User guide

D3 breathing air purifier

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www.n-psi.co.uk

about us

Experience.

Our team is comprised of and supported by individuals spanning all disciplines from research & development, engineering & manufacturing, marketing & sales and service & support. Our backgrounds are in air and gas purification and our experience in this field spans a wide range of industries. We combine this knowledge and experience to ensure our products and services are designed and provided to meet the objectives and expectations of you - our Customer.

Customer.

We recognise that our Customers are not only our valuable distribution partners who sell and support our products or the machine builders who depend on them as protection for their equipment. They are the contractors who install them, the manufacturers who use them in their processes and the service people who maintain them. At nano we have developed our products, packaging and support materials to ensure they exceed all of our Customers' expectations.

Service.

At nano we recognise that world-class customer service is the most important component to any successful business. Your business needs to exceed your customers' expectations to stand out from your competitors and our service must positively impact your business so you can be successful in doing so. Our commitment is simple… we will stand behind our products and ensure that our customer service is unrivaled in the industry.

Experience. Customer. Service.

breathing air purifier

1. manufacturers detials and support

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1.1 general information

1.2 document introduction

This manual provides factory prescribed installation and maintenance procedures for the breathing air purifier. The procedures illustrated in this document are only to be performed by authorized personnel. For further information regarding the procedures outlined in this document contact the manufacturer before proceeding. Be sure to read this document carefully before attempting to install or operate the breathing air purifier. This document should be permanently available at the breathing air purifier installation site.

1.3 warranty guidelines

All products are supplied with a 2 year manufacturer's warranty from the date of purchase when installed and maintained in accordance with the manufacturers guidelines. Only genuine service parts should be used and no modifications made.

1.4 general safety

No modifications must be made to the product. Any modifications may reduce the operational safety of the product and invalidate the manufacturer's warranty. This could potentially result in damage to the product and serious personal injury.

For your own safety, when carrying out work on this product, all relevant national safety regulations must be complied with relating to pressurized and electrical systems.

Only authorized, competent and trained personnel are permitted to work on this product. This user guide is intended solely for such personnel and is to be used only as a reference; it should not be used to replace conventional training.

1.5 intended use of the product

The breathing air purifier is exclusively intended for the treatment of compressed air, which is free from bulk water, oil and solid matter constituents.

The product should be located within a building and protected from extreme conditions and weather. The breathing air purifier must be operated only in accordance with the data on the rating plate. Any operations that do not comply with those stated on the product rating label will render the warranty void

annotations

CAUTIONS: indicate any situation or operation that may result in potential damage to the product, injury to the user, or render the product unsafe.

NOTES: *highlight important sections of information where particular care and attention should be paid.*

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WARNING: This product can expose you to chemicals including lead, which is known to the State of California to cause cancer and/or birth defects or other reproductive harm. For more information, go to www.P65Warnings.ca.gov.

breathing air purifier

2. technical specification

Required Inlet Purity	ISO 8573-1 : 2010 Class 1:2:2
Minimum working pressure	87 psig (6 barg)
Maximum working pressure	145 psig (10 barg)
Power Supply	100 - 240v AC / 50 - 60Hz
Minimum inlet temperature	34.7°F (1.5°C)
Maximum inlet temperature	86°F (30°C)
Ambient Temperature	34-122°F (1-50°C)
IP Rating	IP54 / NEMA 3
Power	38W
Noise	<90dB (A)

2.1 breathing air standards

Impurity	European Pharma	CSA Z180.1	NBA Medical Breathing Air Purifier
*CO_2	<500ppm	<500ppm	<500ppm ♦[1]
*CO_2	<5ppm	<5ppm	<5ppm ♦[2]
SO_2	<1ppm	NA	<1ppm
NO_2	<2ppm	NA	<2ppm
O_2	NA	20-22%	20-22%
N2 & Rare Gases	NA	78-80%	78-80%
Water Vapour	ADP -45°C (-49°F) (-23°F) -31°C at 7 bar (100psi)	At a dew point 5°C under the lowest temperature its exposed to during the year.	PDP better than -40°F (-40°C) to ensure effective operation of the catalyst.
Oil vapour	0.01 mg/m³	<1mg/m3	<0.01mg/m³
Dirt Particles	NA	<1mg/m3	Down to 0.01 micron
Odour	Taste and odour free	Taste and odour free	Taste and odour free
Bacteria	NA	NA	Removed (DOP efficiency 99.999%)
Methane	NA	<10ppm	<10ppm
Volatile non-methane hydrocarbons (VNMH)	NA	<5ppm	<5ppm
Volatile halogenated hydrocarbons	NA	<5ppm	<5ppm

Europe	EN12021
UK	BS4275 : 1997
USA	CGA G7.1-1997 OSHA-Grade D
Canada	CSA Z180.1

***Where excessive levels of CO2 and CO have been indentified as the norm, breathing air purifiers should not be used and alternative strategies should be derived from a risk assessment.**
When challenged with 750ppm ♦[1]
When challenged with 65ppm ♦[2]

All breathing air systems should be proceeded by high efficiency filtration regardless of whether an oil or oil free compressor is used. Inlet air should be filtered such that it complies with ISO 8573-1: 2010 quality classes

2.3 maximum flow rates

Rates at 102psig (7barg) and temperature of 75°F (24°FC)

model	inlet flow rate		outlet flow	
	NL/m	scfm	NL/m	scfm
NBA 2110	4871	172	3653	129
NBA 2120	6117	216	4588	162
NBA 3120	9176	324	6882	243
NBA 4120	12234	432	9176	324
NBA 6120	18351	648	13764	486

For flow rates at other pressures, apply the factor shown:

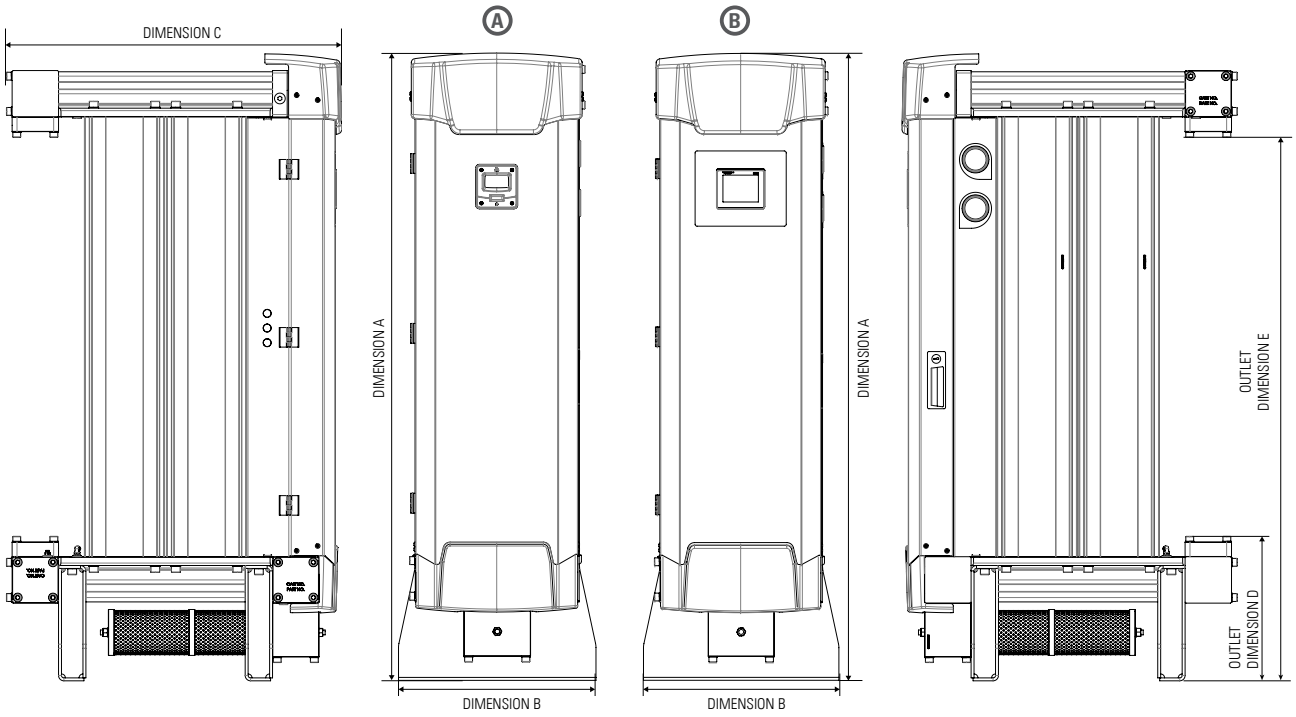
line pressure	bar g	6	7	8	9	10
	psi g	87	102	116	131	145
correction factor		0.92	1	1.07	1.13	1.20

