User Guide

EHA externally heated desiccant air dryer

revision: 002 document: 117-110-8012

www.n-psi.com

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 recognize 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 recognize 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.

table of contents

section		description	page
1	1.1	general information	4
	1.2	manufacturers details and support	
	1.3	document introduction	5
	1.4	warranty guidelines	
	1.5	definition of safety symbols	
	1.6	general warnings	6
	1.7	basic safety rules	7
	1.8	qualified operators	9
	1.9	storage	10
	1.10	transport and handling	
	1.11	proper use of the dryer	11
	1.12	instructions for the use of pressure equipment	
2	2.1	installation site	12
	2.2	installation layout	13
	2.3	dryer specifications	14
	2.4	correction factors	
	2.5	operation	15
	2.6	recommendations for optimal performance	16
	2.7	maintenance	17
3	3.1	EHA operating sequence	18
	3.2	setting the purge pressure	20
	3.3	operating three-valve bypass	21
	3.4	operation of display screen	22
4	4.1	trouble shooting	25
	4.2	arrangement drawings	27
	4.3	electrical drawings	29
	4.4	P & ID drawings	32
	4.5	appendixes	33

1.1 general information

This manual is copyrighted, all rights reserved. It may not, in whole or in part, be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine readable form without prior consent in writing from **nano-purification solutions**. It may not be distributed through the internet or computer bulletin board systems without prior consent from **nano-purification solutions**.

©2021 Air and Gas Solutions LLC

range: D^5 externally heated desiccant air dryers
models: EHA 100 - EHA 5000
doc no: 17-110-8012
issue: 002

1.2 manufacturers details and support

nano-purification solutions
address: 5509 david cox road
charlotte, nc 28269
usa
telephone: 704.897.2182
fax: 704.897.2183
internet: www.n-psi.com
e-mail: support@n-psi.com

nano-purification solutions
address: 1437 route 66
new bethlehem, pa 16242
usa
telephone: 724.297.3416
fax: 724.297.5189
internet: www.airtak.com
e-mail: airtak@airtak.com

nano-purification solutions
address: 7 petrie street, unit 1
st catharines, ontario
l2p3j6
canada
telephone: 905.684.6266
internet: www.n-psi.com
e-mail: canadasupport@n-psi.com

nano-purification solutions
address: dukesway
team valley trading estate
gateshead
ne11 opz
united kingdom
telephone: +44 (0) 191 497 7700
internet: www.n-psi.co.uk
e-mail: enquiries@n-psi.co.uk

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.

1.3 document introduction

This manual is meant for anyone who uses or works on the EHA externally heated desiccant air dryer, mainly the operators. The EHA externally heated desiccant air dryer and this manual are protected by copyright. Any reproduction of the same shall be liable for prosecution. All rights reserved by **nano-purification solutions**, particularly the rights of reproduction and distribution, as well as translation, including those relating to charges of copyright infringement. Any reproduction, processing, duplication, distribution of this document using electronic or mechanical means without the prior written authorization of **nano-purification solutions** is strictly prohibited. This document may have errors and is likely to be modified with respect to technical features.

1.4 warranty guidelines

All products are supplied with a 18 months manufacturer's warranty from the date of shipment from the factory or 12 months from date of installation/start up, whichever occurs first and installed and maintained in accordance with the manufacturers guidelines.

1.5 definition of safety symbols

Before attempting any intervention on the dryer, read carefully the instructions reported in this use and maintenance manual.

General warning sign: Risk of danger or possibility of damage to the machine. Read carefully the text related to this sign.

Electrical hazard: The relevant text outlines conditions which could result in injury. The related instructions must be strict respected.

Danger hazard: Part or system under pressure.

Danger hazard: Component or system which during the operation can reach high temperature.

Danger hazard: It's absolutely forbidden to breathe the air treated with this apparatus.

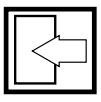
Danger hazard: It's absolutely forbidden to use water to extinguish fire on the dryer or in the surrounding area.

Danger hazard: It's absolutely forbidden to operate the machine when the parts (under pressure or electric panels) are not in place or have been tampered with and changed.

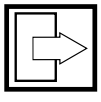
Danger hazard: Machine level noise could be higher than 85 dBA. It is mandatory to install the machine in dedicated area where people are not normally present. The installer and/or the user is responsible for correct installation of the dryer, in order to prevent noise propagation to the near work environment. The installer and/or the user is also responsible for the safety signs affixing into installation site.

Attention: The user that intervenes to the machine must wear hearing protection to operate the dryer. Each employee must select proper PPD (Personal Protection Device) hearing protector (earmuffs, ear canal caps and earplugs) in order to prevent any uneasiness that could cause dangerous situation for him.

Maintenance and/or control operation to be very carefully performed by qualified personnel [1].



Compressed air inlet connection point.



Compressed air outlet connection point.

Condensate drain connection point.

Operations which can be worked out by the operator of the machine, if qualified [1].

NOTE : Text to be taken into account, but not involving safety precautions.

In designing this unit a lot of care has been devoted to the protection of the environment:

- Dryer and relevant packaging composed of recyclable materials.
- Energy saving design.

To ensure our commitment, the user should follow the ecological suggestions marked with this sign.

1.6 general warnings

Read the contents of this manual carefully before starting the units.

This service and maintenance manual describes the design, operation and the instructions for use and maintenance of the units manufactured by **nano-purification solutions**.

nano-purification solutions shall not be liable for any damage caused due to non-compliance with the instructions of this manual.

For any questions or any clarifications that may be required, our qualified **nano-purification solutions** technicians are available to provide all the necessary information.

In order to make it easier to identify the units, it is important to always specify the technical features, especially the serial number, which are printed on the label on the outside of the dryer.

The unit should not be operated, even for a short period of time, under conditions other than the ideal conditions.

A part that does not guarantee safety should not be installed.

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.

1.7 basic safety rules

Compressed air is a highly hazardous energy source. Never work on the dryer with parts under pressure. Never point the compressed air or the condensate drain jet towards anybody. The user is responsible for the installation of the dryer, which has to be executed on the basis of the instructions given in this user guide. Otherwise, the warranty will be voided and dangerous situations for the per sonnel and/or damages to the machine could occur.

Only qualified personnel can use and service electrically powered devices. Before attempting any maintenance action, the following conditions must be satisfied:

- Ensure that any part of the machine is under voltage and that it cannot be connected to the mains.
- Ensure that any part of the dryer is under pressure and that it cannot be connected to the compressed air system.

Any change to the machine or to the relevant operating parameters, if not previously verified and authorized by the Manufacturer, may create the possibility of dangerous conditions it will void the warranty.

Don't use water to extinguish fire on the dryer or in the surrounding area.

nano-purification solutions shall not be held responsible for any possible damage caused, directly or indirectly, by persons or elements that are not non-compliant with these instructions.

Any assembling/removal carried out by THE USER, which is not provided for in this manual or not authorized by "nano-purification solutions", will be considered as an inappropriate operation, thereby damaging safety functions, and will lead to the cancellation of the warranty.

Essential safety rules

WARNING

Read this paragraph carefully and understand it before operating or servicing this machine. The machine is connected to hazardous power circuits (electricity, pneumatic circuit, etc.) and should be used with great care.
This paragraph explains what needs to be understood in terms of safety before operating or servicing the machine. Non-compliance with these safety instructions risks causing injuries or fatal accidents, break-down of the machine, products or installations, or a serious incident.

Operator

- Prior training about the operation and maintenance of the device is a prerequisite for the use and maintenance of the dryer.
- Use and maintain the dryer with the consent of the system manager.
- It is very dangerous to let a person, with poor knowledge and poor understanding about the system and how the machine functions, use it and carry out maintenance operations in an improper or negligent manner.

Before operating the dryer:

- Anyone using the dryer or carrying out its maintenance operations must read this manual carefully and understand its contents. Pay special attention to explanations with the heading “Danger”, “Warning” and “Caution” and understand them thoroughly. Follow the instructions and avoid predictable hazards when you use the dryer or carry out its maintenance operations.
- Before operating or carrying out a maintenance operation, read and understand the safety instructions stated in this manual and the safety labels affixed, on the device, and follow the instructions. Failing the above, you risk suffering facial injuries or even fatal injuries. You also run the risk of the dryer, the products or the installation breaking down or causing a serious incident.
- Other safety instructions are provided in the other paragraphs.

