



# MANUAL

**INSTALLATION OPERATION MAINTENANCE**

Compressed Air Dryer

**Dryspell Plus Series**

**GENERAL**

Compressed air is a vital energy medium used in almost all areas of industrial production. The atmospheric air taken in by the compressor contains contaminants, dirt particles and humidity, i.e. water vapor which condenses in compressed air pipes. The condensation can lead to considerable costs (corrosion, freezing, etc.). These costs can be avoided by the application of a Dryspell Plus Series dryer. This complete purification system includes an optional prefilter with automatic condensate drain, heatless adsorption dryer and in built afterfilter. The Dryspell Plus series with optional Prefilter (Recommended) is specially made for small compressed air flows, is compact, easy to maintain, and comes standard with

- Electronic controller with manual purge economizer and compatible with dew point sensor for automatic purge control
- Electronic drain valve on the inlet filter
- A inbuilt 25 micron particulate after-filter (within the diffuser screen or compactor plate) to protect downstream equipment from desiccant fines

**Design**

The air enters the coalescing prefilter where solids and condensates (oil/water mixture) are retained up to a residual oil content of 0.01mg/cu.m. The heatless regenerative dryer then adsorbs moisture from the compressed air stream down to pressure dew point (PDP) of  $-40^{\circ}\text{F}$  at standard inlet conditions ( $100^{\circ}\text{F}$ , 100% saturated, 100psig). Finally the in built afterfilter removes desiccant fines before they can travel downstream.

**Models**

Dryspell Plus Models	Nominal Inlet Flow SCFM
10	10
20	20
30	30
45	45
60	60
100	100
125	125
200	200
250	250
300	300
375	375

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## Statement of conformity

- 97/23/EC : Pressurized Equipments
- 89/392/CEE : Machine Safety
- 89/336/CEE : Electromagnetic Compatibility
- 73/23/CEE : Low Voltage
- OH6629.5C : CRN

## Specification

Maximum Pressure	: 225 PSIG (16 bar)
Rated Operating Pressure	: 100 PSIG (7 bar g)
Rated Operating Temp.	: 100 F (38 C)
Voltage	: 100 – 240 V AC 50/60 Hz 1Ph
Power Consumption Recommended	: 12 Watts Max
Pre-filter rating	: 0.01 Micron (Coalescer)
After-filter Rating (Inbuilt)	: 25 Microns (within the diffuser screen or Compactor plate)
Cycle Time	: 4 min
Purge Loss	: 15%
Air Outlet Conditions	: -40 C(-40 F) PDP (ISO: 8573-1:2010 (E) Class 2)
Power Cord	: 7 ft.

## Contents

The dryer consists of:

- 2 aluminum towers filled with desiccant
- 2 aluminum blocks including air seals and check valve
- 1 Prefilter (optional)
- 2 solenoid pilot valves
- Built in afterfilters
- 1 electronic control
- 1 pressure gauge
- 2 Mufflers
- Electronic auto drain

## Adsorbent Material

The adsorbent used in the Dryspell Plus series is produced by a unique manufacturing process. The benefits of using this high performance desiccant include:

- Uniform size
  - Reduces pressure drop and channeling
- High crush strength
  - Allows rapid pneumatic loading of towers
- Low abrasion
  - The low abrasion ensures less dusting during transport, loading, and service life which reduces pressure drop and minimizes downstream valve and filter plugging, common with dustier products.
- High adsorptive capacity.
  - The adsorbents high surface area and tailored pore distribution provide a high dynamic H<sub>2</sub>O adsorption capacity. It also has excellent cyclical stability which leads to a long adsorbent life.

## **DESCRIPTION OF OPERATION**

### **Operating Principles**

Wet air enters the inlet prefilter and flows from the top block to the lower block the air transfer tubes. Air then flows to the shuttle / inlet valve and is diverted to tower 1. The compressed air flowing through tower 1 is dried to a -40°F PDP and exits via the outlet filter. A small portion (15%) of the compressed air is expanded to near atmospheric pressure by passing through the purge orifice. Expansion of this already dry air to near-atmospheric pressure increases the ability of the purge air to strip the previously adsorbed water vapor from the partially saturated desiccant bed in tower 2. The air exhausts through the opened two-way purge valve. This cycle continues for 1.5 minutes then the purge valve closes and tower 2 begins re-pressurization. After 30 seconds purge valve 1 opens and the process repeats for tower 2.

- the online tower dries for 2 minutes
- the offline tower regenerates for 1 minute and 30 seconds
- the offline tower re-pressurizes for 30 seconds

### **Warning**

**Failure to follow these instructions can lead to serious injury or death.**

**This dryer should be only be used for drying filtered, compressed air.**

**Ensure inlet air to this air dryer is filtered.**

Only experienced and licensed technicians who are properly trained in compressed air systems should service or repair Trident products. Before start-up or performing any maintenance on any Trident air dryer, filter, drain system, or other equipment, you must first switch off and disconnect all electrical power and service to the equipment at the main disconnect switch. Also, be sure to bypass and depressurize

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the dryer to 0 PSIG. Do not start or operate the dryer if there is a leak. Make sure the dryer's protection rating is applicable to the installation conditions. Do not operate the dryer at pressures and/or temperatures above the maximum allowable marked on the data label. Likewise, verify that incoming voltage matches the voltage marked on the data label. Do not lift the dryer by its piping or control box or drop the dryer. Doing so may damage the dryer.

