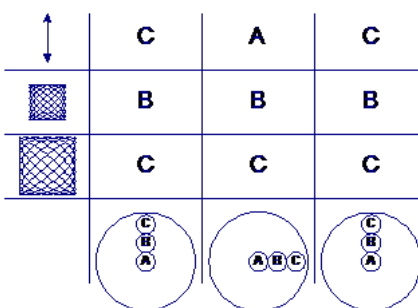
The Emergency Stop button must be reset before the instrument will start again.

# Using the Totalisers

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

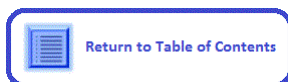
Select a TOTALISER	Press <b>1</b>	→ <b># 1 123</b>	TOTALISER # 1 is displayed
Reset a TOTALISER	Press <b>Reset</b>	→ <b># 1 0</b>	TOTALISER # 1 is reset to zero
Reset ALL TOTALISERS	Press <b>Reset</b> 2s	→ <b># 1 0</b>	ALL TOTALISER are reset to zero
Turn a TOTALISER On or Off	Press <b>1</b> ↔ <b>Hold</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>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.



## 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)



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# Introduction

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 prEN 16094 - Laminate floor coverings - Test Method for the determination of micro-scratch resistance.

## Scratch Resistance Test

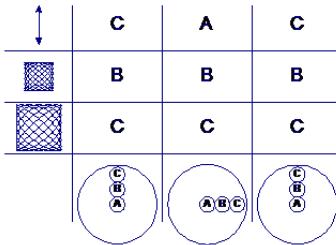
### Summary

The specimen is fixed on a horizontal Abrading Table. A circular scrub material fixed on 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 scrub material for a predetermined number of rubs after which any changes to the surface of the specimen are assessed.

### Details

prEN 16094 describes two procedures, 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 Colour	Very Fine SB 7447 789-672 Maroon	Medium Fine SB 7440 789-671 Brown
Holder for Scrub Material	Version 1 6N Holder + Ring Weight	Version 2 4N Holder only
Speed Factor	1	1
Numbers of Rubs	80	160
Assessment	Gloss Change using Reflectometer	Visual Assessment to scheme in Annex B of prEN 16094



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

This will produce a large Lissajous with a width of 60.5mm.

(Position B produces a small Lissajous of 24mm).



Ensure the Abrading Tables are free from adhesive residues.



Replace the Top Plate.



Using Double-Sided Adhesive Tape, fix the specimen to the Abrading Table.

Using Double-Sided Adhesive Tape, fix the scrub material to the Holder.

Set the Counter to run for 80 rubs.

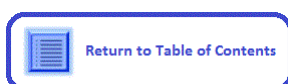
This illustration shows the arrangement for Procedure A.



This illustration shows the arrangement for Procedure B.

Set the Counter to run for 160 rubs.

Note that the additional Ring Weight is not used in Procedure B.



## Recommended Accessories and Consumables

794-519	4 x Station Kits (including weights for 4N loading) for Wood, HPL and Similar Substrates
525-688	4 x Additional Weight for 6N loading
789-671	5 x Pack (10) 3M Scotch-Brite Abradant Pieces (89mm diameter) Type 7440 (Brown)
789-672	5 x Pack (10) 3M Scotch-Brite Abradant Pieces (89mm diameter) Type 7447 (Maroon)
202-402	UKAS Certificate of Calibration for Mini-Martindale Abrasion Tester (up to 2 positions) - Wood

## Optional Accessories

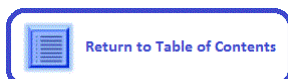
788-761	<b>Lissajous Figure Marker Pen</b> For checking the Lissajous Figure according to EN ISO 12947-1
788-760	Lissajous Figure Recording Paper - per pack (50)

## Consumables

789-671	3M Scotch-Brite Abradant Pieces (89mm diameter) Type 7440 (Brown) for prEN 16094 (Method B) - per pack (10)
789-672	3M Scotch-Brite Abradant Pieces (89mm diameter) Type 7447 (Maroon) for prEN 16094 (Method A) - per pack (10)

## Calibration

202-402	UKAS Certificate of Calibration for Mini-Martindale Abrasion Tester (up to 2 positions) - Wood
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## 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 and 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.

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)



## 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



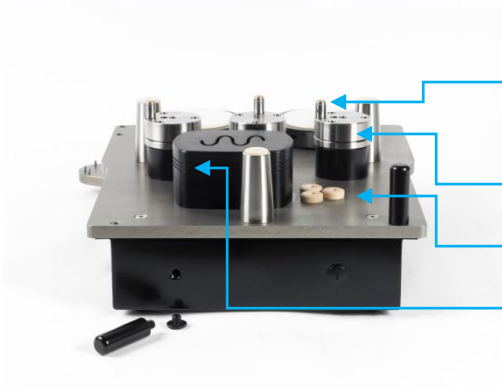
# Identification of Parts

This illustration shows a Mini-Martindale 902W.



