



# USER MANUAL FOR JCI 192 DRY AIR SUPPLY UNIT

## 1. INTRODUCTION

### 1.1 GENERAL FEATURES

The JCI 192 Dry Air Supply Unit provides a low pressure flow of very low humidity air via a push-in connector for 6mm airline plastic tube. This tube (typically 3m long) can be connected directly to the input push-in connector on the control box of the JCI 191. The supply pressure is set to operate over an output pressure range between about 0.05 and 9 p.s.i. The air normally has a dewpoint of  $-40^{\circ}\text{C}$  or less.

The front panel includes a mains On/Off switch, a 1A fuse, a counter to show the accumulated hours of compressor operation, an LED display of internal air pressure or dewpoint – push-button selected. The unit is set at manufacture for either 240V or 115V operation. Indicator LEDs on the front panel show status for pressure and dewpoint.

When the Controlled Humidity Chamber is demanding air from the unit the internal air pressure may fall below the low set point. This may well cause the ‘Low pressure’ indicator light show. This is not a problem situation so long as pressure starts to build as soon as the flow into the JCI 191 is switched off by its control unit. It may be necessary to close the bleed valve a bit if the pressure rises but then falls away rather quickly when the compressor switches off.



When the unit is first switched on when it has been idle for a long time initial dewpoint may be up at  $+2^{\circ}\text{C}$ . The dewpoint can be expected to fall to  $-40^{\circ}\text{C}$  within an hour after switch-on. If no dry air was used from the unit the dewpoint would gradually rise. If this continued the supply of air would be switched off when the dewpoint of the air supply had risen to  $-27^{\circ}\text{C}$ . There is a bleed valve on the front panel and this is set to normally give sufficient airflow to keep the humidity well below  $-27^{\circ}\text{C}$ . However, if the humidity rises above this level when the unit is not supplying dry air then the needle valve in the front panel may be opened a bit (anti-clockwise).

The dewpoint level should decrease, and when this is below -27°C dry air will be able to be supplied. The JCI 192 Dry Air Supply Unit is well suited for providing a supply of clean dry pressurised air for operation of the JCI 191 Controlled Humidity Test Chamber.

## 1.2 DESCRIPTION

The Dry Air Supply Unit has all its connections located at the rear of unit.

The air is dried by use of a heatless regenerative molecular sieve system giving a dewpoint better than -40 degrees Celsius in ambient conditions. All units perform with low noise and minimal vibration. The unit complies with EMC requirements.

An oil-less floating piston compressor is used for maximum reliability and performance. The compressor is mounted on anti-vibration mounts and a compressor pressure relief valve is fitted and set to relieve should the pressure exceed the set level.

Air at atmospheric pressure is compressed by the compressor and fed through a fully automatic, twin bed air drier to the outlet pressure sensor which is factory set to the pressure appropriate to the application.

The air drier used is the 'heatless reactivation' type, which operates on a cycle of 1 minute 'on line' for each bed in turn followed by 1 minute 'on reactivation' or 'offline'. Control of the drier is by way of an electrically driven process timer using a single 180 degree cam in conjunction with changeover micro switch.

The drying process is as follows, air at elevated pressure and temperature passes over the dry desiccant, contained in the drier beds, and gives up some of its heat and most of its moisture. The large number of pores in the material holds the moisture on the surface of the desiccant. This process is known as adsorption. The compressed air is directed to the appropriate drier bed by either one of the two solenoid operated 3 port valves controlled by the process timer. The air is only fed through one drier bed at a time. At the end of 1 minute the timer switches over drier beds such that the one previously 'on line' is now opened to exhaust while the other takes over the drying process. To achieve purging of the moisture from the 'wet' bed, (this is the drier bed which has just come 'offline'), a small proportion of the output dry air at pressure from the drier bed now 'on line' is routed via a fixed restrictor directly to the 'wet' drier bed. As the 'wet' drier bed is now open to atmosphere via the exhaust port on the control solenoid valve, the bleed of dry air will expand as it passes over the wet desiccant material and take up the surface moisture and heat and exhaust it to atmosphere. At the end of a further minute the changeover process will be repeated.