## External Dewpoint Control

The dryer controller has an dew point switch input, which can be connected to a potential free contact of an optional external dewpoint sensor/controller. If left unconnected the Dryer works in a predefined timed cycle. Please set in the dewpoint meter/controller the desired dewpoint of air required from the dryer. The Normally open (NO) contact of the dewpoint meter/controller stays open when unenergised or the dewpoint is worse than this set value. When this potential free contact is OPEN, the dryer works as per the normal cycle, alternating drying between two towers and purging, at a fixed time interval.

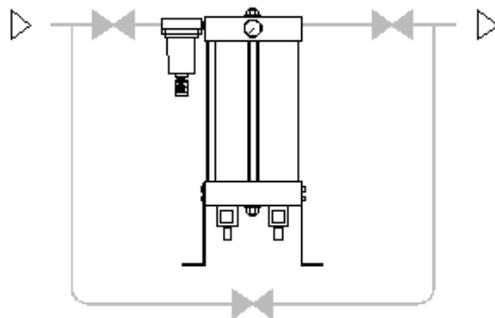
When the dewpoint becomes better than the set value the potential free contact CLOSES, The dryer controller detects this change, and the drying operation, instead of alternating between towers, will remain in the same tower. It first completes the purge cycle for the fixed time and continues diverting air through the same tower to provide dry air at the outlet. This is called 'cycle stretch'. An LED indicator on the front panel of the dryer controller indicates this. When the dew point becomes worse than set point and the potential free contact opens and the dryer controller changes to the other tower and this current tower enters the purge mode. This cycle continues for the other tower too.

## Purge Economiser

It reduces the percentage of regeneration flow based on the front panel setting. It has four options 40%, 60%, 80%, 100% purge optimization cycle respectively. This setting corresponds to flow or moisture load through the dryer.

For better selection, use detailed calculator available at [bit.ly/1i3vjQf](http://bit.ly/1i3vjQf)

## INSTALLATION AND MAINTENANCE



## Safety

**Dryspell Plus dryers are intended for the drying of compressed air. Under no circumstance should they be used to dry other gases.**

The adsorbents used are non-toxic. However, they may cause respiratory problems if they are inhaled in dust form. The use of a dust mask is sufficient to protect personnel.

## Installation Site and Connections

- Install the dryer in a closed clean, dry room protected from freezing. Access to the room should be restricted to personnel qualified in maintenance and operation. The room must be adequately ventilated. The dryer must not be directly exposed to sources of heat. The temperature of the room must not exceed 43°C/109°F.
- Make sure that the dryer is not near any equipment which does not comply with the electromagnetic compatibility directives and which may degrade dryer operation. There must be a minimum distance of 3 feet between the dryer and any other equipment which uses electricity.
- Ensure that the dryer is installed in the vertical position and also at 2 to 3 feet above ground level for easy access of Bottom block and Valves.
- Dryer should be secured by bolting it down.
- Install a system of by-pass valves between the dryer inlet and outlet so the dryer can be serviced without having to interrupt the compressed air supply from the circuit (see diagram above). The upstream and downstream valves must be closed during installation.
- Connect a drain line to the prefilter auto drain outlet.
- Check for leaks after all connections have been made.
- Always pressurize dryer before power up.

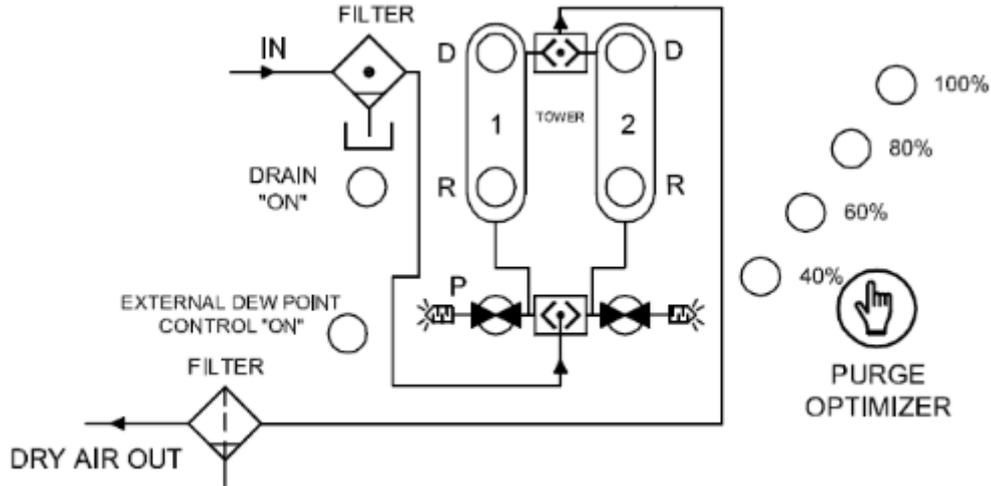
## Running the Installation and switching ON the Dryer

**The upstream and downstream valves of the dryer must be closed and the by-pass valve opened before the compressor is started.**