Warning labels (Warning)

- Warning labels are very important. Do not remove them deliberately.
- If they become dirty or illegible, or they get removed inadvertently or are lost, stick new labels in the place of the earlier ones.

Danger warning

When you use the dryer or carry out a maintenance operation on it, pay attention to the three warning levels below. Understand their content and act accordingly.
The warning messages appear on the warning labels placed on the dryer and given in the safety instructions paragraph of this manual.

DANGER

The “danger” messages provide warning about real dangers and indicate the risks of fatal accident or serious injuries for the operator who does not strictly adhere to the safety instructions provided to avoid such dangers. They also provide warning about the risks of an accidental air leakage or fire due to improper handling.
The content of the messages is identical to the warning messages, except for indicating a higher level of severity. Danger labels generally have a red background.

WARNING

The “warning” messages provide warning about real dangers and indicate the risks of serious injuries or fatal accident for the operator who does not strictly adhere to the safety instructions provided to avoid such dangers.
They also provide warning about the risks of an accidental air leakage or fire due to improper handling. Warning labels generally have an orange background.

CAUTION

The “caution” messages provide warning about real dangers and indicate the risks of minor injuries for the operator, or damage to the system, products and installations, if they do not strictly adhere to the safety instructions provided to avoid such dangers.
Caution labels generally have a yellow background.

1.8 qualified operators

Only the professionals stated below are authorized to operate the unit after having received all the necessary instructions from this manual:

Specialized maintenance electrician
The electrician should have a general knowledge about electrical appliances as well as specific experience working with control boxes and the electrical components of cooling units or similar equipment from the domain of industrial equipment.
The electrician is authorized to carry out only the specific operations stated in this manual by meticulously following the associated instructions.

Maintenance technician
The maintenance technician should have a general experience working with mechanical elements and a specific experience with cooling units or similar equipment from the domain of industrial equipment.
The maintenance technician is authorized to carry out only the specific operations stated in this manual by meticulously following the associated instructions.

Transport operator
The transport operator can carry out only the specific operations stated in this manual by meticulously following the associated instructions.

Staff allocated for the start-up and shut-down of the unit
(Basic operator and engineer operator)
After having understood the information contained in this manual, the basic operator will be authorized to manually operate the unit at the level of the following functions: start-up, shut-down, display of alarms.
In this case, this operator can carry out only the specific operations stated in this manual by meticulously following the associated instructions.

Safety officer
The safety officer is responsible for protection and the prevention of occupational risks as set forth in **OSHA Directive** (Safety in the workplace).
The safety officer shall make certain that all the persons who operate the unit have received all applicable instructions which are contained in this manual, including the initial installation and commissioning operation.

1.9 storage

Keep away from:

- Direct sunshine, rain, wind and sand.
- Temperature: max. 140°F/min. 14°F
- Max. relative humidity: 90%

1.10 transport and handling

The carrier is always liable for any damage caused to the products entrusted to them during transport. Thus, before preparing the unit for its installation and commissioning, it is necessary to carry out a complete visual inspection in order to check that the packing cases are intact and the unit has no apparent damage. It is also important to verify that the units are the ones that have been ordered.

Any damage or complaints must be reported to **nano-purification solutions** and declared to the carrier (or shipper) before the carrier leaves premises when product is delivered.

If there is damage to one or more components, do not start the unit but inform **nano-purification solutions** about the problem to find a mutually agreeable course of action.

Preferably, remove the packaging at the actual place of installation.
The unit should be handled with great care on the premises. Do not use any of its components as a grip. In order to avoid any damage, it is imperative that, during their handling, the units always remain in the position set for their operation.

Do not leave the units in their packaging on premises that are exposed to direct sunlight because the ambient temperatures can effect the components and safety devices on the dryer.

The equipment should be preferably lifted using a suitable crane or forklift. We do not recommend using hands. Handle with care. Heavy blows could cause irreparable damage. Even when packaged, keep the machine protected from severity of the weather.

1.11 proper use of the dryer

This dryer has been designed, manufactured and tested only to be used to separate the humidity normally contained in compressed air. Any other use has to be considered improper. The Manufacturer will not be responsible for any problem arising from improper use; the user will be in any case responsible for any resulting damage.
Moreover, the correct use requires the compliance with the installation conditions, in particular:

- Voltage and frequency of the mains
- Pressure, temperature and flow-rate of the incoming air
- Ambient temperature

This dryer is supplied tested and fully assembled. The only operation left to the user is the connection to the plant in compliance with the instructions given in the following chapters.

The purpose of the machine is the separation of water and eventual oil particles present in compressed air. The dried air cannot be used for respiration purposes or for operations leading to direct contact with foodstuff, unless subject to additional treatment.

1.12 instructions for the use of pressure equipment

To ensure the safe operation of pressure equipments, the user must conform strictly to the above directive and the following:

1. The equipment must only be operated within the temperature and pressure limits stated on the manufacturers name/data plate.

2. No welding is allowed on any of the pressure components.

3. The equipment must not be stored in poorly ventilated spaces, near a heat source or inflammable substances.

4. Vibration must be eliminated from the equipment to prevent fatigue failure.

5. An internal inspection must be carried out at 12 month intervals to check for pressure equipment corrosion.

6. Automatic condensate drains should be checked for operation every day to prevent a build up of condensate in the pressure equipment.

7. The maximum working pressure stated on the manufacturers data plate must not be exceeded.

8. All documentation supplied with the equipment (manual, declaration of conformity etc.) must be kept for future reference.

2.1 installation site

1. Install dryer in a vertical (upright) position. In systems where air usage fluctuates or there are sudden demands, protect dryer against air flow surges by providing sufficient piping between dryer and point of air use or by installing a receiver tank between dryer and point of air use. Allow enough space for future servicing of the unit.

2. Install by-pass piping with inlet, outlet, and by-pass valves to isolate dryer for performing routine maintenance without interruption of the plant air system. All equipment downstream of the air dryer should be rated for 400°F in the event hot air is emitted from the dryer.

3. Install a coalescing filter(s) with automatic drain upstream of the dryer inlet, and a particulate filter(s) downstream of the dryer outlet. By-pass piping is recommended for both (all) filters.

4. Connect inlet air piping to dryer inlet (top of dryer) and outlet air piping to dryer outlet (bottom of dryer).

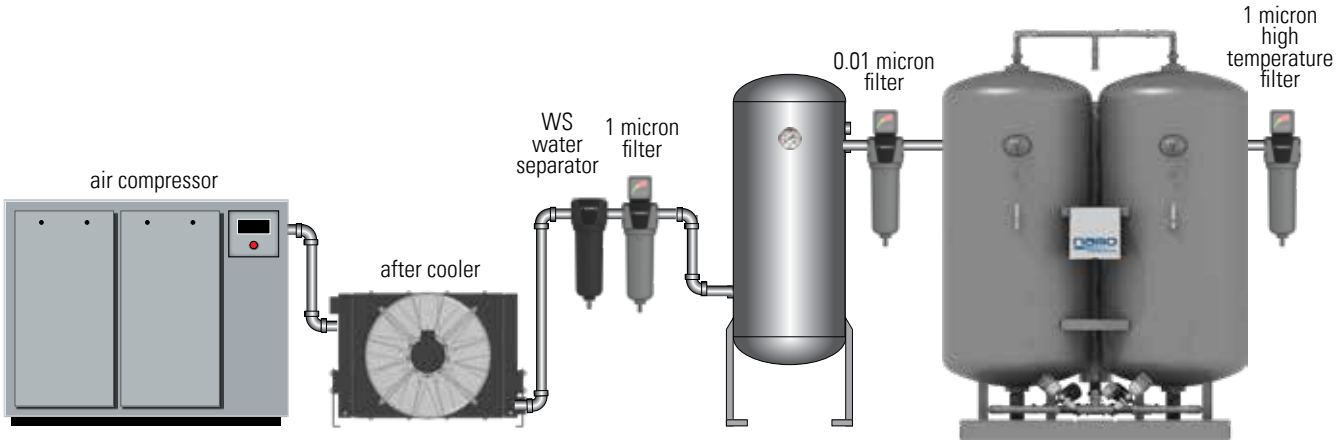
CHECK ALL CONNECTIONS ON THE UNIT FOR TIGHTNESS.