2.2 CO alarm

According to OSHA 1910.134 and CSA Z180.1, should be fitted to monitor the outlet air purity.

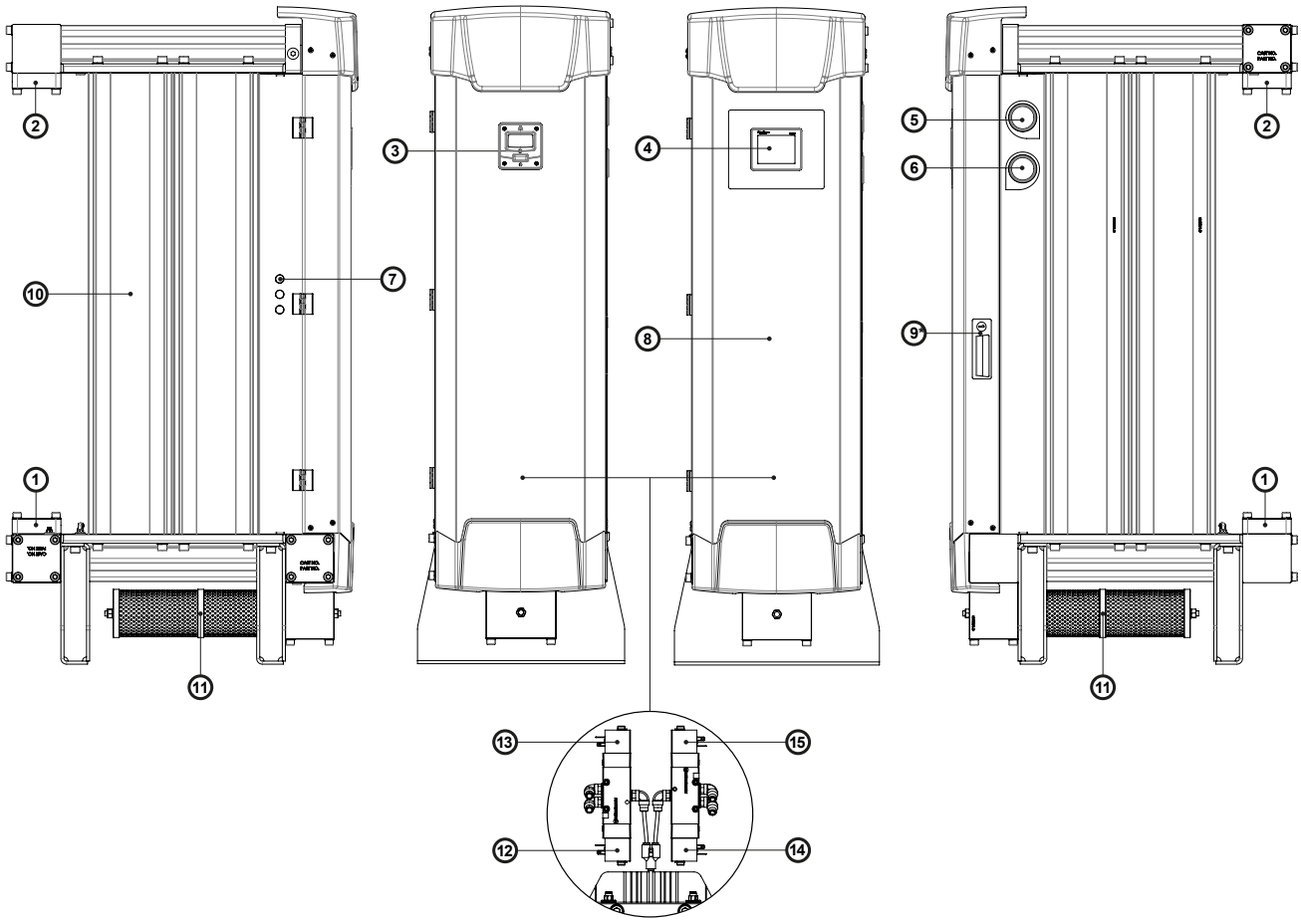
2.4 product dimensions

below illustration shows standard Ⓐ & premium controller Ⓑ



model	dimension						weight	
	A		B		C			
	mm	inches	mm	inches	mm	inches	kg	lbs
NBA - 2110	1283	50.51	400	15.7	680	26.77	97	214
NBA - 2120	1533	60.35			680	26.77	179	394
NBA - 3120	1533	74.13			849	33.42	249	548
NBA - 4120	1533	74.13			1017	40.03	331	729
NBA - 6120	1533	60.35			1352	53.22	439	967