A Pressure Maintaining Valve is fitted between the air drier output and the third solenoid operated 3 port valve. This maintaining valve is used to ensure that the pressure within the drier system is kept at the optimal operating pressure of 50 psi (3.45 bars)

Wet air is prevented from entering the system to which the unit is attached by the Wet Air Bypass Valve, which is located just after the pressure-maintaining valve. This is a 3 port solenoid valve controlled by the Humidity Detector. Under high humidity conditions the valve switches the outlet air from the unit to atmosphere instead of the system. This valve resets automatically once the humidity detector senses dry air at its sensor element.

A pressure sensor connected pneumatically and electrically to the control board controls the start / stop operation of the compressor. The electrical power is fed through the pressure sensor electronics to the compressor, process timer, and hour counter. From initial switch on and once the dewpoint LED changes from red to green air is fed to the outlet of the unit and once connected, out to the system. When the pressure reaches the upper pressure point the pressure sensor activates the switch on the control board and power is cut from the compressor, hour counter and process timer controlling the air drier solenoid valves. When the pressure in the system drops to lower the lower pressure point power is restored. The Hour Counter fitted is non-resettable type to keep a permanent record of compressor running hours for maintenance purposes.

The Humidity Detector is included in the system to provide early warning and affords protection should the drier malfunction. Control is achieved by use of a humidity sensing element fitted on the out let of the air drier and before the compressor pressure maintaining valve. The humidity sensing element is a transducer where resistance varies with humidity. Operation of the sensing element is based on the ability of the hygroscopic film, coated on the dual winding of palladium wire, to change its resistance almost instantly with variations in relative humidity. The resistance change is measured in terms of an AC current flowing through the sensing element, which is read by the Humidity Detector Board. Should the sensing element sense wet air the resistance changes and the Detector board activates the Wet Air Bypass Solenoid Valve bumping the air to atmosphere and the High Humidity Alarm. The design is arranged as 'fail safe'. This means that in the event of power failure the humidity alarm operates and the wet air bypass valve opens. There is also fitted on the front of the unit a Light Emitting Diode (LED) display of the dewpoint of the air exiting the air drier assembly. This reading can be very useful for maintenance purposes as it will show any degradation of the drier assembly before any loss of air occurs due to the switching of the wet air bypass valve. This LED display also indicates the pressure of dry air being held in the system, when the display button is pressed.

A pressure gauge is fitted internally to ensure that the compressor pressure is set at the optimum working pressure of 50 psi (3.45 bars).

### 1.3 SPECIFICATION

<b>Compressor</b>	Oil-less air compressor
<b>Power supply</b>	220/240 VAC 50 Hz
<b>Dry air output</b>	Free air delivery 3 litres/minute (6.35 Cubic Feet/Hour).
<b>Working pressures</b>	Output Relief Valve Cut out (Stop) Nominal Working Cut In (Start) Low Pressure Alarm
<b>Displays &amp; alarms</b>	Compressor Total Running Hours Counter Output Dewpoint (LED) Output Pressure (LED) Low Output Pressure Alarm

	Dewpoint Alarm Power On / Off
<b>Bleed valve</b>	Screwdriver adjustable needle valve in front panel
<b>Dewpoint</b>	Better than - 40 Degrees Celsius in ambient conditions of +30 degrees Celsius and 75% Relative Humidity.
<b>Wet air bypass</b>	Fail safe solenoid valve ensures that only dry air is Supplied to the system. The solenoid valve is controlled by the humidity detector
<b>Air drier</b>	Twin bed fully automatic heatless reactivation. Desiccant - molecular sieve
<b>Operation limits</b>	Operation temperature limits of (0 to +40 Degrees Celsius)
<b>Dimensions</b>	Height 133mm Depth 350mm Width 435mm Weight 11kg

#### **1.4 SAFETY SUMMARY**

##### **a) Abnormal Odour or Smoke**

Immediately interrupt the Power Supply to the unit with the Power Switch located on the front panel.