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)



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

Abrading Tables

Control Panel



Left-hand side view of instrument.

Base Plate

Emergency Stop Button (front left hand side)

Power Lead connection with Power Switch above

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# 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 902W		
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

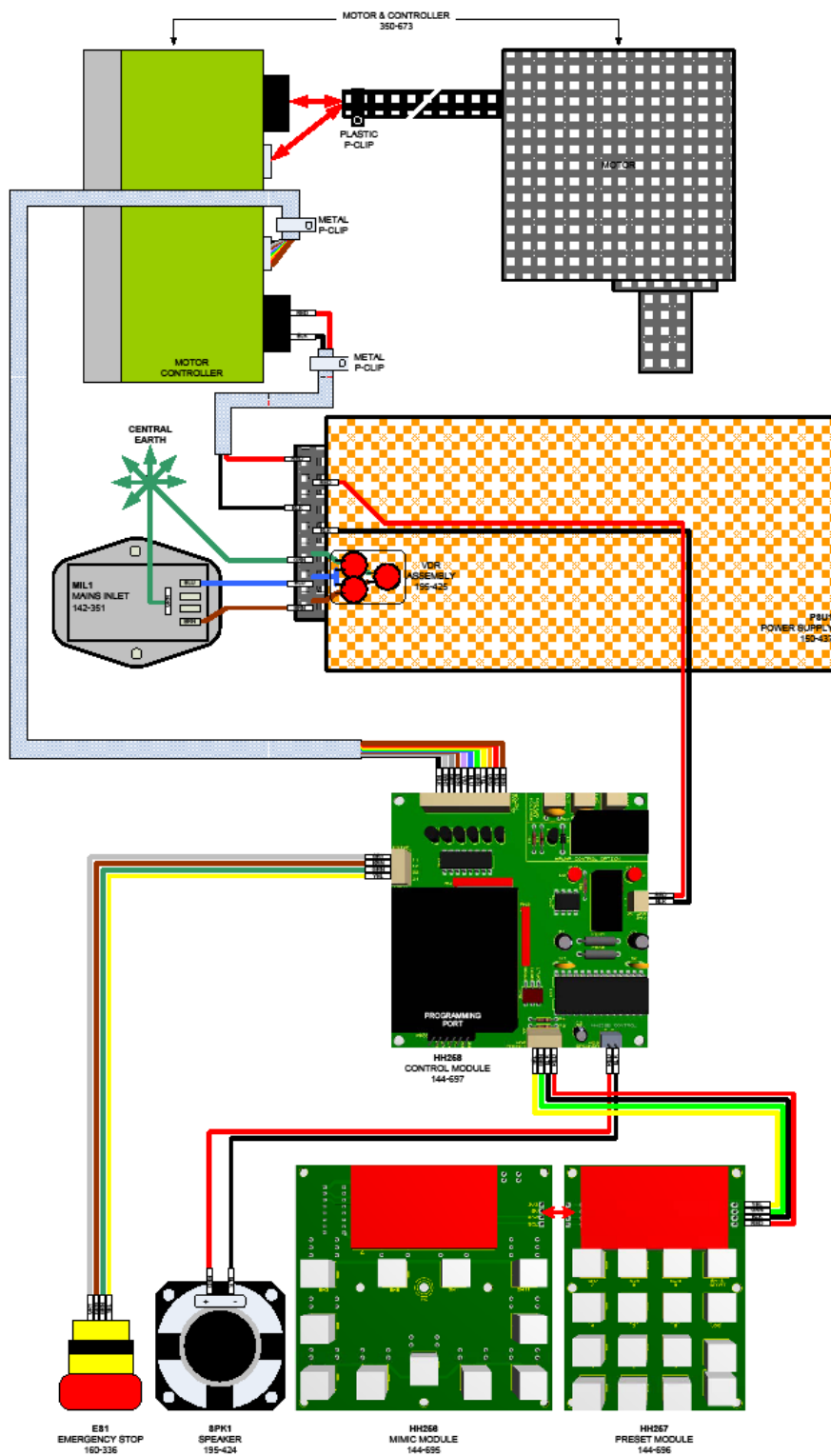
## Specifications

Standard	prEN 16094
Number of specimens	Up to 2
Exposed area of test specimen	144 cm <sup>2</sup>
Working pressure on test specimen	Procedure A 0.63 kPa (4N) Procedure B 0.94 kPa (6N)
Rotational Speed	47.5 ± 2.5 rpm (optional non-standard x1.5 speed available)
Total stroke of drive units	60.5 ± 0.5 mm 24.0 ± 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