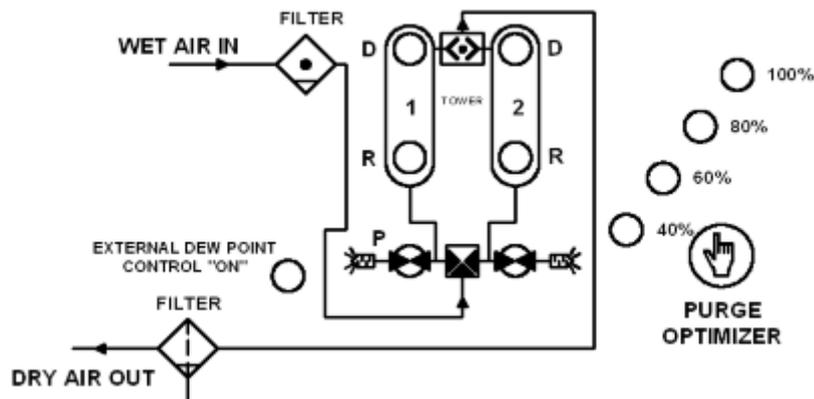
- Make sure power to dryer is in OFF condition.
- Open bypass valve, close outlet valve.
- Open inlet valve until dryer is pressurized.
- Open outlet, close bypass valve.
- Switch ON the power to the dryer.
- Check if the LED on the tower is in the drying operation and that the automatic drain valve at the bottom of the pre-filter drains every 4 minutes.

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## Control Panel DS 31-90



## Control Panel DS 31-200



The control panel presents all the instruments necessary to control and regulate the dryer:

- A machine diagram
- Two LEDs indicating the tower in drying operation (Tower 1 and Tower 2).
- A LED indicating the pre-filter drain operation (Drain) (for models equipped with electronic auto drain.)
- Press '8 sec' Purge Optimizer button continuously, then set the value (40% to 100%) if needed to control the purge flow

### Operating Cycles Time

Drying time : 2 min

Regeneration time : 1 min 30 seconds

Pressurization time: 30 seconds

First Cycle		Second Cycle	
Tower 1	Tower 2	Tower 1	Tower 2
Drying	Regeneration	Regeneration	Drying
	Re-pressurization	Re-pressurization	

When tower 1 LED is lit up, tower 1 is in drying operation and tower 2 is in regeneration mode. After tower 2 regeneration is finished, tower 2 LED will blink to show that the tower is now in the pressurization stage. After 30 seconds of pressurization, tower 1 will depressurize, the operating cycle is reversed with tower 1 in the regeneration stage and tower 2 in the drying mode. **(Caution: At the end of the pressurization, the regeneration tower will depressurize producing a loud noise.)** This cycle occurs every 2 minutes. (For models equipped with pre-filter and electronic auto drain, the pre-filter condensate drain discharge is programmed every 4 minutes for 4 seconds.) All these cycle times are fixed and not adjustable by user.

### Shutting Down the Dryer

Follow the procedure below:

- Open the by-pass valve.
- Close the inlet valve.
- Close the outlet valve.
- Switch off power to the dryer.

**Adsorption dryers are robust, reliable machines. To ensure uninterrupted, trouble free operation, regularly perform the inspections below.**

### Monthly Inspections

During the monthly routine inspection, check that:

- The drying and regeneration cycles function normally,
- The silencers are not clogged.

# Dryspell Plus Series Instruction Manual

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## Semi Annual Inspections

During the semi-annual routine inspection, check that:

- That the drying and regeneration cycles function normally
- The silencers are not clogged/change if clogged
- Filter elements are replaced

## Annual Inspections

During the annual routine inspection, check that:

- The drying and regeneration cycles function normally
- The silencers are replaced
- Filter elements are replaced
- The state of the desiccant: if the desiccant is brown (oil pollution) or if there is a lot of dust (disintegration), then change the desiccant (see next section).
- The state of block 'O' rings.

During the entire operation, the compressor and the dryer must be shut down. It is recommended for all personnel who are in the presence of the desiccant to wear dust masks.

## Quantity of adsorbent in the Dryer

The replacement desiccant in your dryer must be absolutely identical to the initial desiccant. Refer the drawings (Refer exploded view) for adsorbent kit part number or contact the factory.

## Changing the Desiccant

### 1. Dryspell Plus 10, 20, 30

- Bypass the dryer.
- Disconnect the dryer from air lines.
- Loosen the tie rod and remove it
- Remove the old adsorbent and fill activated alumina then molecular sieves
- Make sure O-rings or gaskets are in place
- Install and screw the tie rod

### 2. Dryspell Plus 45, 60

- Bypass the dryer.
- Disconnect dryer from air lines.
- Loosen the M8 Allen Bolt and remove the top block and top compactor plate.

- Remove the saturated desiccant bag by pulling the bag handle upwards and replace the new desiccant bag. If there is no desiccant bag, just tilt the dryer, remove the old desiccant and replace new desiccant bag. Refer Dryspell Plus 45, 60 Exploded view drawing.
- Make sure O-rings or gaskets are in place
- Install the top compactor plate followed by top block and fasten the M8 Allen Bolt.

### **3. Dryspell Plus 100, 200, 300**

- Bypass the dryer.
- Disconnect dryer from air lines.
- Loosen the M8 Allen Bolt and remove the top block and top compactor plate.
- Remove the saturated desiccant bag by pulling the bag handle in upward direction and replace the new desiccant bag. For replacement, put 3 nos. Activated alumina bag (AD1398) then 1 no. Molecular sieves bag (AD1424) in each tower. If there is no desiccant bag, just tilt the dryer remove the old desiccant and replace new desiccant bag.
- Make sure O-rings or gaskets are in place.
- Install the top compactor plate followed by top block and fasten the M8 Allen Bolt.