3. product overview



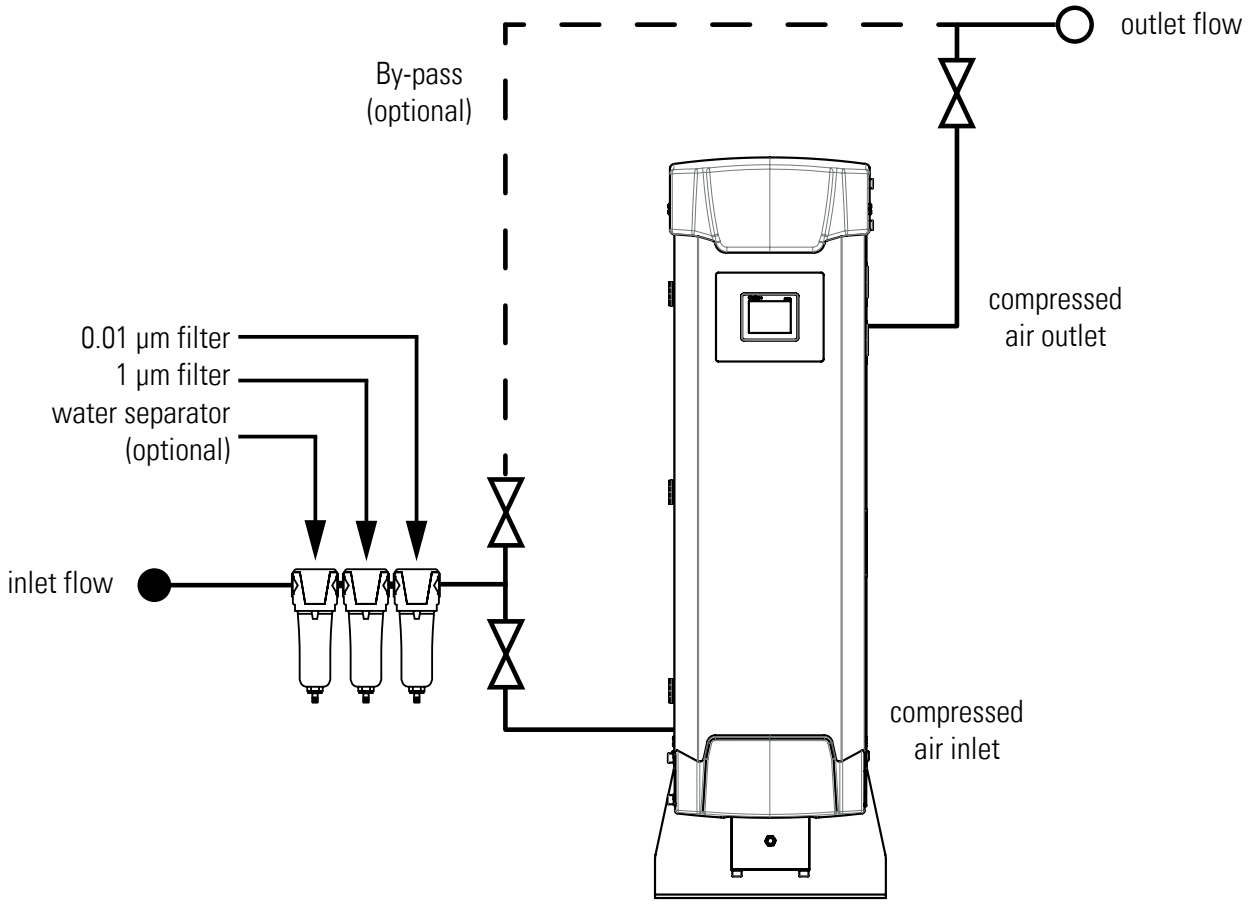
number	description
1	compressed air inlet
2	compressed air outlet
3	standard controller display
4	premium controller display
5	column A pressure gauge
6	column B pressure gauge
7	control module access positions
8	enclosure access door

number	description
9	enclosure handle / lock
10	pressure vessel
11	exhaust silencer
12	inlet valve B
13	inlet valve A
14	exhaust valve B
15	exhaust valve A

breathing air purifier

3.1 typical system layout

IMPORTANT: It is essential that the system into which the unit is installed is fitted with a pressure limiting/ relief device. This device should be installed between the compressor and the unit.



3.2 site location

When selecting an installation site for the unit, ensure the following conditions are met:

- Installation site should be located indoors on a flat surface protected from the weather and other harmful conditions.
- The ambient temperature must not drop below 1.5°C (34.7°F) or exceed 50°C (122°F).
- The installation site should be level and able to support the weight of the product.
- Ensure sufficient space around the product, to allow access for operation and maintenance.
- Take into account the noise generated by the unit exhausting while in use when considering location.

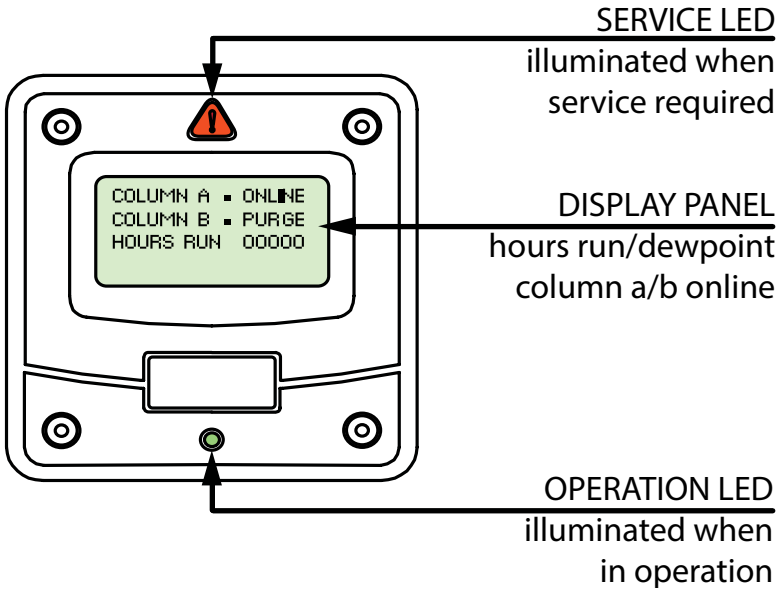
4. start-up & operation - standard controller

Do not allow the unit to flow air unless switched on and cycling.
Resulting effect could be desiccant contamination; requiring a desiccant service.

- Ensure all pipe work is connected as per the typical layout
- The unit is connected with a power supply as stated on the rating label.
- Ensure the inlet air pressure is with in limits as stated on the rating label on the product.
- Ensure the inlet air temperature is with in limits as stated on the rating label on the product.
- Slowly open the inlet flow and allow the unit to pressurize
- Turn on the power to the unit, the unit will display its' status.
- Allow the unit to cycle at least 2 times before slowly opening the outlet flow.
- In case of using the Remote Start/Stop function, ensure external voltage is active.

This unit must be grounded. In the event of an electrical short circuit, grounding reduces the risk of electric shock by providing an escape wire for the electric current. This unit is equipped with a cord having a grounding wire with an appropriate grounding plug.

The plug must be plugged into an outlet that is properly installed and grounded in accordance with all local codes and ordinances. Do not modify the plug provided; if it does not fit the outlet, have the proper outlet installed by a qualified electrician.



4.1 remote start/stop control - standard controller

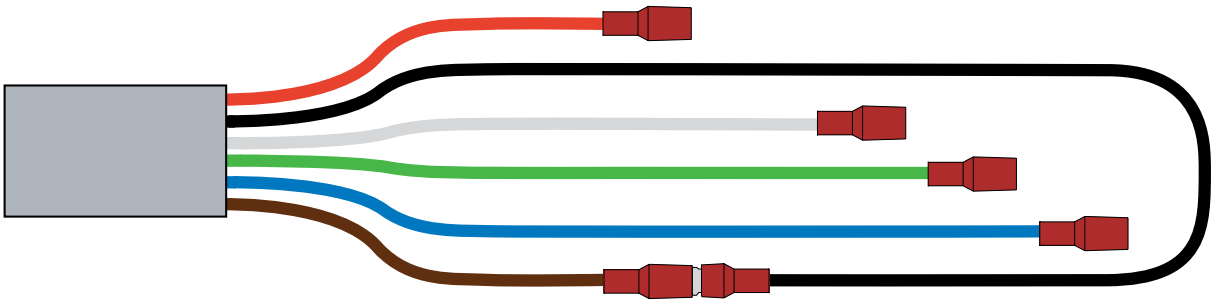
To gain access to the remote start/stop feature:

- Turn to unlock latch & open front door
- Locate flying lead at bottom of controller
- Remove the insulation from the flying lead
- There are six wires;

1. Brown Wire - 24V DC Output
2. Blue Wire - 24V DC Output
3. Black Wire - Remote Start/Stop Input
4. White Wire - Alarm Input (Zero volt contact)
5. Green Wire - Alarm Output (Zero volt contact)
6. Red Wire - Remote Stop Input

- To set up the Remote Start/Stop control, remove/break the connection between the Brown and Black wires and connect externally to a remote switch or relay.
- A 24V DC Output must be connected to the Black wire to enable the dryer to operate, if the connection is broken or if there is no voltage the dryer will switch off and revert to standby mode, displaying "REMOTE STOP ACTIVE" on the controller display.

