

# TEK500 MICROWAVE LEAKAGE DETECTOR

## INSTRUCTION MANUAL



### **⚠ ALWAYS READ THESE INSTRUCTIONS BEFORE PROCEEDING**

Thank you for buying one of our products. For safety and a full understanding of its benefits please read this manual before use. Technical support is available from 01923 441717 and support@martindale-electric.co.uk.

#### CONTENTS

<b>1</b>	<b>Safety Information</b>	<b>1</b>
1.1	Meaning of Symbols and Markings	1
1.2	Precautions	2
<b>2</b>	<b>Introduction</b>	<b>3</b>
2.1	Inspection	3
2.2	Description	3
2.3	Accessories	3
2.4	Battery Installation	3
<b>3</b>	<b>Operation</b>	<b>4</b>
3.1	TEK500 Elements	4
3.2	Self Check	5
3.3	Microwave Leakage Test	5
3.4	Microwave Oven Output Power Test	7
3.5	Output Power Testing Considerations	8
<b>4</b>	<b>Maintenance</b>	<b>10</b>
4.1	Battery Replacement	10
4.2	Calibration	10
4.3	Cleaning	11
4.4	Repair & Service	11
4.5	Storage Conditions	11
<b>5</b>	<b>Warranty</b>	<b>12</b>
	<b>Specifications</b>	

### 1. SAFETY INFORMATION

#### **⚠ REMEMBER: SAFETY IS NO ACCIDENT**

These instructions contain both information and cautions that are necessary for the correct operation and maintenance of this product. It is recommended that you read the instructions carefully and ensure that the contents are fully understood.

Particular attention should be paid to the Precautions and Technical Specifications.

Please keep these instructions for future reference. Updated instructions and product information are available at: [www.martindale-electric.co.uk](http://www.martindale-electric.co.uk)

#### 1.1 Meaning of Symbols and Markings

**⚠ Caution - refer to instructions**

**CE Equipment complies with relevant EU Directives**

**♻ End of life disposal of this equipment should be in accordance with relevant EU Directives.**

#### 1.2 Precautions

This product has been designed with your safety in mind, but please pay attention to the following warnings and cautions before use.

#### **⚠ Cautions**

The TEK500 must only be used by a skilled and competent person who is familiar with the relevant regulations, the safety risks involved and the consequent normal safe working practices, and under the conditions and for the purposes for which it has been constructed and specified.

Before use check the unit for cracks or any other damage. Make sure the unit is free from dust, grease and moisture, especially the conical spacer of the unit. **Do not** use if damaged.

**NEVER** put the TEK500 or the thermometer supplied inside a microwave oven.

It is important not to defeat or tamper with the safety interlock switches on the microwave oven. Before carrying out the leakage test, check that the safety interlock switches operate effectively, such that the microwave power is cut OFF automatically when the oven door is opened.

Avoid severe mechanical shock or vibration and extreme temperature.

To avoid possible corrosion from a leaking battery, remove the battery if discharged, or when the unit is not in use for an extended period.

Microwaves are potentially dangerous. Microwave appliances should never be adjusted or repaired by anyone except properly qualified service personnel.

## 2. INTRODUCTION

### 2.1 Inspection

Examine the shipping carton for any sign of damage. Inspect the unit and any accessories for damage. If there is any damage then consult your distributor immediately.

### 2.2 Description

The TEK500 has been designed to perform the routine microwave leakage tests of BS EN 60335-2-25 and BS EN 60335-2-90, required for domestic and commercial microwave ovens.

The TEK500 has the following functions and features:

- ◆ Self-check function
- ◆ LED indication of 1, 5 and 10mW/cm<sup>2</sup> microwave leakage thresholds
- ◆ Audible indication of microwave leakage >5mW/cm<sup>2</sup>
- ◆ Conical spacer that sets the required 50mm distance from the oven surface

### 2.3 Accessories

The TEK500 comes with the following accessories:

- ◆ Martindale TM2 thermometer
- ◆ 275mL beaker (for microwave leakage tests)
- ◆ 1 litre beaker (for output power tests)
- ◆ Carry case
- ◆ 1 x 9V PP3 battery
- ◆ Instructions

### 2.4 Battery Installation

Refer to Section 4.1 (Battery Replacement) for the battery installation instructions.

3

## 3. OPERATION

### 3.1 TEK500 Elements

1	Buzzer
2	Power ON LED
3	Microwave leakage threshold LED's
4	OFF/CHECK/DETECT switch
5	Conical spacer
6	Battery compartment cover



4

### 3.2 Self Check

Before use, the TEK500 must be tested using the built-in check function. The check function injects a signal into the antenna of the detector to ensure that every stage of the internal circuitry is operating correctly.

Slide the switch to the **CHECK** position. Check that the **ON**, **1**, **5** and **10mW/cm<sup>2</sup>** LED's are all illuminated and a continuous audible tone is present.

If any of the LED's fails to illuminate, replace the battery and re-test the unit.

**Do not use** the TEK500 if all four LED's fail to illuminate simultaneously or a continuous audible tone is not present.