### **4. Dryspell Plus 125, 250, 375**

- Bypass the dryer.
- Disconnect dryer from air lines.
- Loosen the M8 Allen Bolt and remove the top block and top compactor plate.
- Remove the saturated desiccant bag by pulling the bag handle upwards and replace the new desiccant bag. For replacement, put 3 nos. Activated alumina bag (AD1398) followed 1 no. Activated alumina + molecular sieves bag (AD1452) then 1 no. Molecular sieves bag (AD1424) in each tower. If there is no desiccant bag, just tilt the dryer remove the old desiccant and replace new desiccant bag.
- Make sure O-rings or gaskets are in place
- Install the top compactor plate followed by top block and fasten the M8 Allen Bolt.

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## **TROUBLESHOOTING**

### **LEDs not Glowing**

A – Check the power supply connection and tension.

### **Tower Status LED not changing**

A – Change the controller.

### **LEDs Status Change but Tower not Switching**

A – Check coil connection at DIN and terminal connector in the controller.

B – Check the solenoid valve.

### **No Purging**

A – Check the solenoid valve.

B – Check the exhaust valve.

C – Clean the silencer (muffler).

### **Continuous Purging at Tower 1**

A – Shuttle / Inlet valve not closing.

B – Check pilot air for exhaust valve.

C – Check exhaust valve for stuck piston.

### **High Purge Loss**

A – Check outlet shuttle closing.

B – Check for silencer choke.

### **High Pressure Drop across Dryer**

A – Pre-filter may be clogged. Check and replace filter elements.

B – Check whether the dryer is being overflowed.

### **Moisture at the outlet (or) flow dewpoint**

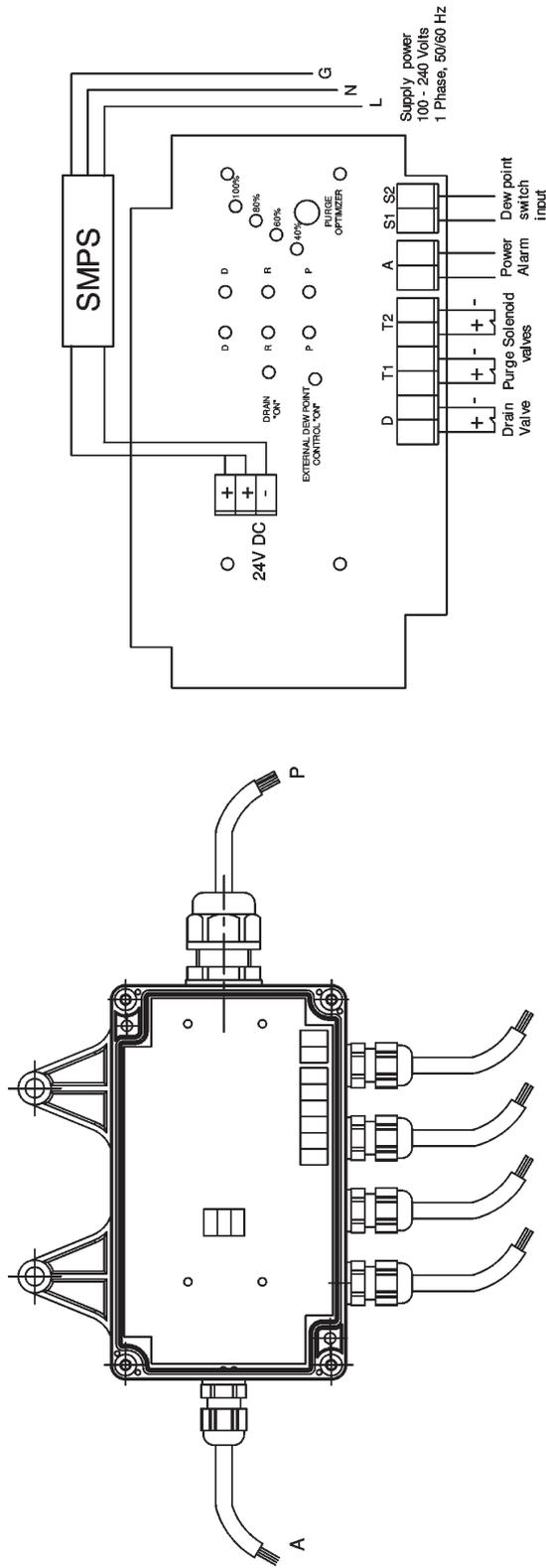
A – Check the purge economiser mode at 100% (or) at calculated percentage of load factor.

B – Check proper functioning of valves (or) dryer cycle.

C – Check adequate pre filtration of air using prefilter as per specification.

D – Check desiccant condition for presence of oil, liquid or water and replace if coated.

# CONTROLLER ELECTRICAL DIAGRAM - DS 31-90



**Note:**

- P - Power
- T1 - Tower 1 Solenoid
- T2 - Tower 2 Solenoid
- D - Drain
- S1, S2 - Dew point switch input \*
- A - Power alarm \*

**Power alarm logic**

- Controller powered : Contact closed
- Controller not powered : Contact Open

S1, S2: To connect Dew point meter display unit. This can be connected in parallel with another Dryspell plus controller as done in dual system.

