

CONTROLLED DRY GAS SYSTEM MODEL 5311



Operating Instructions

12/1/05



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1.0 INTRODUCTION

Many applications require the accurate control of relative humidity at a specific point below ambient for long-term applications in storage cabinets or test chambers. The Model 5311 Controlled Dry Gas System is specifically designed to meet these requirements. The controlled solenoid activated valve regulates the amount of dry gas required to both maintain a dry environment and conserve the amount of dry gas used in most sealed chambers.

The Model 5311 is completely self-contained and comes complete with controlled solenoid valve, adjustable flow control valve, universal input voltage 12 VDC power module (90-260 VAC, 50/60 Hz), 5% RH sensor with ½" NPT compression fitting plus a ¼" NPT and a quick disconnect fitting for ¼" polyflo tubing.

The standard sensor supplied with the Dry Gas System has a fixed set point of 5%. Sensors with other humidity set points are available as an option. The Model 5311 is capable of maintaining the humidity level to better than $\pm 3\%$ of the fixed controller set point with a measurement accuracy of $\pm 2\%$ R.H.

It should be noted that the larger the chamber, the greater the variation in relative humidity throughout the chamber from the sensor reading. Good air circulation in the chamber is critical to maintaining a uniform humidity level throughout the controlled environment.

2.0 DESCRIPTION

The Model 5311 Controlled Dry Gas System consists of two (2) basic components: a Humidity Sensor and a Controlled solenoid valve with adjustable flow regulator.

2.1 Humidity Sensor

The standard Humidity Sensor is an integrated unit measuring approximately 1"Lx.438"Wx.375"D that plugs into a 18" multi-conductor cable that is hard-wired to the control module. Longer cable lengths are available as an option. A temperature compensated capacitive sensing element where capacitance is proportional to humidity is used to detect the relative humidity level. This sensor is programmed at the factory to produce a digital output about a pre-selected set point. The standard factory setting is 5% RH where the sensor produces a 5V signal (ON) when the RH level is $>6\%$ and a 0V (OFF) signal when the RH level is $<3\%$. Other fixed RH set points are available as an option. Contact ETS to order.

The sensor can be mounted to the wall of the chamber using an adhesive backed clamp or Velcro or in the supplied ½" NPT compression fitting, shown in Figure 2.1-1, that is mounted in the chamber wall. Other mounting configurations can also be used to meet the user's specific requirement.



Figure 2.1-1 Sensor mounted in compression fitting

A 18" (1m) hard wired cable provides the input/output interconnect between the Control unit and the Humidity Sensor. The sensor end is fitted with a flat, 4-pin female receptacle with the following pin-out configuration:

Pin-1	Temp Signal In (not used)
Pin-2	Power (2-5.5VDC)
Pin-3	RH Out (0-off/5V-on)
Pin-4	Ground

2.2 Control/Solenoid/Flow Regulator unit

The Control/Solenoid/Flow Regulator unit is shown in Figure 2.2-1. It will be referred to as just the Control Unit.



Figure 2.2-1 Control/Solenoid/Flow Regulator unit

The Control unit is designed as a complete assembly. There are no user controls except the flow regulator adjust knob. The only indicator is a Green LED that indicates the solenoid is on and supplying gas to the chamber.

2.3 System Operation

Figure 2.3.1 is a block diagram illustrating the operation and installation of the Model 5311 installed in a sealed Chamber.