5. Connect the three-phase electric power to terminals inside the control enclosure, in accordance with local and national codes. To prevent the Programmable Controller timing device, and heater from operating when the air supply is interrupted, it is recommended that provisions be made to shut off the dryer when the air compressor is not in use.

CHECK ALL ELECTRICAL CONNECTIONS!

6. Install remote piping of purge exhaust line if high temperature or humidity is objectionable. If remote piping is required, maintain piping temperature above freezing and allow for the draining of condensed moisture away from the dryer.

2.2 installation layout



Installation is suggested when the compressed air treated from the dryer is only a part of the total flow rate of the compressor; or when the compressor operates at reduced load and the total consumption equals the compressor flow rate.

Dryer is supplied with 0.01 micron filter on the inlet and a 1 micron high temperature filter on the outlet. It is recommended to install both water separator and 1 micron filter before the dryer, in order to extend the life of the inlet filter.

2.3 dryer specifications

specifications	standard	optional
maximum particle size (ISO class) (*)	class 2 (1 micron)	class 1 (0.01 micron)
maximum water content (ISO class) (*)	class 2 (-40°F pdp)	-
min/design/max operating pressure range	80 psig / 100 psig / 150 psig	58 to 250 psig
min/design/max ambient temperature	38°F / 100°F / 120°F	-
min/design/max inlet temperature	38°F / 100°F / 120°F	-
power supply requirements	460 VAC / 60 Hz	

*per ISO 8573.1:2010

2.4 correction factors

correction factor for inlet pressure									
psig	60	70	80	90	100	110	130	140	150
barg	4	5	6	6	7	8	9	10	10
F1 factor	0.65	0.74	0.83	0.91	1.00	1.04	1.12	1.16	1.20

correction factor for inlet temperature								
°F	70	80	90	100	105	110	115	120
°C	21	27	32	38	41	43	46	49
F2 factor	1.12	1.10	1.06	1.00	0.93	0.86	0.80	0.75

SIZING A DRYER

How to find the air flow capacity

AIR FLOW CAPACITY = **NOMINAL CAPACITY OF THE DRYER** x **F1 FACTOR** x **F2 FACTOR**

Example: A EHA 250 has a nominal capacity of 250 scfm.

What is the maximum allowable flow through the dryer at following operating conditions:
Air Inlet Pressure : 110 psig (8 barg) From table for pressure correction F1=1.04
Air Inlet temperature: 105°F (41°C) From table for temperature correction F2=0.93

AIR FLOW CAPACITY = **250 scfm** x **F1 1.04** x **F2 0.93**

Air Flow Capacity= 241.8 scfm
This is the maximum air flow rate that the dryer can accept under those operating conditions.

2.5 operation

SET UP

1. Remove fill plug. Fill tanks slowly with specified desiccant. Replace fill plug.
2. Remove muffler to prevent clogging from desiccant dust.

Note: Always wear ear protection when muffler is removed.

3. With dryer by-pass valve open, **slowly** open the inlet valve to the dryer and allow the unit to pressurize. When the pressure gauges indicate that the dryer is at full line pressure, open dryer outlet valve and close the by-pass valve. The filters should be placed on-line using a similar procedure.
4. To start up the dryer, turn the three-phase supply power on. Turn the selector switch on the front of the cabinet to the POWER ON position. The display panel will come on. After a short time, one tower will depressurize and start to regenerate, the other tower will be drying air at full line pressure. After about 4 hours, the low-pressure tower will pressurize, and the towers will switch functions.
5. Adjust the purge flow control valve to the proper pressure setting indicated in the **setting the purge pressure (Page 20)** section while the dryer is in the last half of the regeneration cycle or cool down period.
6. Re-install the muffler after one complete cycle.

SHUT DOWN

1. Turn dryer off.
2. Allow towers to depressurize to atmospheric pressure.
3. Allow the dryer to cool completely before performing any maintenance.

2.6 recommendations for optimal performance

1. Do not exceed rated design flow.

2. Make sure dryer is turned on when air is passed through the unit. Tower switching is vital to the successful drying of air.

3. Change pre-filter and after-filter elements regularly. The coalescing pre-filter, when operating properly, will remove contaminates such as oil and liquid water as well as abrasive solids that could reduce the effectiveness of the dryer. The particulate after-filter will prevent desiccant particles from migrating downstream and possibly damaging equipment.

4. Never weld to vessel framework. This may cause damage to the Programmable Logic Controller which controls dryer operation.

5. Check and clean the muffler often during initial operation. Desiccant dust is especially heavy after shipment and tower filling. Allow the dryer to cycle several times without the muffler.

REMEMBER TO WEAR HEARING PROTECTION.

SAFETY

1. Do not repair or replace any part of the dryer while the unit is under pressure.

2. Do not repair or rewire electrical components of the dryer while power is supplied to the unit.

5. Avoid touching high temperature piping and the desiccant towers while the dryer is operating.

CHECK ALL ELECTRICAL CONNECTIONS!

2.7 maintenance

1. Change pre-filter and after-filter elements regularly!

2. Periodically check that the dryer is cycling properly. Watch for each tower to alternate between line and atmospheric pressure. The entire cycle will take about 8 hours.

3. Approximately once a year, shut unit down and inspect all valves. (Based on an 8 hour work day).

4. Approximately once a year, check the desiccant bed for oil contamination and/or losses.

5. Approximately once a year, inspect and clean purge muffler(s). If signs of oil are present, desiccant may be contaminated.

6. Periodically verify that insulation is in good condition and repair or replace if necessary.

7. Replace desiccant every three to five years. Be sure to check the level of the top of the desiccant when the dryer is new. The desiccant may not go to the top of the tank due to tanks can be used on more than one dryer size. Note the level of the desiccant, so it can be monitored over time.

REPLACING DESICCANT

1. Open by-pass valve. Close dryer outlet valve and dryer inlet valve.

2. Turn dryer off.

3. Allow towers to depressurize to atmospheric pressure.

4. Allow the dryer to cool completely.

3. Loosen plug at bottom of tower. Allow desiccant to drain, then replace plug. Loosen plug at top of tower. Fill with fresh desiccant, then replace plug. (For molecular sieve use: 1/3 activated alumina, 1/3 molecular sieve, 1/3 activated alumina)

4. Desiccant dust may be unusually heavy after changing the desiccant. To remove this dust from the dryer, allow the dryer to cycle several times **without** the purge muffler.

Remember to wear hearing protection during this procedure.

5. A couple of weeks after filling the dryer with desiccants, shut the unit down and check desiccant level. Top off with fresh desiccant if necessary.

6. Should a problem arise, consult **trouble shooting (Page 25).**

IMPORTANT: EHA EXTERNALLY HEATED DESICCANT AIR DRYERS ARE DESIGNED TO USE A SPECIFIC DESICCANT. WHEN REPLACING THE DESICCANT, ALWAYS USE DESICCANT OF THE SAME SIZE AND TYPE AS THAT WHICH WAS SUPPLIED WITH YOUR DRYER. FOR MORE INFORMATION, PLEASE CONSULT THE FACTORY.

3.1 EHA operating sequence

The heater control circuitry monitors the heater sheath temperature to a safety set point. If the core temperature of the heater reaches the set point the PLC will disengage the Heater Safety Contactor and shut down the heater and keep the temperature from running away. An alarm will be generated. If the alarm is set off the heater circuit should be inspected before clearing the alarm. Be sure to check the heater contactor to make sure the tips are not jammed or welded together.

The PLC also monitors the temperature of the purge air with a thermocouple located where the heater is connected to the bottom piping. The PLC will turn the heater off when the temperature reaches the set point, typically 400°F. When purge temperature reaches the lower limit, the heater will be turned back on till the temperature reaches the set point again. It will cycle between the upper and lower set points till the end of the heating cycle.
If the heater temperature does not reach low limit set point the dryer will switch into a heatless cycle and the towers will switch every five minutes and the purge bypass valve will open to allow more purge air so the towers can be regenerated properly. The dryer will stay in heatless mode till it is reset. The heating circuit should be inspected before resetting the unit.

