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ELECTRO MAGNETIC Innovative Technologies

Kerone Research & Development Centre (KRDC),  
B/47, Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India  
Tel- +91-251-2620542/43/44/45/46, Email-info@kerone.com, www.kerone.com



**Continuous Microwave+Convection Heat  
Treatment for Sterilization of Cinnamon  
Powder**

ISO 9001-2008 | ISO 9001-2015 | EMS 14001 | OHSAS 18001  
In Association with SVCH-Technologii, Moscow (Russia)



RESEARCH & DEVELOPMENT ASSOCIATES



# KERONE

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ISO-9001-2008 COMPANY

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<b>Customer:</b>	<b>M/s. CMC Engineering Export GmbH, Colombo</b>
<b>Process:</b>	<b>Continuous Microwave+Convection Heat Treatment for Sterilization of Cinnamon Powder</b>

### TEST REPORT No: 47/KRDC/LAB/17 Mum 02/03/2021

Date Sample reception : 02/03/2021

ID : 47/LAB/189

### SAMPLE DESCRIPTION:

Sampling : As Requested

Sample Condition : Acceptable

Quantity : 25 kg

Sampling date : 10/03/2021

Product : Cinnamon Powder

Requirement : Sterilization

Start Date test : 10/03/2021

End Date test : 10/03/2021

### FAT TRIAL EXPERIMENTAL SET UP:



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**CONTINUOUS MICROWAVE+CONVECTION HEATING SYSTEM SPECIFICATIONS:**

<b>Microwave Power</b>	8.7kW
<b>Frequency</b>	2450 ± 50 MHz
<b>Convective Power</b>	2.5 kW
<b>Microwave Exposure Zone (Cavity)</b>	3000 mm length wise
<b>Product surface temp. range</b>	Max. 120 deg cells
<b>Conveyor width</b>	500mm
<b>Conveyor Speed</b>	Variable 0.2 to 4MPM
<b>Conveyor Motor Drive</b>	1 HP AC Induction with VFD
<b>Entry Vestibule length</b>	1100mm
<b>Exit Vestibule Length</b>	1100 mm
<b>Exhaust Power</b>	1.5 HP

**ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:**

<b>Temperature (degree C)</b>	35°C (±5°C)
<b>Humidity (%)</b>	≤30% RH
<b>Pressure (kN/m2 or kPa)</b>	Not recorded

**Note for recommendation:** Environmental conditions have a direct impact on test results. Accuracy and consistency of test data are affected by the laboratory conditions.





RESEARCH & DEVELOPMENT Services


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## EQUIPMENTS USED:

Name of Equipment	Picture of Equipment	Specifications
Compact Thermal Imaging Camera		Model: FLIR E-30 Resolution: 160x 120IR Thermal sensitivity of 0.10°C
Moisture Analyzer		Make: Axis Balance Description: Moisture range: 1%(sample 0.02/0.05g), 0.1% (Sample 0.5/5g), 0.01%(Sample>5g)
Thermo Hygrometer		Model No: HTC-2 Temperature accuracy: $\pm (1.8^{\circ}\text{F})$ Temperature resolution: $0.1^{\circ}\text{C}$ ( $0.2^{\circ}\text{F}$ ) Humidity range: 10%~99% RH Humidity accuracy: $\pm 5\%$ RH Humidity resolution: 1% RH

## SAMPLE PREPARATION AND METHOD/PROCEDURE:

The experiment has been performed on given sample of cinnamon powder to speed up the heating rate for sterilization treatment. For this experimental run, two types of trials have been taken, one with open treatment to sample and second in sealed packed bags, for that given sample has been sealed packed in microwave transparent bags and placed in microwave+convection heating system for different setting parameters to achieve sterilization treatment. Then, the observations are made for on the basis of temperature on product and any damage to sample and bags during microwave exposure.

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**ANALYTICAL RESULTS:**

	<b>Trial No. 1</b>	<b>Trial No. 2</b>
<b>Trial Type</b>	<b>Open</b>	<b>In bags</b>
<b>Microwave Power (kW)</b>	<b>5</b>	<b>5</b>
<b>Setting Temperature (°C)</b>	<b>100</b>	<b>100</b>
<b>Exposure Time (minutes)</b>	<b>6</b>	<b>6</b>
<b>Temperature on Product (°C)</b>	<b>75-80</b>	<b>90-100</b>
<b>Initial moisture Content (%)</b>	<b>7-8</b>	<b>7-8</b>
<b>Final moisture Content (%)</b>	<b>4-5</b>	<b>Not taken</b>
<b>Remarks, if any</b>	<b>No change in color</b>	<b>No change in color</b>

**BEFORE AND AFTER PICTURES OF TREATED SPCIMEN SAMPLE:****1. Open Trial:****BEFORE****AFTER****Format: F/R&D/01**



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## 2. Bags Trial:



BEFORE



AFTER

### OBSERVATIONS:

The heating behavior of Cinnamon powder has been investigated under the microwave irradiation mode dryer for sterilization treatment. As per physical investigation, it has been observed that there is no color change and no damage in any of the sample with required temperature on product.

The samples are being sent to Bombay Test House for Microbiological analysis to get further test reports.

Miss. Komal Bhoite  
Tested By