Under no circumstances should an external voltage or current be applied to any of these wires, as damage to the control system will occur, negating the warranty.

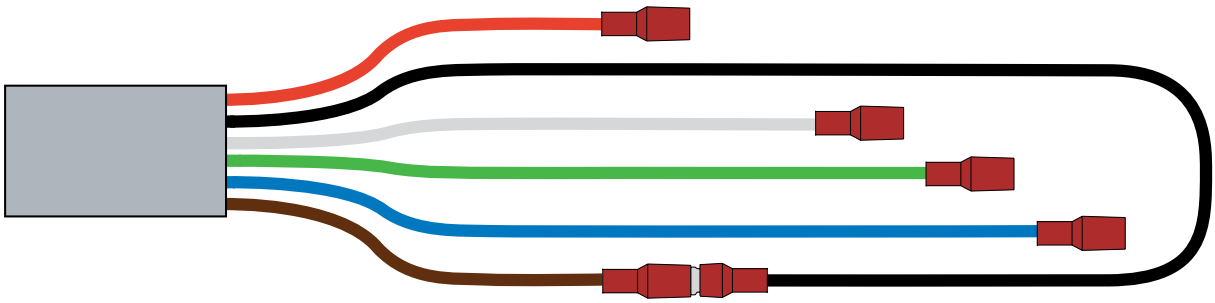


4.2 emergency stop - standard controller

- Turn to unlock latch & open front door
- Locate flying lead at bottom of controller
- Remove the insulation from the flying lead
- There are six wires;

1. Brown Wire - 24V DC Output
2. Blue Wire - 24V DC Output
3. Black Wire - Remote Start/Stop Input
4. White Wire - Alarm Input (Zero volt contact)
5. Green Wire - Alarm Output (Zero volt contact)
6. Red Wire - Remote Stop Input

- To set up the Emergency Stop, create a connection between the Red and Blue wires via a central relay or swith
- If a 24V output is connected to the red wire the dryer will automatically switch off and enter standby mode, displaying remote stop is active.



4.3 shutdown procedure - standard controller

Isolate unit from compressed air system.

The unit will still be pressurized
Ensure the unit is fully depressurized and isolated

To fully depressurize, following the steps below;

- Cycle the dryer at least twice to ensure the unit exhausts and is completely depressurized.
- When fully depressurized the 'clicking' of the exhaust valves will be heard but no air exhausted.
- When the unit is fully depressurized, isolate from the electrical supply.

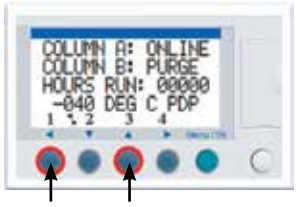
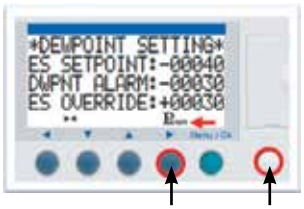
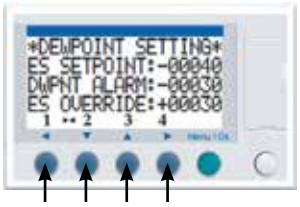
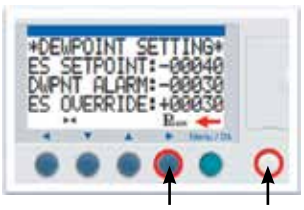
4.4 monitoring dryer performance (when ES option is fitted) - standard controller

The pressure dew-point is displayed on the display of the control panel. When the dew-point displayed is equal to or better than -40°C (-40°F) PDP the dryer will switch into energy saving mode and stop cycling, resulting in zero purge, but no interruption in flow. When the dew-point degrades to -39°C (-40°F) or higher, then the dryer will restart cycling ensuring the dew-point is maintained at or better than -40°C (-40°F).

If during normal operation, the unit fails to achieve dew-point (degrades above -30°C (-22°F)) the dewpoint alarm output will be indicated on the front screen and the remote alarm output will activate.

The set levels for the ES and dewpoint alarm are adjustable and can be accessed by carefully removing the front bezel to expose the PLC and adjustment buttons.

Hold buttons A & B down for 8 seconds to access the menu shown on page 17 display 8.

Adjusting Dewpoint Settings - Standard controller	
Hold down button 1 and button 3 for five seconds	
In the DEWPOINT SETTING menu, hold down the white button until the word 'Param' appears at the bottom of the screen Press button 4 once. The text will change to 'Prog'. The 'ES SETPOINT' line will begin to flash.	
Using the buttons, adjust the 'ES SETPOINT' or 'DWPNT ALARM' Button 1 is used to move up a line. Button 4 is used to move down a line. Button 2 is used to lower the value Button 3 is used to increase the value.	
Following any changes to the configuration, it is essential that the program is reverted back to 'Param'. Hold down the white button until 'Prog' is displayed at the bottom of the screen Once 'Prog' appears, press button 4 once. The text will change back to 'Param'.	

Beware, this is only an illustrative example.