A Visual Moisture Indicator (VMI) is located near the discharge of the dryer. It senses the dew point of the air going downstream of the dryer. The VMI will be green if the dew point is below -20°F and turn yellow when the dew point is above approximate -20°F.

If the unit is equipped with the Energy Saver option, the dryer will have a dew point probe instead of the VMI. The dew point probe will display the current dew point on the touchscreen display.

With an Energy Saver option, at the end of the drying cycle it will compare the outgoing dew point reading to the set point. If the dew point is better than the set point, the program will hold the online tower from switching until the dew point is no longer lower than the set point. It will hold the tower up to sixteen (16) hours. The set point can be change in the Set-Up Screen on the touchscreen. The set point should be -40°F from the factory. If the plant can work at a dew point higher than that, the set point can be change to a higher point. With a dew point of -35°F or higher an energy savings can be realized.

It may be necessary to periodically remove the probe for calibration or repairs. To do this without disrupting the normal operation of the dryer, a few steps need to be followed.

First go to the Set-Up screen and change the dew point control button to off.
Next close the 3/8" ball valve ahead of the dew point probe.
Disconnect the wires from the probe and unthread the probe from the tee. You may want to install a pipe plug in the tee and close the needle valve if the ball valve is not trusted.

To reinstall the probe, thread the probe into the tee, make sure it is tight. Connect the wires to the probe. Open the needle valve slightly, then open the ball valve slowly. There should be a small about of air coming out of the brass muffler, the probe needs a constant flow of dry process air across it to work properly. The dew point reading should be displayed on the touchscreen. If the probe is not kept in a small amount of desiccant, it can absorb some water vapor form the ambient air. The probe will dry out quickly with the dry air moving across it. The last step would be to turn the dew point control button back ON, on the Set-Up Screen.

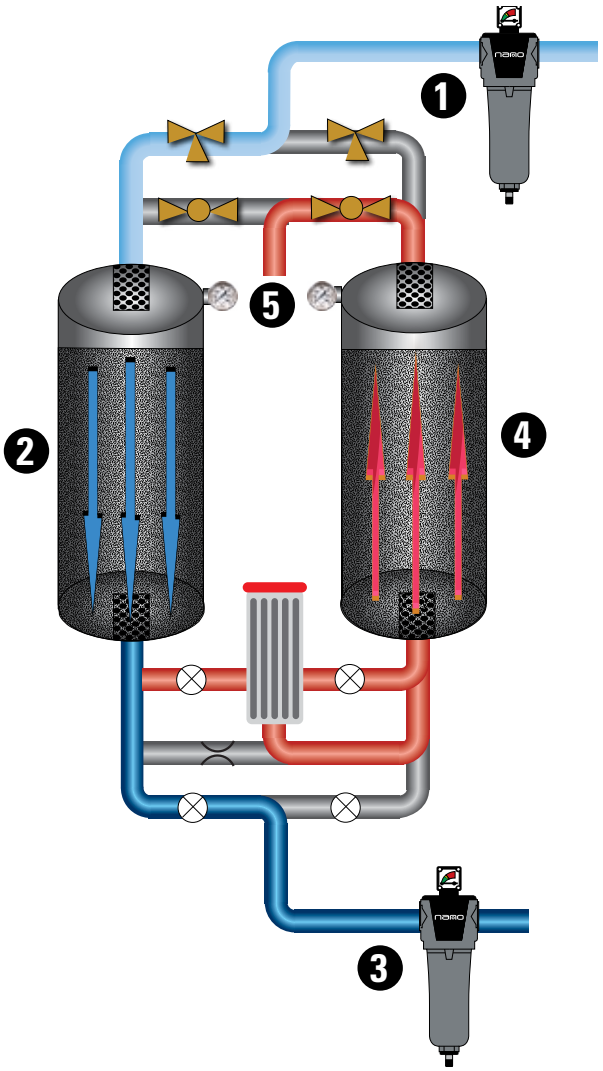
If the reading is between -112°F and -157°F there is a problem with the probe. Most likely there is a open cable connection or an incorrect connection.

externally heated desiccant air dryer

Each tower will have a pressure transducer to monitor the pressure in both towers as it cycles through the program. The online tower should be at line pressure while drying process air. The offline tower should be at or near zero while it is in heating and stripping cycles. It will go back to line pressure when it is done with the repressurization cycle. If the PLC does not see the proper pressure at the proper time in the cycle it will set off an alarm.

OPERATING PRINCIPLE

The EHA externally heated desiccant air dryers consists of two tanks filled with Activated Alumina. At any given time, one tower will be drying the compressed air while the other tower is regenerating the saturated desiccant beads (Activated Alumina). A small portion of the dry air (termed Purge Air) is used for the regeneration of the saturated desiccant, expanding it to near atmospheric pressure and heating it in an external electric heater. The condensate that is stripped from the desiccant bed is purged into the atmosphere through the purge exhaust valve and the purge exhaust mufflers.



1. Wet, contaminated air passes through coalescing pre-filter to remove particulate and liquid down to 0.01 micron.
2. Air passes through desiccant bed where moisture vapor is adsorbed.
3. Dry air passes through 1 micron after-filter which retains any dust particles.
4. Simultaneously, a small amount of dry, heated "purge air" is counter-flowed being directed through opposite tower along with external electric heater removing moisture and regenerating the desiccant bed.
5. Purge exhaust port

"Purge air" is approximately 8%.

3.2 setting the purge pressure

The Externally Heated Purge Regenerative Air Dryers use heated dry compressed air to purge moisture from the off-line tower. The dryer operates on an eight-hour cycle. Each tower dries for four (4) hours and purges for four (4) hours.

Heated dried air from the online tower is used for the first three hours of the purge cycle. For 53 minutes of the remaining hour, non-heated dry compressed air from the on-line tower is used for purge. This is done for two reasons; 1) As a final purge to remove any remaining moisture from the off-line tower. 2) To cool the desiccant bed before the tower is put back on-line.

To set the purge pressure for your unit, go to the TECHNICAL SPECS matrix and locate your model. Go across the row to the PURGE PRESSURE section. This is what the purge gauge should be set to. This will enable the dryer to produce a -40°F pressure dew point while operating under a given set of conditions.

Locate the purge adjustment valve and gauge in the back of the unit usually between the towers. When the unit is in a heating cycle adjust the valve till the gauge reads the proper amount.

Heated Technical Specifications

model	capacity	purge (psi)	purge (cfm)	orifice (color)	orifice (size)	desiccant per tower (lbs)	in/out connection
EHA 100	100	48	8	blue	3/32"	75	1" NPT
EHA 175	175	47	14	gold	1/8"	150	1 ½" NPT
EHA 250	250	25	20	green	3/16"	200	1 ½" NPT
EHA 350	350	40	28	green	3/16"	275	2" NPT
EHA 500	500	30	40	red	1/4"	375	2" NPT
EHA 700	700	47	56	red	1/4"	525	2" NPT
EHA 850	850	20	61	red	1/4"	650	2" NPT
EHA 1000	1000	42	80	brown	5/16"	750	3" Flg
EHA 1350	1350	40	108	yellow	3/8"	1025	3" Flg
EHA 1700	1700	52	136	yellow	3/8"	1275	3" Flg
EHA 2100	2100	46	168	silver	7/16"	1575	4" Flg
EHA 2400	2400	55	192	silver	7/16"	1800	4" Flg
EHA 3100	3100	54	248	white	1/2"	2325	4" Flg
EHA 3800	3800	39	304	black	5/8"	2850	6" Flg
EHA 4300	4300	47	344	black	5/8"	3225	6" Flg
EHA 5000	5000	56	400	black	5/8"	3750	6" Flg

3.3 operating the three-valve bypass

1. All models can be fitted with optional three valve bypass piping installed at the factory. Three-valve bypass piping is installed for ease in performing routine maintenance such as changing filter elements. If you do not order three valve piping on your unit, it is recommended that you install a three-valve bypass, similar to the one depicted in Figure 1.0 when installing the dryer.

2. During normal operation, valves 1 & 3 will be open and valve 2 will be closed, allowing air to flow through the filters and dryer.