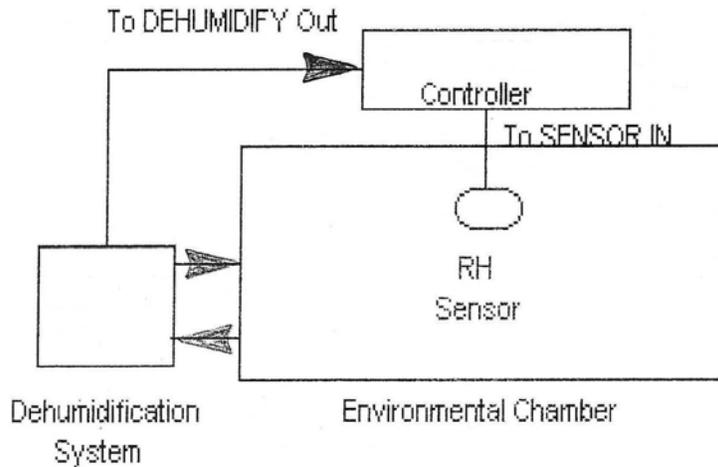


Figure 2.3-1 Controlled humidity chamber block diagram

The Humidity Sensor measures the relative humidity inside the chamber. If the humidity measured in the chamber exceeds the fixed set point by more than 1% R.H. the solenoid valve is powered and dry gas is injected. When the humidity inside the chamber drops to 3% RH the solenoid valve is deactivated, shutting off the flow of dry gas. The valve will then cycle on and off automatically as required by the Controller to maintain the specified humidity level.

A 12V DC universal power module is used to power the Model 5311. It operates from 90-260 VAC, 50/60 Hz. For international applications the user will have to provide the appropriate adapter plug to convert the standard North American 2-prong plug to mate with the available power (MAINS) outlet.

3.0 INSTALLATION AND OPERATION

3.1 Initial Check Out

Unpack the Control unit and Sensor and inspect for visible damage. If no damage is observed then proceed to check out the system as follows:

1. The Humidity Sensor is prewired to the control unit when shipped.
2. Plug the low voltage connector from the power module into the power jack located on the bottom of the Control unit. Then plug the power module into the

appropriate power outlet (MAINS). This will automatically power up the Control unit. There is no power ON/OFF switch.

3. Wait a minute or two and observe the Green LED mounted on top of the unit. If the ambient humidity is above the fixed set point the solenoid will be activated and the LED should light.

3.2 Installation

3.2.1 Sensor

The Humidity Sensor should be positioned in the test chamber to sense the best average humidity condition within the chamber. The sensor is normally installed using either the supplied clamp or mounted in the ½" NPT compression fitting supplied with the Controller. A ¾" to ½" reducer is provided so the compression fitting can be mounted in standard ETS chambers that come standard with a ¾" NPT fitting. A 0.875" (21mm) clearance hole is required. Wall thickness must be less than ¼" (6mm).

CAUTION:

The sensing element is sealed within the sensor assembly, protected against mechanical damage by a slotted housing cover. Under no circumstances should the sensing element be touched. The sensor should never be cleaned using compressed air. Dust and dirt particles can be removed by blowing gently. There are no user serviceable parts in the Model 5311 sensor.

3.2.2 Control Unit

The Control Unit may either be installed directly onto the chamber wall using the fitted 2" (5cm) long, ¼" NPT threaded tube or the quick disconnect fitting screwed onto the threaded tube so it can be placed at a remote location, using ¼" polyflo tubing to connect the solenoid gas outlet to the chamber using the extra quick disconnect fitting. A small relief hole is required to prevent pressure build-up in the chamber. The extra quick disconnect can be used for this application.

3.2.3 Dry gas requirements

Typical dry gases are nitrogen, CO₂ and dry air. Usually these gases are under high pressure at the source. An appropriate pressure reducer should be installed between the source and the Dry Gas Control System.

Gas flow to the chamber is controlled by the flow regulator connected to the solenoid valve gas input. It should be adjusted for a flow rate between 10 and 50 cfm. If the chamber door is to be opened frequently then a higher flow rate will reduce the humidity quicker. If the door is to be opened occasionally then

a lower flow rate will better conserve the dry gas. If the flow rate is to be monitored then a flow gage can be installed between the valve output and the chamber inlet. Ultimately, it is up to the user to determine the optimum flow rate for the particular application.

4.3 Operation

The Model 5311 Dry Gas Control System is self-sustaining and does not need any operator function to maintain the required humidity level. Once the unit is operating and the proper flow rate established no further user action is required.