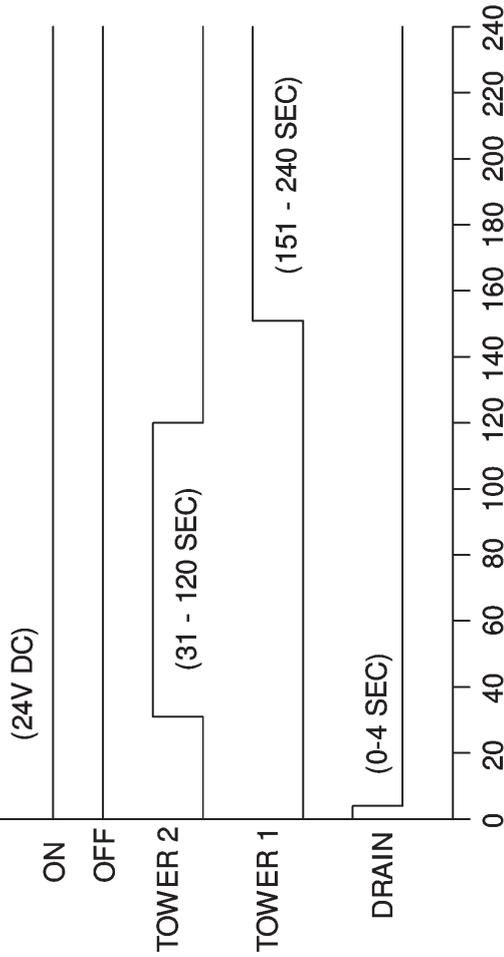
\* Optional for Customer interface

**DEWPOINT SWITCH INPUT:**

Customer needs to give a potential free contact to the dewpoint switch input.  
 Econo Mode : When Dewpoint temperature is 'better' than required value, contact to be closed. Dryer will stretch the cycle.  
 Run Mode : When Dewpoint temperature is 'worse' than required value, contact to be open. Dryer will run as per normal cycle.

## DS 31-90 CONTROLLER TIMINGS INPUT: 100-240 VOLTS AC, 12 WATTS MAX

Drying time per tower is 2 minutes in time mode extended if dew point is good  
Regeneration time 1.5 minutes is fixed, re-pressurization time 0.5 minutes in timer  
mode during re-pressurization states if the econo terminals are shorted (dew point is  
satisfied) then this re-pressurization state stretches until the contacts opens (dew point  
above set point)



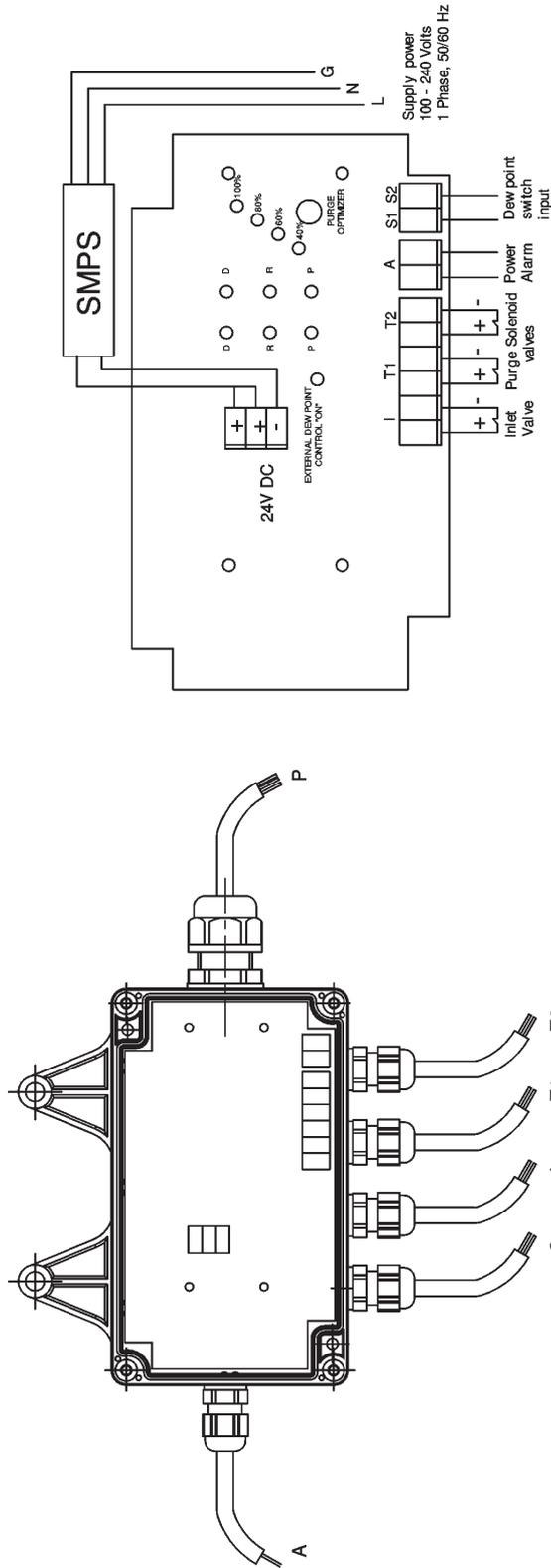
TIMING IN SECONDS, 240 SECOND CYCLE

### MANUAL PURGE ECONOMISER

#### PURGE TIMING

PURGE OPTIMISER	TOWER 1	TOWER 2
100%	31-120 (90 Sec)	151-240 (90 Sec)
80%	31-103 (72 Sec)	151-223 (72 Sec)
60%	31-85 (54 Sec)	151-205 (54 Sec)
40%	31-67 (36 Sec)	151-187 (36 Sec)

# CONTROLLER ELECTRICAL DIAGRAM - DS 31-200



**Note:**

- P - Power
- T1 - Tower 1 Solenoid
- T2 - Tower 2 Solenoid
- I - Inlet Valve
- S1, S2 - Dew point switch input \*
- A - Power alarm \*

Power alarm logic  
 Controller powered : Contact closed  
 Controller not powered : Contact Open

S1, S2: To connect Dew point meter display unit. This can be connected in parallel with another Dryspell plus controller as done in dual system.