3. To perform routine maintenance, operate the valves in 3-2-1 order to allow air to flow directly from the inlet connection to the outlet connection without passing through the dryer (close valve 3, open valve 2 and close valve 1). Remember to bleed the air pressure from the dryer and filters before performing any service. See Sections entitled **maintenance (Page 17)** or **REPLACING DESICCANT (Page 17)** for specific instructions.

4. When bringing the dryer back on-line after maintenance, operate the valves in 1-2-3 order to prevent back flow to the dryer and filters. (Open valve 1, close valve 2, open valve 3.)

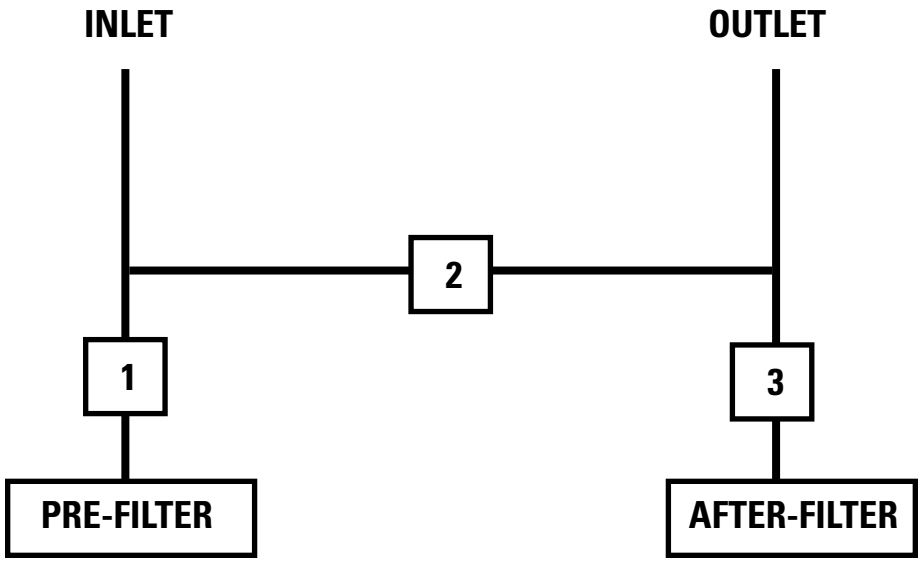


Figure 1.0 - Typical EHA F2-3V Three-Valve Bypass

3.4 operation of display screen

- Turn the Power On selector switch on, the screen will display a flow diagram of the unit, after a few seconds of the screen initializing the configuration.

FLOW DIAGRAM SCREEN

- The flow diagram screen will show the state of the towers, valves, and mufflers. The valves will be green in color when they are open, and red when they are closed.
- The tanks will be green when it is drying process air for the plant use. It will turn red when it is being regenerated (off-line). It will be either Heating, Stripping or Pressurizing.
- The tank will turn yellow when it is in stand by mode. Stand By mode is when the tank has been regenerated and pressurized, but the dew point is still good from the on-line tank. The tank will stay in this mode till the dew point falls outside the set point or 16 hours have passed. The dryer must be equipped with the Energy Saver option for this to occur.
- The mufflers will be red when the vessel is on-line, pressurizing, or in stand by. When air is passing through the muffler it will turn green.
- The heater will turn green when they are running and red when they are turned off.
- On each vessel, the state that it is in will be displayed on it, along with the time it has been in that state. (DRY, HEAT, STRIP, PRESSURIZE, STANDBY)
- The dew point and the dew point set point are displayed at the bottom of the screen.
- The heater temperature and heater set point are display next to the heater on the display.
- The blue button in the upper left corner will transfer the display to the next screen.
- The ALARM RESET button will appear at the top center of the screen when an alarm condition has occurred. By pressing it, the screen will change to the Alarm screen.
- The MANUAL STEP button will appear when the dryer is placed in the manual mode for maintenance purposes. This button will advance the dryer one step each time it is pressed. A blue dialog box will appear and identify the step that the dryer is in.
- The SYSTEM SETUP button will transfer the display the system set up screen. A password will be needed to access this screen.
- The SCREEN SAVER button will cause the screen to go blank. The screen saver can be turn off by touching anywhere on the screen.

ALARM SCREEN

- The alarm screen will display any alarms that have occurred.
- The ALARM RESET button will clear any alarm shown, if the problem has been rectified.
- The ALARM HISTORY button shows what alarms have occurred, the last one will be number one on the list. The detail button will show when it happens and when it was cleared. The alarm count button will show how many of each alarm has occurred. The clear all button will erase the history log.
- The TS GUIDE button will show the most likely cause of the alarm and where to start the troubleshooting process.

DEW POINT TREND SCREEN

- This screen is a trend of the dew point readings. It will display a reading every 15 minutes on the graph. The graph will display 96 points and by using the scroll buttons at the top of the graph, it can move backwards in time to through 11052 data points (12 days)
- The current reading is displayed on the graph as well.
- The dryer will have to have the Energy Saver option to be able to read the dew point.

HEATER TEMPERATURE TREND SCREEN

- The graph tracks the temperature of the heater. It displays a data point every 15 minutes and the graph displays 96 points. Using the scroll buttons at the top of the graph, the trend can move backwards to show 11052 data points (12 days).
- The current heater temperature is displayed on the graph.

SYSTEM SET UP SCREEN

- A password is needed to enter this screen. The password for the screen is "777".
- The MODE button will change the operation of the dryer. Auto mode allows the PLC to run the dryer. The system will operate automatically. When the dryer is in Manual mode, the dryer will only change states when the MANUAL STEP button is pushed on the Flow Dia. Screen. If the unit is left in manual mode for over an hour it will automatically switch to Auto mode.
- The DEW POINT CONTROL button will disable the option when it is pushed. It must be pressed again to enable the function.
- The FAIL TO SWITCH button will disable the option when it is pushed. It must be pressed again to enable the function.
- The HEATER TEMP indicator shows the heater temperature set point. The increment and decrement arrows can be used to adjust the set point up or down. It will move in 10-degree increments.
- The DEW POINT indicator shows the dew point set point and current valve. The increment and decrement arrows adjust the set point up and down.
- The FACTORY DEFAULT button will return all variables back to their original values. The dew point set point will be -40°F, the heater temperature set point will be 450°F, the dryer will be in manual mode with the Flex Power Purge and Fail to Switch options activated. After resetting, turn the screen off for a few seconds then turn back on. Put dryer in Auto mode thru the system setup screen.
- DRYER TYPE button can change the program from an EXTERNAL HEATED DRYER and a BLOWER PURGE DRYER
- FILTER psid button is if differential pressure transducers are used.
- HEATLESS MODE button can put the unit in heatless mode if the heater would be removed from service. The unit would go to a 10-minute cycle and increase the purge amount to regenerate the offline tower. Press the button again to take it out of heatless mode. This should be done when the towers are ready to switch.
- TECH PAGE 1,2 and 3 goes to a Tech Page where program parameters can be entered. These pages are password protected since making changes to these parameters can seriously affect the operation and quality of the air the dryer produces.

TECH PAGE 1 SECTION

- The BLOWER REMAIN ON TIME display and adjustment arrows are for setting the time the blower remains on when the heater is turned off. This function is not used for external heated dryers and should remain set at zero.
- The HTR SHEATH OVERTEMP SP is where the set point for the heater sheath or tube is set. The set point is set at the factory and protects the heater from running away and melting down. The arrow buttons can adjust the set point.
- The OUTLET PRESSURE LOW SP is compared to the tower pressure of the tower that is being regenerated during re-pressurization. If the tower pressure is less than the set point, then an alarm will be set.
- The INLET PRESS DRYING LOW SP is compared to the tower pressure of the tower that is on-line drying air. If the tower pressure is less than the set point, then an alarm will be set.
- The PURGE PRESSURE PSI is the low set point for the purge pressure. After the purge pressure is set with the purge valve and gauge, the program compares the transducer number with the set point. If the transducer number goes below the set point an alarm is set off. If the purge pressure is too low, then the tower will not regenerate properly, and the dew point will not be achieved.
- The FLOW SWITCH STATUS shows if the blower on a Blower Purge dryer is working. If it would fault an alarm would be set and the heater would shut off. Since an External Heated dryer does not have a blower or flow switch, there is a jumper installed at the PLC to make the status GOOD and allows the heaters to work. If this would read FAULT and the alarm ON, the heater will not work and there is probably a wire issue.