Frequent on/off cycling of the solenoid valve may be indicative of a poor chamber seal. The chamber should be thoroughly inspected to determine where the leak(s) are occurring and the problem corrected.

5.0 CALIBRATION

The Model 5311 Controller is calibrated prior to leaving the factory. There are no user adjustable controls. Calibration can be checked by placing a calibrated humidity indicator in the chamber next to the sensor and observe that the Controller is maintaining the humidity within the specified range. If significantly out of tolerance or just does not work then the unit will have to be returned to the factory for service.

NOTE:

If returned to the factory for repair, first obtain a RMA number from ETS by calling 215-887-2196 Ext. 220.

6.0 TROUBLESHOOTING

The Model 5311 should provide trouble-free service. If a problem with the system is suspected, it is recommended the fault be initially isolated to either the Sensor, Control unit or solenoid.

The following troubleshooting guide should assist the user in locating the more obvious problems:

1. No Power - Check power at the wall outlet.
2. Green LED does not come on even though the humidity level inside the chamber is known to be at least several percent above the fixed set point of the Model 5311. Return unit to factory.
3. Obviously incorrect humidity control – If sensor was removed from its connector, check to see that it has been replaced properly. The arrow (▲) should line up with

the left hand side of the sensor with the sensing grill facing up. If it was reversed reinstall properly. The sensor will not be damaged if plugged in backwards.

Next, if the ambient humidity is near the fixed set point check sensor operation by blowing gently onto sensor for several seconds and observe the Green LED. If the LED turns on the humidity sensor and control electronics are at least working.

4. No dry gas flow, Green LED remains on constantly – Check to see if there is dry gas at the source. If so then the valve may be contaminated preventing it from opening or closing. Return the unit to the factory for replacement.
5. Difficulty maintaining low humidity within the chamber – The chamber may either be leaking, ambient humidity may be very high or the flow rate is too low. Generally, with a dry gas system the humidity within the chamber should recover and stabilize within a few minutes. If this is not happening then try increasing the flow rate. Also, check to ensure that dry gas is being injected. If dry air is being used there may be condensation in the line.

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7.0 WARRANTY

Electro-Tech Systems, Inc. warrants its equipment, accessories and parts of its manufacture to be and remain free from defects in material and workmanship for a period of one (1) year from date of invoice and will, at the discretion of Seller, either replace or repair without charge, F.O.B. Glenside, similar equipment or a similar part to replace any equipment or part of its manufacture which, within the above stated time, is proved to have been defective at the time it was sold. All equipment claimed defective must be returned properly identified to the Seller (or presented to one of its agents for inspection). This warranty only applies to equipment operated in accordance with Seller's operating instructions.

Seller's warranty with respect to those parts of the equipment which are purchased from other manufacturers shall be subject only to that manufacturer's warranty.

The Seller's liability hereunder is expressly limited to repairing or replacing any parts of the equipment manufactured by the manufacturer and found to have been defective. The Seller shall not be liable for damage resulting or claimed to result from any cause whatsoever.

This warranty becomes null and void should the equipment, or any part thereof, be abused or modified by the customer or if used in any application other than that for which it was intended. This warranty to replace or repair is the only warranty, either expressed or implied or provided by law, and is in lieu of all other warranties and the Seller denies any other promise, guarantee, or warranty with respect to the equipment or accessories and, in particular, as to its or their suitability for the purposes of the buyer or its or their performance, either quantitatively or qualitatively or as to the products which it may produce and the buyer is expected to expressly waive rights to any warranty other than that stated herein.

ETS must be notified before any equipment is returned for repair. ETS will issue an RMA (Return Material Authorization) number for return of equipment.

Equipment should be shipped prepaid and insured in the original packaging. If the original packaging is not available, the equipment must be packed in a sufficiently large box (or boxes if applicable) of double wall construction with substantial packing around all sides. The RMA number, description of the problem along with the contact name and telephone number must be included in formal paperwork and enclosed with the instrument. Round trip freight and related charges are the owner's responsibility.