### 3.3 Microwave Leakage Test

The following routine test should be carried out on microwave ovens, to ensure that microwave leakage remains below the recommended safe maximum of 5mW/cm<sup>2</sup> (5W/m<sup>2</sup>).

The leakage test should be carried out with the microwave oven connected to its rated power source.

Fill the smaller beaker supplied, with 275mL ± 15mL (275g ± 15g) of water having a temperature of 20°C ± 2°C, and place it in the centre of the microwave oven.

The oven should then be operated at its maximum microwave power setting.

**⚠** Combination microwave ovens **must** be set to use microwave power **only**. All other means of heating must be turned off.

5

Slide the TEK500 switch to the **DETECT** position. Only the green **ON** LED should be illuminated.

While the microwave oven is running, place the flat tip of the TEK500 conical spacer against the surface of the appliance (see Fig. 1) and move the detector about slowly all over the exterior surface of the oven to locate any points of microwave leakage, paying particular attention to the door seal, the edges of the door, the front window, any seams in the case construction and any ventilation slots.



Fig. 1

The yellow LED indicator will signal when microwave power is detected above 1mW/cm<sup>2</sup>.

Hazardous radiation detected above 5mW/cm<sup>2</sup> and 10mW/cm<sup>2</sup> respectively is indicated by the red LED indicators. An audible tone will sound as an additional warning of microwave leakage that is present above the 5mW/cm<sup>2</sup> danger limit.

In the event of extended or repeated tests, the water in the beaker should be changed as necessary to prevent boiling and evaporation.

An oven that exhibits microwave leakage of 5mW/cm<sup>2</sup> or above should be taken out of service and investigated for faults by a

6

competent service engineer. It should not be put back into service until faults are cured and the oven can be shown to pass the microwave leakage test.

Note: Industrial ovens may well operate at frequencies outside the frequency range of the TEK500 (2450 ± 25MHz). Always check before use.

### 3.4 Microwave Oven Output Power Test

After the microwave leakage test is found to give a satisfactory result, the following procedure can be used as a simple functional test to assess the microwave heating power of the oven.

This functional test should be carried out with the microwave oven connected to its rated power source.

Fill the 1L beaker supplied with 1L ± 5mL (1000g ± 5g) of water having a temperature of 10°C ± 1°C.

Use the thermometer (supplied) to accurately measure the initial temperature of the water.

Record the actual water volume and the initial temperature.

Place the beaker in the centre of the lowest shelf in the oven. **DO NOT** leave the thermometer in the beaker when it is placed in the oven.

The oven should then be operated at its maximum microwave power setting for 90 seconds.

 Combination microwave ovens **must** be set to use microwave power **only**. All other means of heating must be turned off.

7

Note: The heating time is not critical, but must be recorded accurately.

For an oven with an imprecise clockwork timer, use a stopwatch or wristwatch with a second-hand to establish the duration of the test.

Immediately after the 90 seconds microwave heating episode, open the door, give the contents of the beaker a very brief stir using the thermometer, then measure the final temperature of the water.

Determine the rise in temperature from:

Temperature rise = Final temperature – Initial temperature

The microwave heating power of the oven can be estimated from the following formula:

Microwave heating power (Watts) =  $\frac{4190 \times \text{Temperature rise}}{\text{Heating time (seconds)}}$

Note: The above formula is simplified for convenience. The result should be rounded off to the nearest 50W.

At the end of testing, switch **OFF** the TEK500 before returning it to its carry case.

### 3.5 Output Power Testing Considerations

It is important that the quantity of water, temperature rise and heating time are all recorded accurately, to reduce any errors.

However, experience shows that many ovens will appear to under-perform.

Results may indicate a heating performance as low as 60% of the “declared” performance that has been marked on the oven by the manufacturer.

8

Where an oven appears to under-perform when assessed using the simplified formula, the full test procedure can be employed, as given in BS EN 60705 (Household microwave ovens – Methods for measuring performance).

A number of factors can contribute to this low reading, some of which will be influenced by the construction and physical size of the oven, as follows:

- ◆ Container is not large enough in area to pick up the output of the magnetron effectively
- ◆ Water volume is too small
- ◆ Error in temperature measurements
- ◆ Error in measurement of true heating time, especially on ovens with a clockwork timer
- ◆ Error in allowance for the magnetron filament heating-up time
- ◆ Thermal capacity of the container used during test is not taken into account
- ◆ Rating declared by manufacturer is permitted to vary by ± 15% (± 120W on an 800W oven) and may present an optimistic figure
- ◆ Rating declared by manufacturer may not have been rounded down to nearest 50 Watts
- ◆ Magnetron has degraded over its working life

Note that industrial and commercial microwave ovens fall into a separate category.

While the TEK500 itself is suitable for testing the level of microwave leakage around door seals etc., the assessment of microwave oven heating performance is beyond the scope of the TEK500 thermometer and beaker kit.

9

Such industrial and commercial microwave ovens typically will be physically larger and more powerful than household microwave ovens.

Industrial microwave ovens are covered by a separate standard, which should be consulted if applicable:

BS EN 61307 - Industrial microwave heating installations – Test methods for the determination of power output.