TECH PAGE 2 SCREEN

- The LEFT PURGE TEMPERATURE is the temperature of the exhaust coming out of the left tower when it is being regenerated.
- The RIGHT PURGE TEMPERATURE is the temperature of the exhaust coming out of the right tower while it is being regenerated.
- The LEFT-HEAT EXHAUST SP is set point for the temperature of the exhaust for the left tower while purging. It can be changed with the arrow buttons. When the purge exhaust temperature reaches the set point, then the tower should be regenerated. At that time the heater can be turned off and the tower can be cooled off.
- The RIGHT -HEAT EXHAUST SP works the same as the left heat exhaust SP but on the right tower.
- The LEFT-STRIP EXHAUST SP is the temperature set point for the exhaust for the left tower. When the temperature of the exhaust goes below the set point during the stripping cycle, then the stripping air can stop, and the tower can be repressurized.
- The RIGHT- STRIP EXHAUST SP is the same as above but for the right tower. The set points can be adjusted with the arrow buttons beside them. The readings are in Fahrenheit degrees.

The DISABLED EXHAUST SP'S button disengages the set points so the program will run on time function instead of temperatures. If the button is pushed, then the set points are live.

TECH PAGE 3 SCREEN

- HEATER CIRCUIT ON DELAY SP is the amount of time that will lapse before the next circuit of the heater comes on.
- HEATER CIRCUIT OFF DELAY SP is the amount of time between circuits being shut off.

These set points only are used when the heater has more than one circuit. If the heater has only one circuit the set points should be zero. The set points are in seconds.

- The PRE-PURGE TIME is the time the pre-purge valves will be open to depressurize the towers before they are regenerated. These valves are located under the towers and have mufflers attached to them. They allow the air to be relieved out the bottom of the tank, reducing the chance of bouncing the desiccant. These valves are typically only used on larger unit.

4.1 trouble shooting

problem	cause	solution
Poor dew point performance	Flow exceeds rated capacity	Reduce flow or consult factory if increased flow volume is needed
	Low inlet pressure	Check and replace pre-filter element if necessary
	Excessive water	Check upstream separator, pre-filter and drain
	Desiccant contamination	Replace desiccant and filter elements
	High inlet temperature, above 110°F	Check upstream after cooler
	High or low ambient conditions	Change dryer location to correct condition
	Heat malfunction	See Heater Malfunction section
Excessive pressure drop across dryer	Excessive inlet flow	Reduce flow or consult factory if increased flow volume is needed
	Low inlet pressure	Check pre-filter and replace element if necessary
	Switching valve failure	Check for proper valve operation. If valve hangs up, check pilot air filter and replace element if necessary. Inspect valve, solenoid and actuator and replace if necessary
Switch-over failure	Electric power loss	Turn dryer off. Check power to unit. Check all connections to process controller
	Switching valve failure	Check for proper valve operation. If valve hangs up, check pilot air filter and replace element if necessary. Inspect valve, solenoid and actuator and replace if necessary
Pressurization failure	Purge regeneration valve orifice clogged	Check for proper valve operation. If valve hangs up, check pilot air filter and replace element if necessary. Inspect valve, solenoid and actuator and replace if necessary.
	Failure of check valve	Clean or replace check valve if necessary
	Purge valve failure	Check for proper valve operation. If valve hangs up, check pilot air filter and replace element if necessary. Inspect valve, solenoid and actuator and replace if necessary
Regeneration failure	Failure of check valve	Clean or replace
	Purge valve failure	Check for proper valve operation. If valve hangs up, check pilot air filter and replace element if necessary. Inspect valve, solenoid and actuator and replace if necessary
	Purge exhaust muffler clogged	Clean or replace

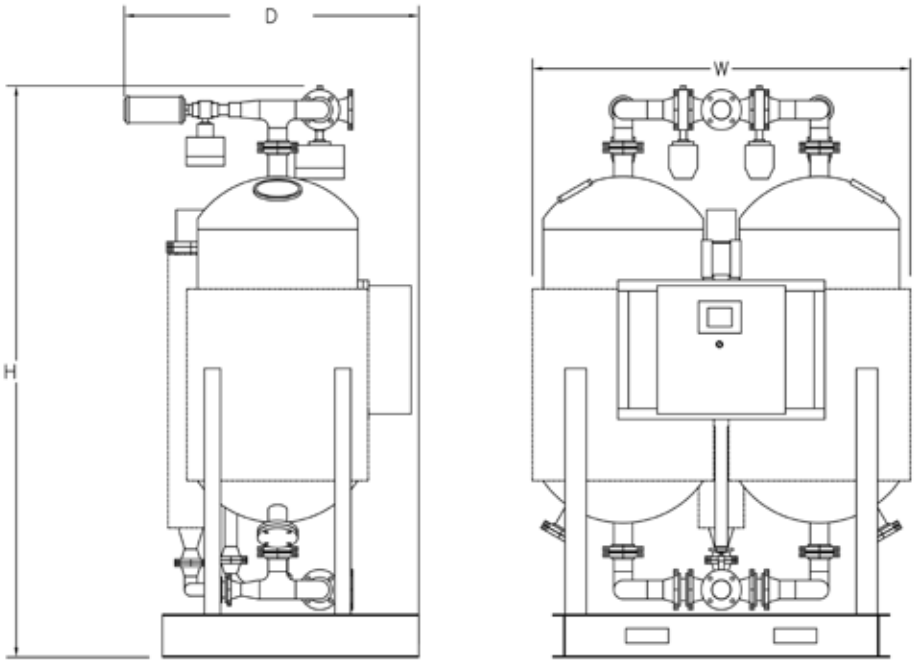
externally heated desiccant air dryer

problem	cause	solution
Back-pressure build-up in tower being purged.	Purge exhaust muffler clogged	Clean or replace
	Failure of check valve	Clean or replace
Heater malfunction	Excessive heat	Verify regeneration flow. Verify operation of blower. Verify that cooling cycle is function properly (see Dryer Operating Sequence).. Verify heater temperature reading. Replace thermocouple if necessary
	Insufficient heat	Verify regeneration flow. Check wiring and power supply to heater and contactor. Verify temperature reading.

WARNING: If the manual mode is used for trouble shooting, the dryer may be moved into the next half of the cycle, allowing the towers to switch without sufficient cool down, hot air up to 400°F may be sent down-stream. Caution should be taken to protect personnel and equipment from these elevated temperatures.

4.2 arrangement drawings

EHA 100 to EHA 5000



model	dimensions					
	W		D		H	
	in	mm	in	mm	in	mm
EHA 100	44.00	1117.60	42.00	1066.80	83.00	2108.20
EHA 175	40.00	1016.00	42.00	1066.80	83.00	2108.20
EHA 250	48.75	1238.25	41.00	1041.40	86.50	2197.10
EHA 350	50.75	1289.05	43.00	1092.20	86.00	2184.40
EHA 500	54.75	1390.65	45.75	1162.05	90.00	2286.00
EHA 700	54.75	1390.65	48.50	1231.90	90.75	2305.05
EHA 850	63.25	1606.55	52.25	1327.15	91.50	2324.10
EHA 1000	68.25	1733.55	56.50	1435.10	110.00	2794.00
EHA 1350	70.80	1798.32	53.70	1363.98	105.50	2679.70
EHA 1700	83.10	2110.74	56.70	1363.98	95.50	2425.70