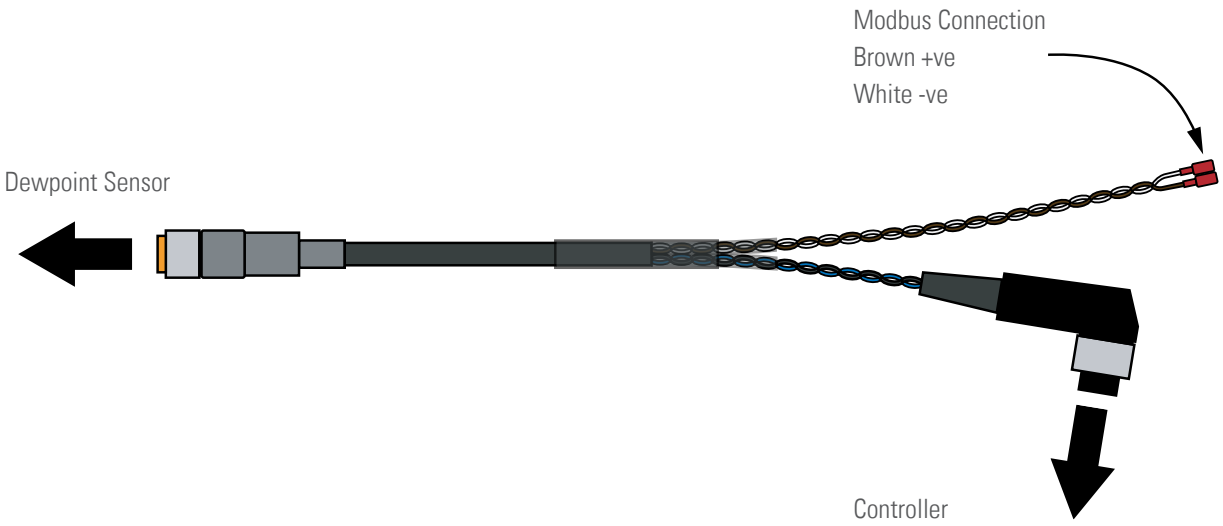
1	**Power-up Display (only visable on power start-up for 10 seconds)**	
	During power-up the screen will display: Program number followed by the version Total hours the product has operated This screen can be displayed at any time by pressing and holding buttons 1 & 2 for two seconds	PROGRAM NUMBER 99-100-0060-V1.1 TOTAL HOURS:+00000 x10,000:+00000
2	**Normal Operation Display**	
	During normal operation the screen will display: Column 'A' and 'B' status, this will show as one of three sequences: ONLINE - column is flowing PURGE - column is regenerating READY - column is waiting to switch Hours the dryer has run between services	COLUMN A: ONLINE COLUMN B: PURGE HOURS RUN: 00000
3	**Service Re-set Display**	
	When due a service, the product display will show 'SERVICE REQUIRED'. After servicing the product, you will be required to reset the service hours run counter. When a magnet is held to the specified area on the dryer shroud for 10 seconds, the screen will display 'SERVICE RE-SET'. The hours run counter will revert back to zero.	COLUMN A: ONLINE COLUMN B: PURGE HOURS RUN: 00000 SERVICE REQUIRED COLUMN A: ONLINE COLUMN B: PURGE HOURS RUN: 00000 SERVICE RE-SET
4	**Normal Operation Display (ES Models)**	
	During normal operation of an ES enabled product, the screen will constantly disply the updated pressure dewpoint reading. This can be displayed in either degrees celcius or degrees fahrenheit, depending on how the controller is configured. Speak to the manufacturer about your requirements	COLUMN A: ONLINE COLUMN B: PURGE HOURS RUN: 00000 -045 DEG C PDP

5	**Energy Saving Mode Active Display (ES Models)**	
	While energy saving mode is active the screen will display: • Column 'A' status and Column 'B' status, this will be shown as; • ONLINE; this column is flowing • 'ENERGY SAVING MODE' • Hours the dryer has run between services/hours in ES mode • Constantly updated dew-point reading, this can be displayed in either degrees celcius or degrees fahrenheit.	COLUMN A: ONLINE ENERGY SAVING MODE HOURS IN ES: 00000 -045 DEG C PDP
6	**Dew-point Sensor Fault Display (ES Models)**	
	If a fault occurs with the dew-point sensor or the connection to the dew-point sensor, the screen will display; • Column 'A' status and Column 'B' status • Hours the dryer has run between services/hours in ES mode • 'DEWPT SENSOR FAULT'	COLUMN A: ONLINE COLUMN B: READY! HOURS RUN: 00000 DEWPT SENSOR FAULT
7	**Dew-point Alarm Display (ES Models)**	
	If the dew-point sensor reading falls below the desired alarm limit the screen will display; • Column 'A' status and Column 'B' status • Hours the dryer has run between services/hours in ES mode • 'DEWPOINT ALARM'	COLUMN A: ONLINE COLUMN B: PURGE HOURS IN ES: 00000 DEWPOINT ALARM
8	**Energy Savings Adjustment Display (ES Models)**	
	When adjusting the ES set-point the screen will display; 'ES SETPOINT' - This is the point at which the dryer activates ES mode. If the dewpoint is less than the ES set-point, ES mode activates. If the dewpoint is greater than the ES set-point, ES mode deactivates. 'DWPNT ALARM' - this is the point that the dryer will activate the dewpoint alarm and remote alarms. 'ES OVERRIDE' This is the maximum time in minutes that ES mode is continuously active before the dryer switches columns and performs a regeneration cycle.	*DEWPOINT SETTING* ES SETPOINT:-00040 DWPNT ALARM:-00030 ES OVERRIDE:+00030

4.5 modbus connection ES option - standard controller

connection to allow monitoring of dryer performance. (when Modbus ES sensor option is fitted) - standard controller

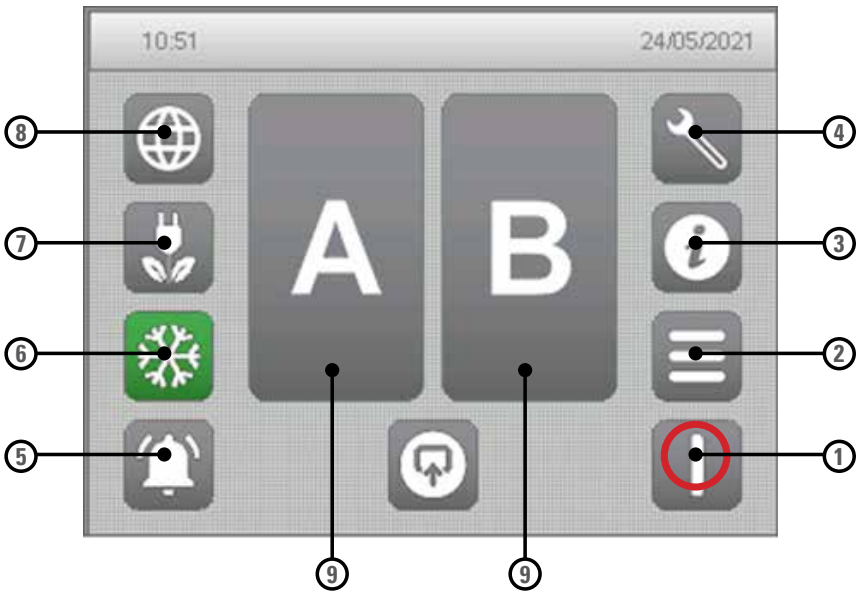
Where Modbus ES sensor option is fitted, connections must be applied as shown below.
For further information on connection set-up, consult supporting documentation



5. start-up and operation - premium controller

Do not allow the unit to flow air unless switched on and cycling.
Resulting effect could be desiccant contamination; requiring a desiccant service.

- Ensure all pipe work is connected as per the typical layout.
- The unit is connected with a power supply as stated on the rating label.
- Ensure the inlet air pressure is with in limits as stated on the rating label on the product.
- Ensure the inlet air temperature is with in limits as stated on the rating label on the product.
- Slowly open the inlet flow and allow the unit to pressurize.
- Turn on the power to the unit, the unit will display its' status.
- Allow the unit to cycle at least 2 times before slowly opening the outlet flow.
- In case of using the Remote Start/Stop function, ensure external voltage is active.



This unit must be grounded. In the event of an electrical short circuit, grounding reduces the risk of electric shock by providing an escape wire for the electric current. This unit is equipped with a cord having a grounding wire with an appropriate grounding plug. The plug must be plugged into an outlet that is properly installed and grounded in accordance with all local codes and ordinances. Do not modify the plug provided; if it does not fit the outlet, have the proper outlet installed by a qualified electrician.