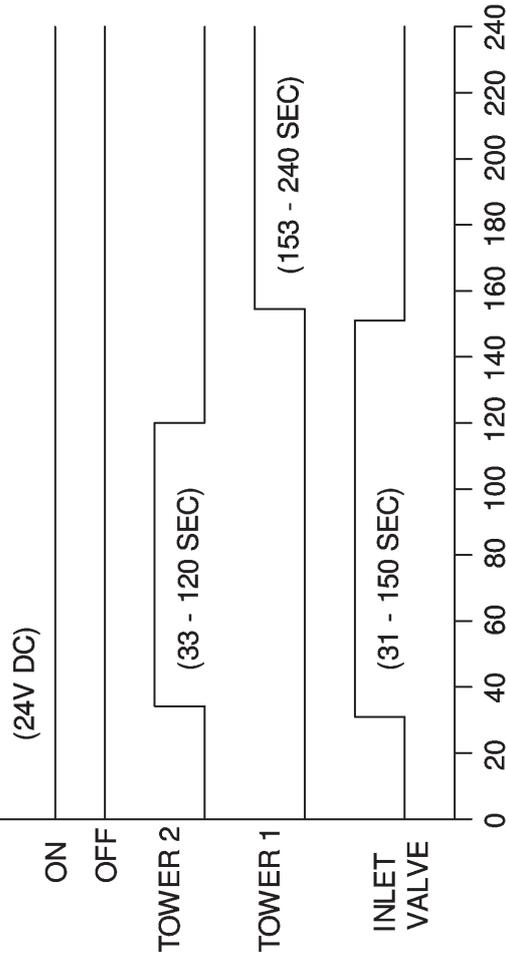
\* Optional for Customer interface

**DEWPOINT SWITCH INPUT:**

Customer needs to give a potential free contact to the dewpoint switch input.  
 Econo Mode : When Dewpoint temperature is 'better' than required value, contact to be closed. Dryer will stretch the cycle.  
 Run Mode : When Dewpoint temperature is 'worse' than required value, contact to be open. Dryer will run as per normal cycle

## DS 31-200 CONTROLLER TIMINGS INPUT: 100-240 VOLTS AC, 12 WATTS MAX

Drying time per tower is 2 minutes in time mode extended if dew point is good  
Regeneration time 1.5 minutes is fixed, re-pressurization time 0.5 minutes in timer  
mode during re-pressurization states if the econo terminals are shorted (dew point is  
satisfied) then this re-pressurization state stretches until the contacts opens (dew point  
above set point)