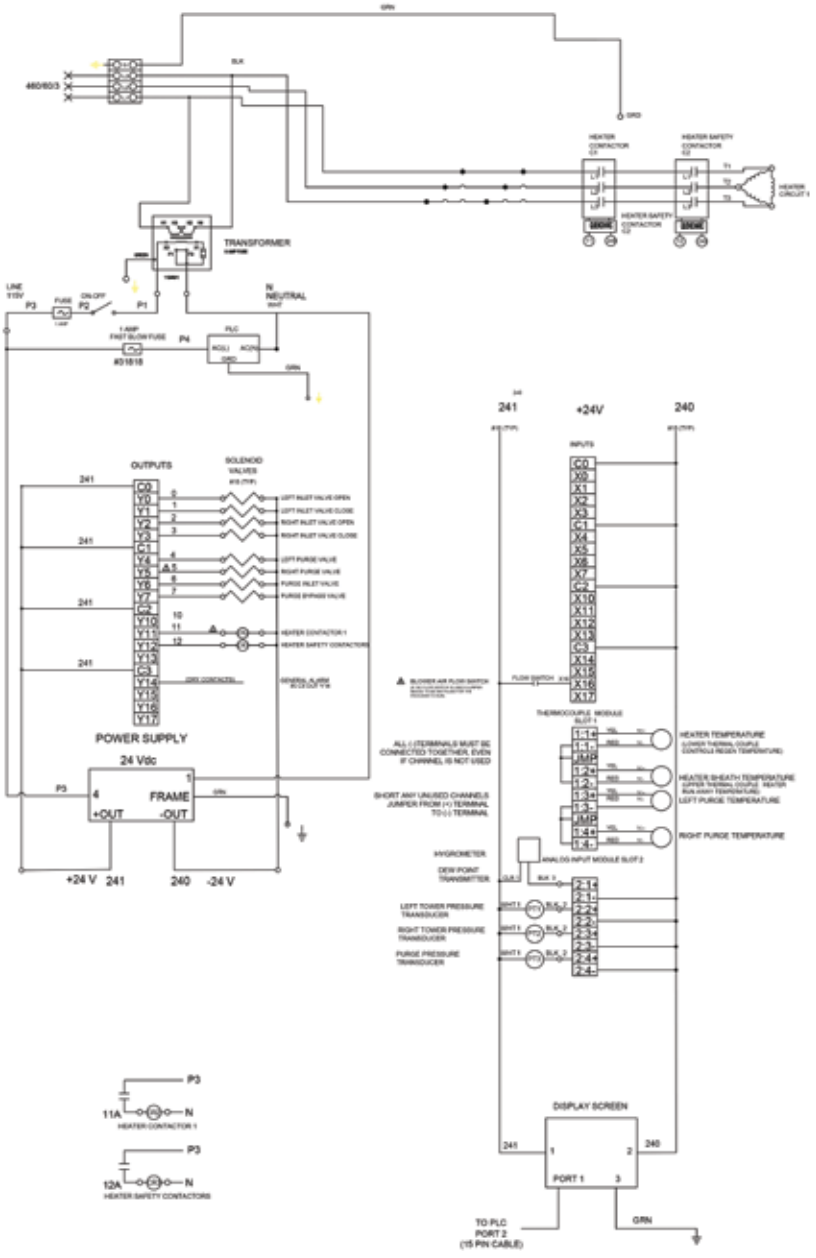
externally heated desiccant air dryer

EHA 100 to EHA 5000 (continued)

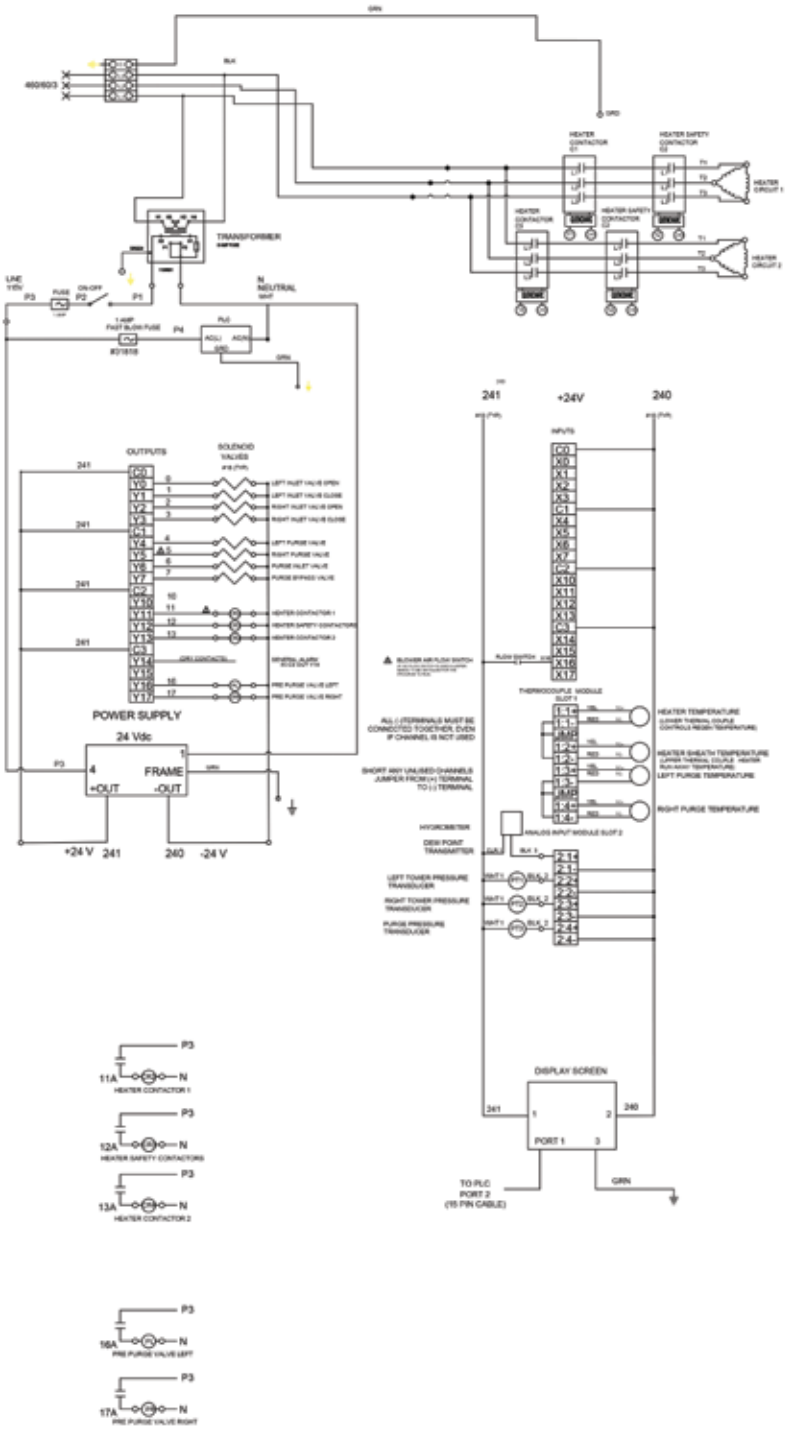
model	dimensions					
	W		D		H	
	in	mm	in	mm	in	mm
EHA 2100	83.10	2110.74	56.70	1440.18	106.00	2692.40
EHA 2400	83.10	2110.74	56.70	1440.18	114.00	2895.60
EHA 3100	102.40	2600.96	68.00	1727.20	117.50	2984.50
EHA 3800	108.40	2753.36	71.00	1803.40	115.50	2933.70
EHA 4300	132.00	3352.80	96.00	2438.40	110.50	2806.70
EHA 5000	116.00	2946.40	83.00	2108.20	119.50	3035.30