After 10 minutes of inactivity, the HMI will enter an energy saving mode where the HMI screen will go black. A green LED will remain lit at all times to indicate the HMI is still fully functional. If at any point the HMI detects human interaction the energy saving mode will deactivate and the screen will revert back to the main display seen above.

breathing air purifier

HMI display features - premium controller

No.	symbol	description
1		**start button;** the dryer is ready to start-up. Press to Start.
		**stop button;** the dryer is ready to shutdown. Press to Stop.
2		**menu;** access to the menu structure.
3		**general information** view the model number, serial number, build date and installation date.
4		**service information;** access total hours, hours run since last service and service provider details.
		**service reminder;** the dryer will require a service soon.
		**sevice required** the dryer requires a service.
5		**alarm records;** access alarm and event logs such as low inlet pressure and high purity alarm.
		**alarm records;** minor alarm is active.
		**alarm records;** major alarm is active

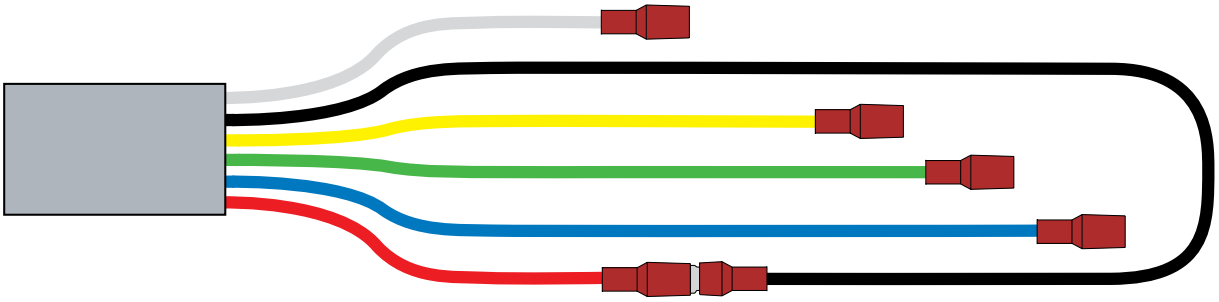
No.	symbol	discription
6		**dew point status;** access to the outlet dew point measurement (optional extra)
7		**economy;** access total hours in economy, percentage savings
		**economy;** if flashing green the dryer is in energy saving mode
8		**language selection;** access to different languages such as french and german.
9		**column status;** when grey. column A and/or B is offline.
		column status; when amber, column A and B is equalising.
		column status; when green, column A or B is online and producing gas.
10		**remote start/stop;** the generator is/has shutdown due to the remote start connection being broken

5.1 remote start/stop control - premium controller

To gain access to the remote start/stop feature:

- Open the enclosure door, this will then expose the controller
- Remove the insulation from the flying lead
- There are six wires;
  1. Red Wire - 24V Output (24V+)
  2. Blue Wire - 4-20 mA Output (420-)
  3. Black Wire - Remote Start/Stop (RMS)
  4. Yellow Wire - 4-20 mA Output (420+)
  5. Green Wire - Alarm Output (ALM)
  6. White Wire - Emergency Stop (EMS)
- To set up the Remote Start/Stop control, remove/break the connection between the Red & Black wires and connect externally to a remote switch or relay.
- A 24V DC Output must be connected to the Black wire to enable the dryer to operate, if the connection is broken or if there is no voltage the dryer will switch off and revert to standby mode, displaying "REMOTE STOP ACTIVE" on the controller display.

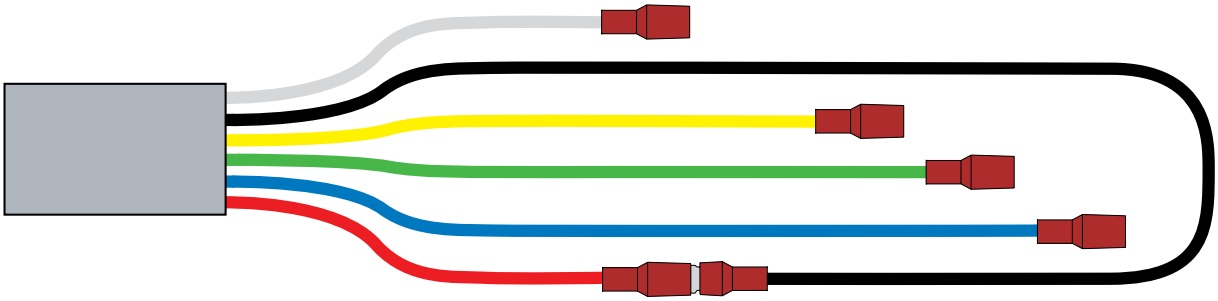
Under no circumstances should an external voltage or current be applied to any of these wires, as damage to the control system will occur, negating the warranty.



5.2 emergency stop control - premium controller

To gain access to the remote start/stop feature:

- Open the enclosure door, this will then expose the controller
- Remove the insulation from the flying lead
- There are six wires;
  1. Red Wire - 24V Output (24V+)
  2. Blue Wire - 4-20 mA Output (420-)
  3. Black Wire - Remote Start/Stop (RMS)
  4. Yellow Wire - 4-20 mA Output (420+)
  5. Green Wire - Alarm Output (ALM)
  6. White Wire - Emergency Stop (EMS)
- To set up the Emergency Stop, create a connection between the White and Red wires via a central relay or swith
- If a 24V output is connected to the red wire the dryer will automatically switch off and enter standby mode, displaying remote stop is active.



5.3 shutdown procedure - premium controller

Isolate unit from compressed air system.

The unit will still be pressurized
Ensure the unit is fully depressurized and isolated

To fully depressurize, following the steps below;

- Once isolated from the compressed air source
- Cycle the dryer at least twice to ensure the unit exhausts and is completely depressurized.
- When fully depressurized the 'clicking' of the exhaust valves will be heard but no air exhausted.
- When the unit is fully depressurized, isolate from the electrical supply.
- Press ○ to to return to I.

5.4 monitoring dryer performance (when ES option is fitted) - premium controller

1 Home Screen

2 Select the menu button

3 Login as user, use passcode 1234

4 Select settings

5 select dewpoint settings

6 now you can adjust the energy saving settings.

6. maintenance

Maintenance operations should only be conducted once the system has been shut down and is fully depressurized. All operations should be carried out by authorized and suitably trained personnel.

- Isolate the unit from the compressed air and electrical supply ensuring the system is in a safe condition for maintenance to be carried out.
- All connections must be removed with care, paying particular attention to the areas that become pressurized.
- All seals removed during maintenance operations must be replaced with new seals.
- Only certified and approved replacement parts should be used.
- Do not modify or adjust the control settings.
- Check all connections and sealing faces for cleanliness and secure seating prior to assembly.
- Ensure all components are re-fitted to the product before operation.
- Check all connection and sealing faces for any leakage, if any found resolve and check again.
- Ensure the unit is left operating in a safe working condition after completion of maintenance.

6.1 cleaning

Clean the equipment with a damp cloth only and avoid excessive moisture around any electrical connections. If required a mild detergent can be used. Do not use abrasives/solvents as these may cause damage.