### MANUAL PURGE ECONOMISER

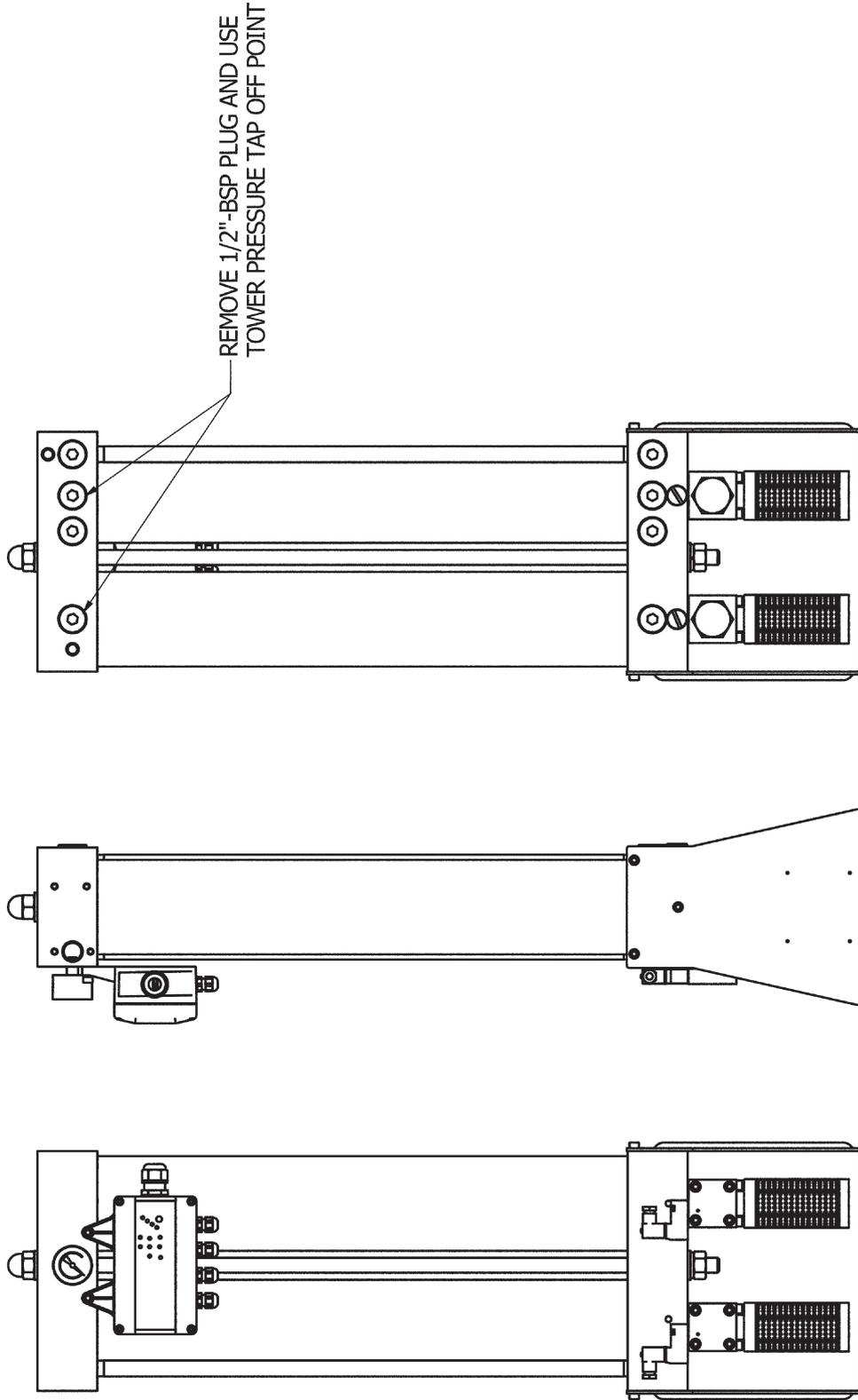
#### PURGE TIMING

PURGE OPTIMISER	TOWER 1	TOWER 2
100%	33-120 (88 Sec)	153-240 (88 Sec)
80%	50-120 (70 Sec)	170-240 (70 Sec)
60%	68-120 (52 Sec)	188-240 (52 Sec)
40%	86-120 (34 Sec)	206-140 (34 Sec)

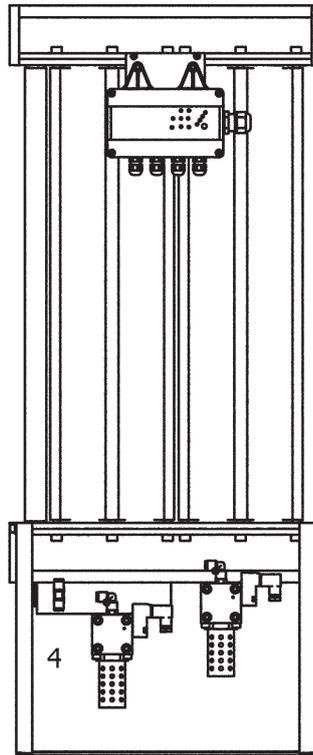
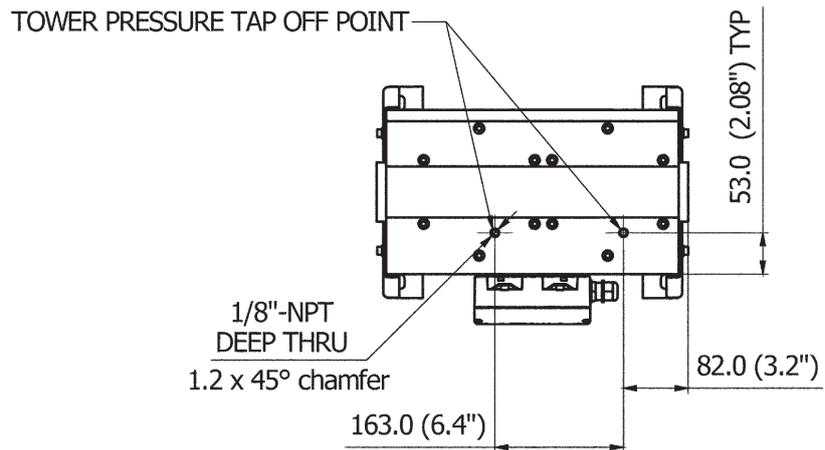
# Dryspell Plus Series Instruction Manual

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## DRYSPELL PLUS 20-30 TOWER PRESSURE TAP OFF POINT



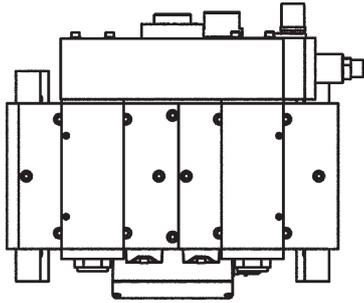
DRYSPELL PLUS 45 & 60  
TOWER PRESSURE TAP OFF POINT



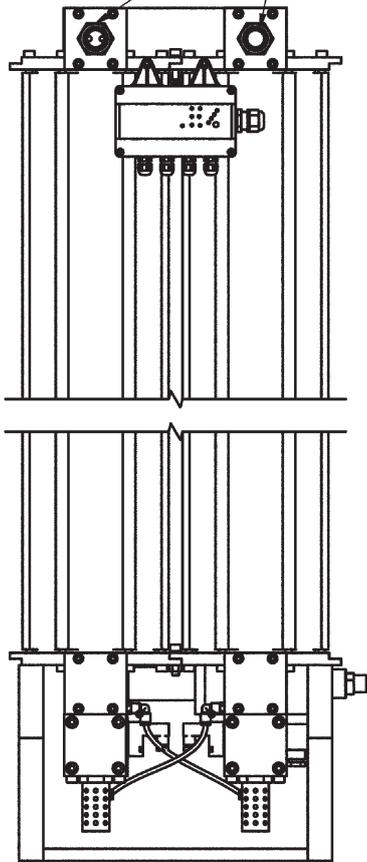
# Dryspell Plus Series Instruction Manual

