

JCI 191 CONTROLLED HUMIDITY TEST CHAMBER

To provide opportunity to measure the charge dissipation capabilities of materials under defined humidity conditions with measurement of temperature and humidity. Humidity can be controlled and measured from ambient down to below 15% RH.

INTRODUCTION

The ability of many materials to dissipate static electricity quickly, as needed if static risks and problems are to be controlled, can depend strongly on relative humidity. The reason is that the ease of charge movement depends on the amount of surface moisture that is adsorbed. Humidity can also affect the 'capacitance loading' experienced by charge on the surface of materials [1]. Studies to compare the capabilities of materials and to judge their suitability for practical applications need to be made under defined and measured conditions of temperature and humidity. The JCI 191 Controlled Humidity Test Chamber provides simple and easy to use facilities in which charge decay and capacitance loading measurements can be made using JCI 155 and JCI 149 charge decay test instrumentation with various types of sample support.



DESIGN FEATURES

JCI 191 Controlled Humidity Test Chamber has internal dimensions of 610 x 590mm and 300mm high with a transparent polycarbonate lid which can be lifted up for loading and removal of samples. The lid is hinged at its rear edge and stays are provided to support the lid in the open position. Two long sleeve rubber gloves are mounted in the front side so that anything in the chamber can be reached and handled or operated. The size of the chamber is adequate to take a good number of samples and a JCI 155 instrument on a JCI 176 Charge Measuring Sample Support - or a JCI 149 on a JCI 170 powder sample support.

The humidity in the chamber is controlled using a semiconductor sensor which gives a linear response signal from 0 to 100%RH. Observations of humidity and temperature are displayed on a 3½ digit LCD on a control box mounted on the right hand side of the chamber. Humidity is controlled using a user settable circuit that compares the observed humidity to a set level and switches an electromagnetic airflow valve appropriately. Dry air is required at low pressure and low flow rate to the valve. This may be supplied by, for example, flow from a regulated high pressure cylinder of compressed air or from a special air drier unit. A small fan is provided in the chamber to circulate the air and give uniform humidity and temperature conditions. The target humidity level is set by pressing the 'set humidity' push button and then adjusting the multiturn potentiometer to adjust the level as displayed on the LCD. In operation humidity levels remain steady within about $\pm \frac{1}{2}$ %RH and can be set from ambient down to below 15%. This covers the values of 50% and 15% RH recommended for standardised measurements [2,3]. Display of the temperature in the chamber is achieved by pressing the 'press for temp' push button.

Connecting leads are provided into the chamber to provide mains power for a JCI 155 (or JCI 149), for connecting to an external microcomputer and for connecting to a JCI176 Charge Measuring Sample Support. The serial communication lead from the JCI 155 links out directly to the computer. Other connections are made via the control box. This control box includes a push button for zeroing charge measurement observations and an 8w min DIN socket to link to a DMM or a storage oscilloscope for charge measurements. Once instrumentation and samples are loaded into the chamber it is easy to set up and control measurements from outside.

OPERATION

Mount the Chamber on a stable and fairly level support surface with the glove apertures towards a convenient operator position. A normal table height surface is convenient.

Connect to the mains power supply. Connect to the dry air supply using standard 6mm plastic tubing. This is connected via the push in connector on the top of the Control Box. With the lid of the Chamber closed switch on the mains power supply. The LCD will show the present level of humidity. The temperature will be shown when the 'press for temp' push button is pressed. The small fan at the back of the chamber will be operating. Press the 'set humidity' push button and set the target humidity in the range from ambient to 15%RH. If the target value set is below ambient then the 'dry air in' LED will be illuminated. Switch on supply of dry air. The humidity in the chamber will fall slowly and stabilise at the set level.

Output signals from 8w min DIN connector:

1	Conduction charge signal x1	black
2	Induction charge signal x1	white
3	Conduction charge signal x8	red
4	Induction charge signal x8	yellow
5	Charge zeroing	violet
6	Ground	blue
7	Humidity signal (0 - 1.0V)	green
8	Temperature signal (0 -1.0V)	brown

For charge decay and capacitance loading measurements in the chamber it is usually most convenient to place the JCI 155 Charge Decay Test Unit on a JCI 166 or JCI 176 sample support towards the operator side of the chamber. Connect the mains lead with its IEC connector to the JCI 155. Make an earth bonding link between the 'Durable Dot' connectors on the sample support and the body of the JCI 155. This is conveniently a 500mm long lead with 4mm bayonet plugs at each end. Connect the 8w min DIN serial communications lead

into the 8w min DIN socket in the back plate of the JCI 155. This lead is the one going through the chamber wall separately and with a 9w D type socket connector on its free end outside the chamber. When using a JCI 176 connect the 8w min DIN plug into either of the 8w min DIN sockets in the back plate. The JCI 176 will be powered directly from power supplies in the Control Box. When all leads are connected it is convenient to position the JCI 155 so the operator can easily take readings and set controls with the instrumentation. Before starting work it is wise to check that the operator can easily enter hands into the gloves and can handle and control any item within the chamber volume. Similar arrangements will apply if a JCI 149 Charge Dissipation Test Unit is used on a JCI 170 Sample Support. If a JCI 140C Static Monitor is used then the associated JCI 141 is mounted within the chamber. This is linked to the JCI 140C by the 8w-8w min DIN cable and the 8w min DIN cable to link to the external computer is connected into the JCI 141.

When several samples are put into the chamber it will be wise a) to keep these separated to minimise chance of transfer of surface treatments between samples, and b) to make it easy for samples to acclimatise to local environmental conditions. It may prove helpful to have small wire racks within the chamber to store samples with segregation.

When loading samples between the JCI 155 and the JCI 166 or JCI 176 sample support it is important to check that the upper surface of the sample is flat and smooth, and that there is no chance of loose fibres or material getting into the JCI 155 test aperture.

SPECIFICATION FEATURES:

<i>Chamber size:</i>	610 x 590mm and 300mm high inside
<i>Measurements:</i>	humidity and temperature values are displayed on a 3½ digit LCD
<i>Humidity control:</i>	within about $\pm 1/2$ % from ambient to below 15%RH
<i>RH/T Display:</i>	Humidity to 0.1% Temperature to 0.1°C Selected by push button.
<i>Controls:</i>	Push button to select temperature display in place of humidity Push button to enable target humidity level to be set with potentiometer Push button to zero charge measurement observations
<i>Signal outputs:</i>	cable with 9w D type socket connector for direct serial communications linkage to a microcomputer. 8w mini DIN socket providing connection from JCI 176 charge measuring sample support in the Chamber. Output signals are provided proportional to humidity and temperature measurements. Connections are provided for remote control of charge measurement zeroing.
<i>Power supply:</i>	Mains power is connected via an IEC connector on the Control Box. Operation from 110-240V supplies.
<i>Dry air supply:</i>	standard 6mm push-in plastic tube. dry air supply 0.1 bar about 1litre min ⁻¹

REFERENCES:

- [1] J. N. Chubb “*Measurement of tribo and corona charging features of materials for assessment of risks from static electricity*” IEEE-IAS Meeting Phoenix, Arizona Oct 1999
- [2] BS 7506: Part 2: 1996 “*Methods for measurements in electrostatics*” British Standards Institution
- [3] IEC 61340-5-1: 1998 “*Electrostatics – Part 5-1: Protection of electronic devices from electrostatic phenomena – General requirements*” (Technical Report) International Electrotechnical Commission