6.2 daily checks

- Check the unit for any signs of external damage.
- If the red service indicator is active, the unit must be serviced to ensure continued operation.
- Remove any loose dust or dirt from the unit, clean all surfaces that appear to have attracted unwanted contaminants.
- Ensure the unit is operating within the specification.
- Always check all connections for any leaks.
- Ensure all loose parts are removed or secured to the unit before operation.

6.3 service schedule and breakdown

service	year 1 (12 months or 6,000 hours)	year 2 (24 months or 12,000 hours)	year 3 (36 months or 24,000 hours)	year 4 (48 months or 36,000 hours)	year 5 (60 months or 44,000 hours)	year 6 (72 months or 53,000 hours)	year 7 (84 months or 61,000 hours)	year 8 (96 months or 70,000 hours)
A	✓	✓	✓	✓	✓	✓	✓	✓
B		✓		✓		✓		✓
C				✓				✓
E (ES MODELS ONLY)	✓	✓	✓	✓	✓	✓	✓	✓

Service A - Every 1 year (12 months - or 6,000 hours)
Replace external exhaust silencer/muffler element(s)

Service B - Every 2 year (24 months - or 12,000 hours)
Replace integrated filters
Replace cartridges
Replace exhaust valves
Replace inlet valves
Replace outlet valve seals
Replace top manifold gasket seals

Service C - Every 4 year (48 months - or 24,000 hours)
Replace control valves [inc. solenoid coils]

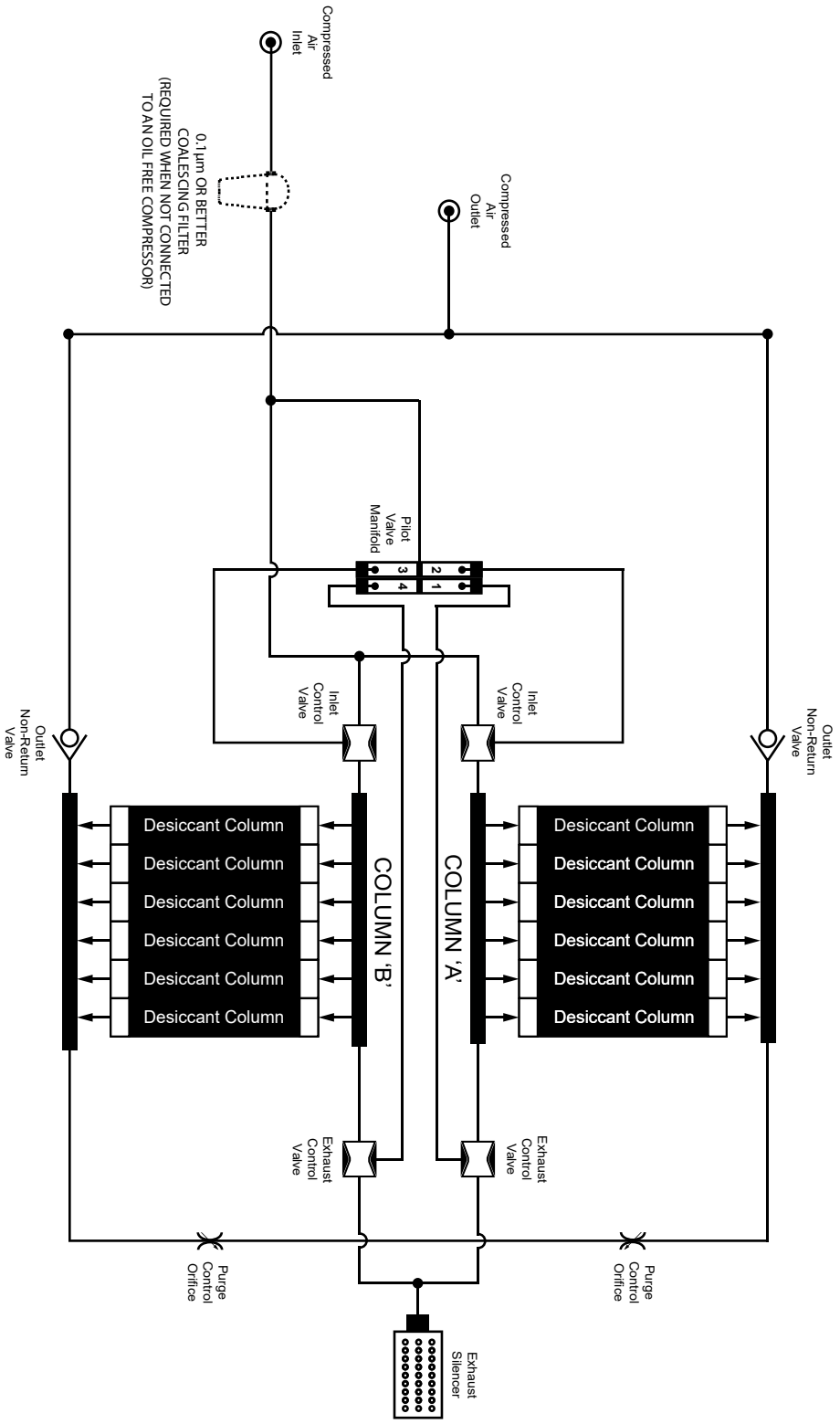
Service E - Every 1 year (12 months - or 6,000 hours)
Calibrate dew-point sensor
(Applicable to ES models only)

When contacting your service provider be sure to provide the part number and serial number of your dryer, this can be found on the rating plate.