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# Exploded Diagrams - Mini-Martindale 902W

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

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	126-001	Support Tower
2	6	126-009	BEARING PAD
3	1	126-030	DRIVE ASSEMBLY
4	1	126-008	Motor Cover
6	1	126-025	CONSOLE FABRICATION ASSEMBLY
7	1	1000	EMERGENCY STOP BUTTON
8	1	142-011	IC Means Base
9	1	Means Lead 90 Degree Bend	Means Lead
10	1	Heater Label	HEATER SERVICE INFO LABEL
11	1	Heater Information Label	HEATER SERVICE INFO LABEL
12	1	Serial Label	Instrument Serial Label
13	4	126-010	Top
14	2	126-011	SERVICE WINDOW
15	1	Motor Motor BLH5100AC Parallel Shaft	Motor BLH5100AC Parallel Shaft
16	3	101-793	20T PULLEY 32-48-20
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	126-011 Switch Box	126-011 Switch Box
23	1	104-312	90T Rot Coupler
24	4	126-015	90T Coupler Screw
25	1	BSI 4168 - M6 x 30	Hexagon Socket Head Cap Screw
27	1	20T 5mm Pitch Pulley	20T Pulley 24-48-20
28	1	Timing Belt 480 BPL 20T 20T	Timing Belt 480 BPL
29	1	126-010	Emergency Stop Latch
30	13	ANSI B11.3 - M6 - M6x0.5 x 8	Forged Socket Head Cap Screw - Metric
31	3	104-471	Taper Lock 12000010 (1.00) 10mm Bore
32	1	119-441	M6 100 Deep Washer
33	1	BSI 4168 - M6 x 16	Hexagon Socket Head Cap Screw
34	3	104-472	Taper Lock 12000010 (1.00) 10mm Bore
35	1	105-502	6 x 6 x 4.5mm KTY
36	4	104-204	Making Tool Foot (used 48C150)
37	1	126-017	Fascia Housing
38	1	126-016	FASCIA FRONT
39	1	119-566	90T M6 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 Nitrile V Ring Cord
43	2	106-516	Quartz Spinner
44	4	126-004	126-011 Scotch Brite Brick
45	1	101-201	Needle Bearing (Def. B52)
46	2	126-004	Service Trap Blanketing Plug
47	4	101-201	Needle Bearing (Def. B52)
48	2	126-004	Service Trap Blanketing Plug
51	1	Laminated Floor Sample Large	Laminated Floor Sample Large
52	1	Laminated Floor Sample Trim	Laminated Floor Sample Trim
53	1	126-313	90T Base Plate
54	1	126-314	90T BASE ASSEMBLY
55	1	126-312	90T Top Plate
56	1	126-004	90T 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	126-026 - M6 x 6.4	Brass 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 - 6.4 x 20 - B	Parallel Pin
71	4	ISO 4762 - M6 x 10	Hexagon Socket Head Cap Screw
72	4	119-180	MM x 12 SS "C" SLANK TUBER SCREW
73	4	PCB Locking Pin	PCB LOCKING PIN
74	1	104-204	Making Tool Foot
75	1	104-204	Making Tool Foot
76	1	104-204	Making Tool Foot
77	4	101-201	Needle Bearing (Def. B52)
78	8	101-201	Needle Bearing (Def. B52)
79	4	MM M6 Axial	MM M6 Axial
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	Brass Socket Head Cap Screw - Metric
82	2	104-271	Hand Abrasion Form
83	2	ISO 10642 - M3 x 12	Hexagon Socket Countersunk Head Screw
84	2	ISO 9602 - M3	Procion hexagon nuts
85	5	P-026	90T Standoff (used 1 laminated)
87	1	126-314	90T Standoff (used 1 laminated)
88	6	ISO 4762 - M6 x 20	Hexagon Socket Head Cap Screw
89	1	104-119	Stitch Material Holder Kit (Laminated)
94	3	BSI 4168 - M6 x 12	Hexagon Socket Head Cap Screw

	<b>JAMES H. NEAL &amp; Co. Ltd.</b> 100, Park Road The H.A. Centre, Walsby East Yorkshire YO21 2JH	PART NAME MODEL NUMBER DRAWING NUMBER QUANTITY UNIT DATE	PART NUMBER QUANTITY UNIT DATE	PART NAME MODEL NUMBER DRAWING NUMBER QUANTITY UNIT DATE
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## Revision History

See front cover for Publication number, e.g., 290-902W-1\$A.

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

Rev	Date	Originator	Details of revision
A	04-01-11	PG	First release
B	17-05-11	PG	Graphic page 8 updated, Speed options changed.
C	10-04-12	PG	Service & Calibration / User Servicing Replacement Parts (Spares)