There is a fuse link which operates in the event of excessive current, however take all due care and attention at all times.

##### **b) Lethal Voltages Present**

The unit contains lethal voltages. Assume that all circuits are live. Familiarise yourself with the wiring diagram, which is in the appendices

##### **c) Pneumatic Precautions**

The compressor and air drier assembly operate under high pressure, therefore ensure that all safety practices are followed. Always vent the unit to atmosphere before servicing pneumatic components.

## 2: INSTALLATION

### 2.1 INITIAL INSPECTION

Immediately inspect the shipping container and cushioning material for damage. Check the shipment against the Delivery Note. Inspect the unit for electrical and mechanical damage. In the event of any of the following problems:

- a). contents incomplete or incorrect,
- b). internal or external mechanical damage,
- c). defective operation

Please contact the supplier immediately. In the event of shipping damage, keep the shipping container and cushion material for inspection by the carrier.

### 2.2 UNPACKING

Unpack the unit, taking care not to damage the cushioning materials. Save the shipping container and cushioning materials until normal unit operation has been established.

### 2.3 POWER REQUIREMENTS

The unit can be supplied to operate on all standard voltages and is set at the time of manufacture. Please ensure that your voltage and frequency requirements are stated at the time of enquiry or on the order.

### 2.4 CONNECTIONS

*Air Outlet connection:* 1/8" female thread fitted with 6mm push-in pneumatic for use with plastic (polyamide) airline hose

*Power connection:* IEC Mains filter plug.  
Unit supplied with 2 metre 3 core power cord.

*Drain Outlet:* 10-32UNF female thread connection exhaust air vent. This will allow removal of any purge liquid away from any other equipment.

### 2.5 INSTALLATION PROCEDURES

**a) Location** - The JCI 192 is a free standing unit and may be located on any convenient clean flat surface away from sources of dust and dirt and excessive moisture. It is connected to the JCI 191 Controlled Humidity test Chamber by up to about 3m of 6mm polyamide airline hose.

**b) Pneumatic connection** - All units are supplied with one of each coupling. 1/8" male thread x 1/4" O/DIA tube and 1/8" male thread x 3/8" O/DIA tube.

The exhaust air from the drier bed assembly is vented at the back of the unit via a vent pipe connection. If used in humid conditions it may be desirable to pipe the vented air away from other equipment.

**c) Power Connection** - Units are supplied with standard 2 metre IEC power cord with a 13 amp 3 pin plug for connection to a mains power supply.

**d) Set up** - The Dry Air Supply Unit has a front panel illuminated Power Switch. The other indicators on the front panel show the status of the unit. See section 3.1 for further information on displays and indicators.

## 2.6 OPERATION:

The following procedure should be followed before the air and alarm connections are made to the system.