Information should be sought from the oven manufacturer if there is any difficulty in assessing the heating performance of industrial or commercial microwave ovens.

## 4. MAINTENANCE

### 4.1 Battery Replacement

The battery compartment is underneath the unit.

Undo the screw securing the battery cover and lift off the battery cover.

Remove the old battery and replace with a new 9V battery (IEC 6LR61, NEDA 1604A), observing correct polarity.

Replace the battery cover and secure with the screw.

### 4.2 Calibration

To maintain the integrity of measurements made using your instrument, Martindale Electric recommends that it is returned at least once a year to an approved Calibration Laboratory for recalibration and certification.

10

Martindale Electric is pleased to offer you this service. Please contact our Service Department for details.  
 Email: service@martindale-electric.co.uk  
 Tel: 01923 650660

#### 4.3 Cleaning

If contamination is found, clean with a damp soft cloth and if necessary a mild detergent or alcohol. Do not use abrasives, abrasive solvents, or detergents which can cause damage to the unit. If a mild detergent is used, the unit should subsequently be thoroughly cleaned with a water dampened soft cloth. After cleaning, dry and allow to remain in a dry environment for 2 hours before use.

#### 4.4 Repair & Service

There are no user serviceable parts in this unit other than those that may be described in section 4. Return to Martindale Electric if faulty. Our service department will quote promptly to repair any fault that occurs outside the guarantee period.

Before the unit is returned, please ensure that you have checked the unit and battery.

#### 4.5 Storage Conditions

The instrument should be kept with the battery removed, in warm dry conditions away from direct sources of heat or sunlight, and in such a manner as to preserve the working life of the unit. It is strongly advised that the unit is not kept in a tool box where other tools may damage it.

#### 5. WARRANTY AND LIMITATION OF LIABILITY

This Martindale product is warranted to be free from defects in material and workmanship under normal use and service. The warranty period is 2 years and begins on the date of receipt by the end user. This warranty extends only to the original buyer or end-user customer, and does not apply to fuses, disposable batteries, test leads or to any product which, in Martindale's opinion, has been misused, altered, neglected, contaminated, or damaged by accident or abnormal conditions of operation, handling or storage. Martindale authorised resellers shall extend this warranty on new and unused products to end-user customers only but have no authority to extend a greater or different warranty on behalf of Martindale.

Martindale's warranty obligation is limited, at Martindale's option, to refund of the purchase price, free of charge repair, or replacement of a defective product which is returned to Martindale within the warranty period.

This warranty is the buyer's sole and exclusive remedy and is in lieu of all other warranties, expressed or implied, including but not limited to any implied warranty of merchantability or fitness for a particular purpose. Martindale shall not be liable for any special, indirect, incidental or consequential damages or losses, including loss of data, arising from any cause or theory.

Since some jurisdictions do not allow limitation of the term of an implied warranty, or exclusion or limitation of incidental or consequential damages, the limitations and exclusions of this warranty may not apply to every buyer. If any part of any provision of this warranty is held invalid or unenforceable by a court or other decision-maker of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision or other part of that provision.

12 Nothing in this statement reduces your statutory rights.



### Specification TEK500 Microwave Leakage Detector



#### ELECTRICAL

LED indication thresholds: 1, 5, 10 mW/cm<sup>2</sup>  
 Threshold accuracy: ±1dB for plane wave of all polarizations  
 Audible indication: >5mW/cm<sup>2</sup>  
 Frequency of operation: 2450 ± 25MHz  
 Response to step input change: <1 second  
 Overload capacity: 50mW/cm<sup>2</sup>

#### GENERAL

Power: 1 x 9V, PP3 alkaline battery (IEC 6LR61, NEDA 1604A)

Dimensions: 145 x 64 x 30mm  
 Distance from flat of conical spacer to field sensor: 50mm  
 Weight: Approx. 164g including battery  
 Includes: TM2 thermometer, 275mL beaker, 1 litre beaker, carry case, 1 x 9V battery, instructions

#### ENVIRONMENTAL

Operating conditions: Temperature: -5°C to 40°C  
 Relative humidity: 10 to 80% R.H.  
 Storage conditions: Temperature: -10°C to 50°C  
 Relative humidity: 0 to 80% R.H.

#### FUNCTIONALITY

Conforms to the routine testing requirements of BS EN 60335-2-25 and BS EN 60335-2-90 for a microwave leakage detector

#### Check out what else you can get from Martindale:

- 18th Edition Testers
- Accessories
- Calibration Equipment
- Continuity Testers
- Electricians' Kits
- Environmental Products
- Full Calibration & Repair Service
- Fuse Finders
- Digital Clamp Meters
- Digital Multimeters
- Labels
- Microwave Leakage Detectors
- Motor Maintenance Equipment
- Multifunction Testers
- Non-trip Loop Testers
- Pat Testers & Accessories
- Phase Rotation Testers
- Proving Units
- Socket Testers
- Thermometers & Probes
- Test Leads
- Voltage Indicators
- Specialist Metrohm Testers (4 & 5kV)
- Specialist Drummond Testers



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