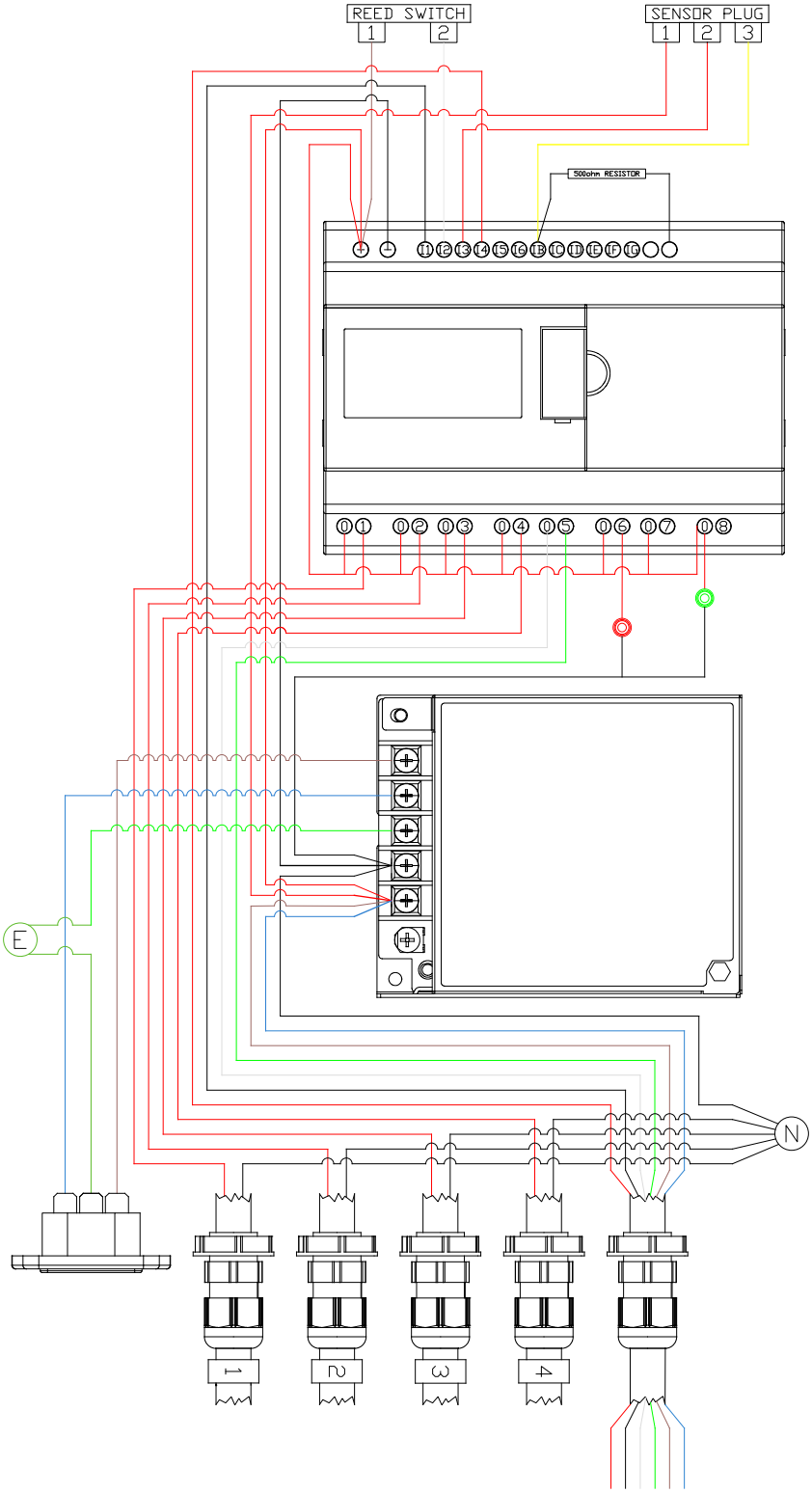
7. trouble shooting

problem	problem caused	solution
Poor dew-point performance	Insufficient inlet pressure	6 barg (87psig) minimum inlet pressure required to operate, if not, check and restore system pressure
	Electrical fault	Ensure the power is on and the dryer front panel is illuminated; check the dryer is cycling correctly
	Moist or contaminated desiccant	Eliminate the cause of contamination, replace desiccant cartridges (do not re-use)
	Excessive inlet air temprature	Check against the technician specification
	Insufficient purge air	Purge incorrectly adjusted, consult the service personnel to adjust the settings (factory pre-set). Consult Service Technician to adjust as per site condition.
	Exhaust silencer blocked	Replace exhaust silencer/muffler element(s).
Failure of dryer to cycle	controller not functioning correctly	Ensure the controller is powered up, check the on screen column status to ensure it is powering the solenoid valves during operation
	insufficient inlet pressure	6 barg (87 psig) minium inlet pressure required to operate, if not, check and restore system pressure
	controller not illuminated	Check power supply to the dryer, check fuse and replace.
	failure to de-pressurize when cycling	Control valve not functioning correctly; if there is power to the coil, replace valve. Consult controller display
	outlet flow stops	Check inlet air supply
	failure to initialize dryer	Switch off and restart dryer. Ensure dryer is pressurized before powering up to allow the dryer to initialize before operation.
	erratic air flow from exhaust	Faulty or damaged valves, carry out service

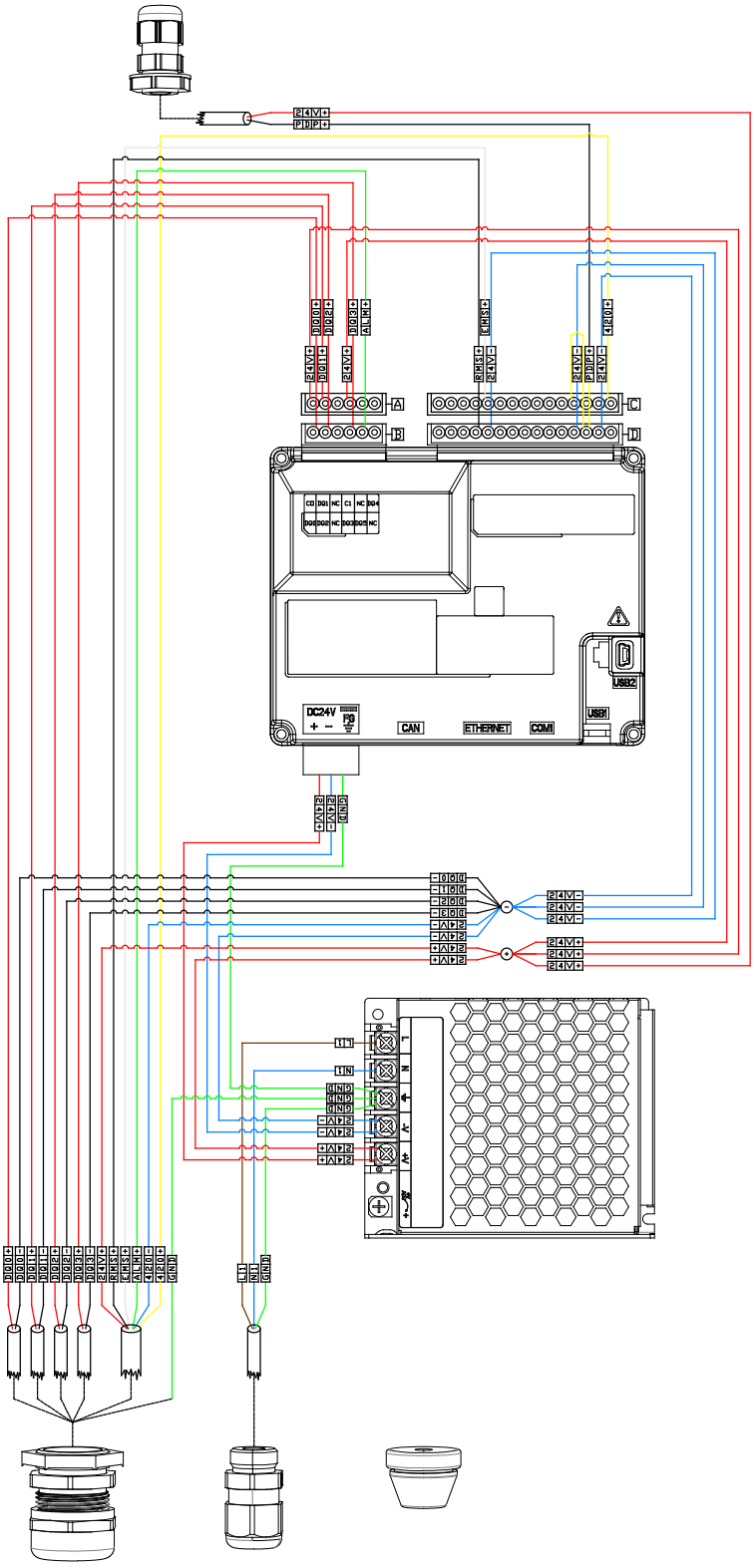
8. process and instrumentation diagram



8.1 wiring diagram - standard controller



8.2 wiring diagram - premium controller



notes

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