1. Connect the output coupling and power cable to the unit, do not connect to system yet, and lead the drain tube to a suitable point.
2. Ensure that the mains cable is attached and that power is available at the equipment.
3. Switch the unit on by switching the POWER switch on the front panel and ensure that the switch illuminates. At the same time the compressor starts, the LED display illuminates, the hour counter starts and some of the single LED's will be illuminated. If the LED display is showing 0 (zero) psi press the button once and it will change to display the dewpoint.
4. The dewpoint will slowly reduce until it has reached a Pre-set 'SAFE' dewpoint level. This could take up to 15-20 minutes depending on the length of time which the unit has been out of service. Until the dewpoint reduces to this level no air will exit the unit by the outlet coupling, but instead all the air will be exhausted through the drain tube to atmosphere. This is because the wet air bypass solenoid valve is in operation and is purging the wet air exiting the drier. Pressure and humidity red LED's will be illuminated.
5. When the dewpoint reaches the safe level the wet air bypass valve resets and allows the now dry air to pass to the outlet coupling. When this occurs the humidity red LED will extinguish and the green LED illuminates.
6. Allow the dewpoint reading to continue to decrease until it settles. While it is doing this check the operation of the process timer and drier bed solenoid valves. This can be done by feeling a brief increase in airflow out of the drain tube every minute.
7. Now check that the pressure sensor operates correctly. Firstly press the button below the LED display to obtain pressure display. Then close the outlet coupling by means of connecting a blanking plug or shut off valve, this will create a small system volume. The dry air will fill this volume and the pressure will increase and at a set point the compressor will stop. Due to the small volume being used the pressure will probably stabilise below the required upper pressure. If after an initial reduction the pressure display continues to reduce then there is a leak somewhere between the outlet bulkhead and the shut-off valve. If not however open the shut off valve and this will cause the compressor to restart due to the pressure dropping.
8. The unit is now ready for connection to the system. Switch the unit off. Connect the tubing from the system to the JCI 191 Controlled Humidity Test Chamber.

9. With the power supply to the JCI 191 switched off, so that its flow control valve remains closed, switch on the JCI 192 unit and allow the pressure to build. When the compressor cuts out, at its high pressure set point, there will be a slow decrease in pressure due to loss of air through the front panel bleed valve. This will be about 0.01 psi per second. If the pressure loss rate is much higher then this it will be appropriate to look for leaks in the connection to the JCI 191.
10. Once satisfactory system has been confirmed the power supply to the JCI 191 may be switched on so that controlled levels of humidity below ambient can be achieved. It is recommended that the pressure reading is checked regularly to ensure that there are no major leaks.
11. Now that the system has stabilised the unit will maintain the pressure within the system between the Pre-set limits. At demand of dry air by the JCI 191 the pressure will fall to a low level. This is not a problem – so long as the pressure builds once the control valve in the JCI 191 Control Unit closes.
12. The Dry Air Supply Unit can operate on 100% duty cycle for extended periods. Nearly continuous operation will occur while humidity levels are being reduced but the duty cycle should fall to a moderate value once the target humidity is reached. A much higher duty cycle can be expected for operation at low humidity levels.
13. The lowest level of humidity achievable in the output airflow depends upon the ambient temperature and humidity. Levels down to 20%RH should be readily achieved. If much lower humidity levels are required then it may be necessary to ensure the ambient temperature and humidity are at moderate levels.



illuminated the pressure within the system is being maintained between the required limits. If the red LED illuminates however, the pressure has dropped to below the low output pressure set point. This may occur while air flow is required to the JCI 191.

### **3.3 OPERATING PROCEDURES**

The unit requires limited operator attention at only scheduled maintenance intervals, (see Section 4 for further information). However it is suggested that the unit be regularly monitored for the first few weeks of operation and then a monthly check on operating duty cycle. It is recommended that the LED display be left on pressure so that so that anyone will be able to see instantly the pressure being held in the system.

Under normal operating conditions the following will be true. The Power ON / OFF switch will be illuminated, the hour counter will be operating if the compressor is operating, the LED display will be indicating the pressure of the system and the green dewpoint and pressure and LED's will be illuminated.

It is recommended that low humidity levels are only maintained in the JCI 191 while these are required for test operations. This will diminish wear of the compressor and extend time before any servicing may be required.

### **4. SERVICING**

The number of hours the compressor has operated is shown in the counter just above the LED display. When the hours have reached over 2500 it is desirable to consider replacing the compressor seals. A new kit of seals for oil free operation (piston seal and valve plate seals) can be obtained from JCI. These seals can be fitted by a competent pneumatic engineer. An alternative indication of a need for servicing is a significant reduction in pneumatic performance. Where a buffer volume (say 10l) is included in the output air supply line this loss of performance will be indicated by an increase in the time for the pressure build up phase of operation.