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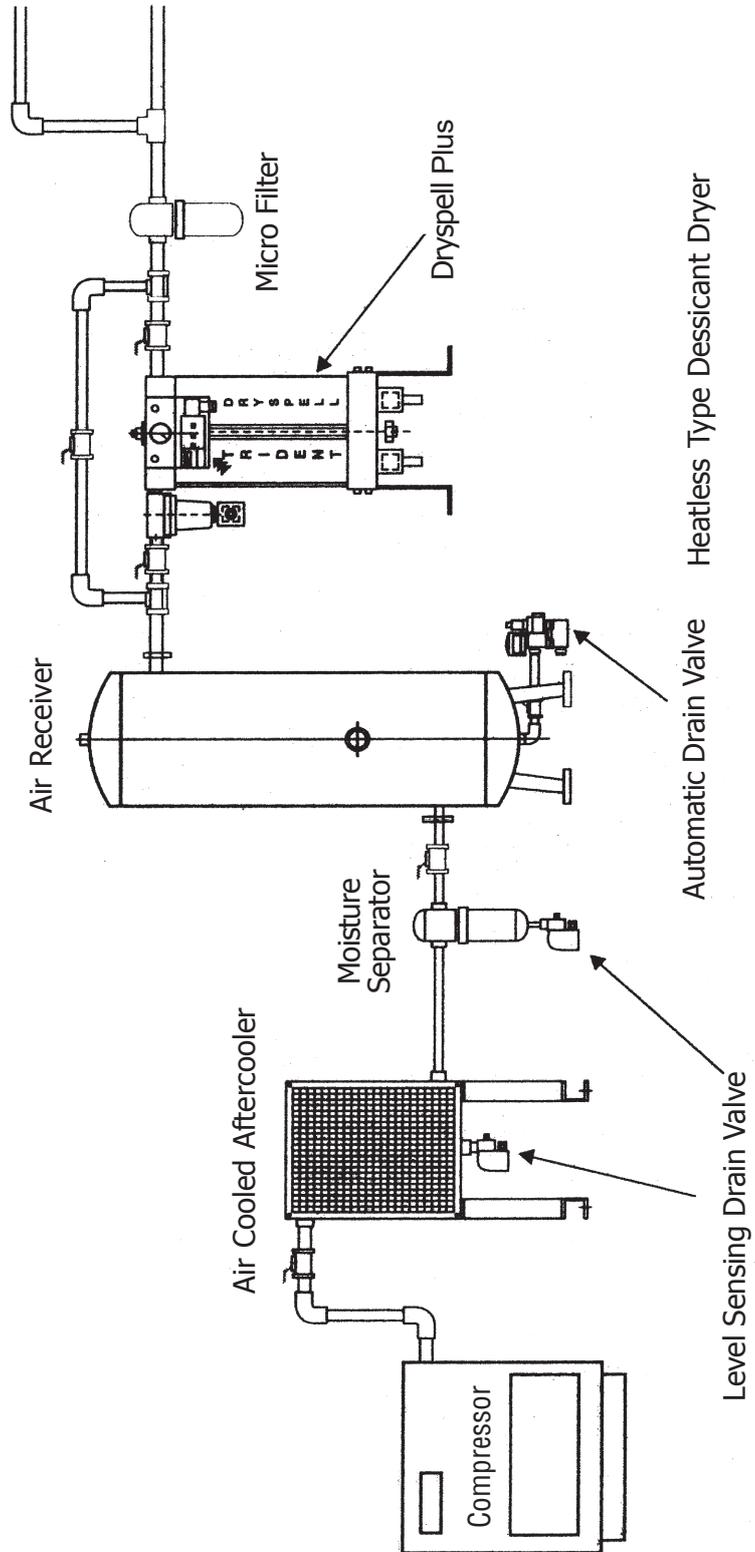
## DRYSPELL PLUS 100-375 TOWER PRESSURE TAP OFF POINT



REMOVE COLOR CHANGING INDICATOR (3/4" NPT)  
AND USE TOWER PRESSURE TAP OFF POINT



## COMPRESSED AIR LAYOUT



# INSTALLATION & COMMISSIONING REPORT

## Compressed Air Dryer

Customer :	Model :
Contact person :	Sl.No :
Designation :	Phone :
	Fax :

(Please add any comments or remarks found while unpacking)
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### 1. INSTALLATION

a) Installation at : Before / After Air Receiver	LED Glowing	Yes / No
b) Inlet Air : Normal / High Temperature	Tower 1 and 2 Drying	Yes / No
c) Side clearance : Yes / No provided	Depressurizing	Yes / No
d) Power Grounded : Yes / No	Regeneration	Yes / No
e) Air Flow Outlet : Normal / Faulty		
f) Change over : Normal / Faulty sequence		
g) Change over : Normal / Faulty sequence		

### 2. COMMISSIONING

Installation	Date of completion
Commissioning	Date of completion

Comments :

Customer	Installation Engineer
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_____ Signature & Name of Engineer	_____ Dealers Signature & Seal	_____ Customer's Signature & Seal
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