4.3 electrical drawings

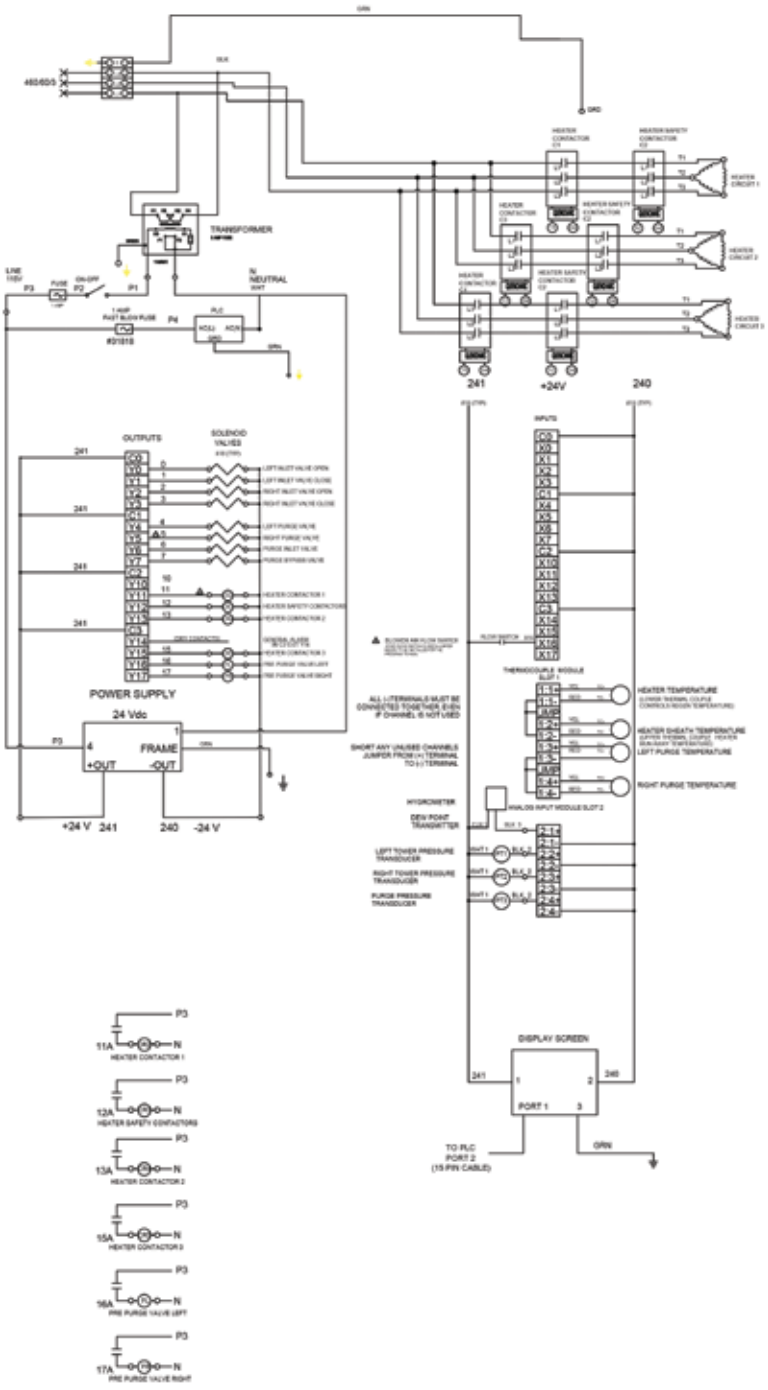
EHA with one circuit heater



EHA with two circuit heater

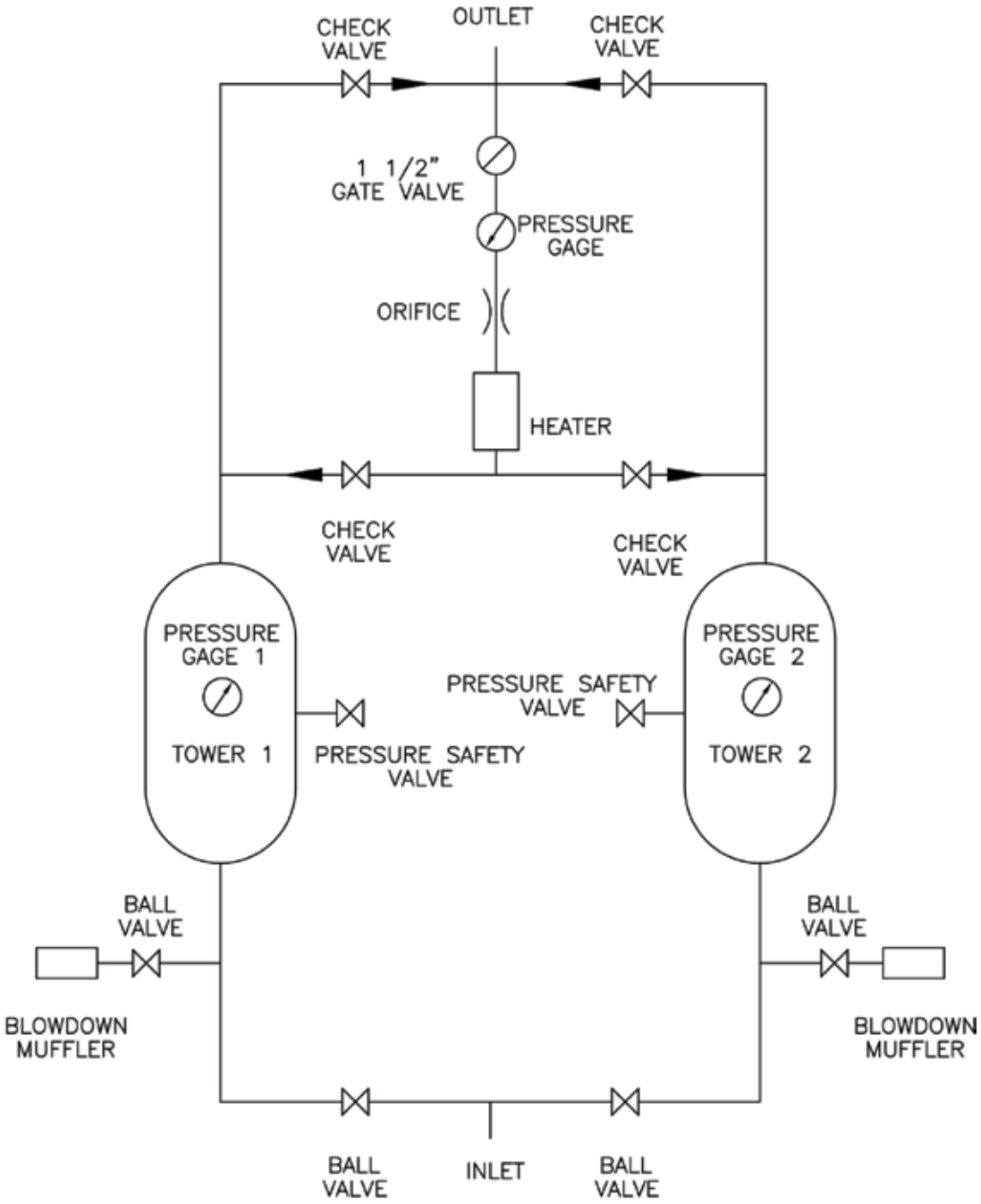


EHA with three circuit heater



4.4 P & ID

EHA 100 to EHA 5000



4.5 appendixes

reference	power supply	power input	inlet & outlet (1)	max working pressure	dimensions			approx. weight (2)
model		kW	NPT(F)/Flg	(psi)	W (in)	D (in)	H (in)	lbs
EHA 100	460 VAC/60 Hz	2	1″	150	44.00	42.00	83.00	700
EHA 175	460 VAC/60 Hz	3	1 ½″	150	40.00	42.00	83.00	825
EHA 250	460 VAC/60 Hz	4.5	1 ½″	150	48.75	41.00	86.50	900
EHA 350	460 VAC/60 Hz	6	2″	150	50.75	43.00	86.00	1500
EHA 500	460 VAC/60 Hz	10	2″	150	54.75	45.75	90.00	2400
EHA 700	460 VAC/60 Hz	15	2″	150	54.75	48.50	90.75	2900
EHA 850	460 VAC/60 Hz	18	3″	150	63.25	52.25	91.50	3350
EHA 1000	460 VAC/60 Hz	18	3″	150	68.25	56.50	110.00	3800
EHA 1350	460 VAC/60 Hz	25	3″	150	70.80	53.70	105.50	5000
EHA 1700	460 VAC/60 Hz	30	4″	150	83.10	56.70	95.50	5500
EHA 2100	460 VAC/60 Hz	38	4″	150	83.10	56.70	106.00	7200
EHA 2400	460 VAC/60 Hz	50	4″	150	83.10	55.70	114.00	8750
EHA 3100	460 VAC/60 Hz	60	6″	150	102.40	68.00	117.50	11,000
EHA 3800	460 VAC/60 Hz	67	6″	150	108.40	71.00	115.50	14,200
EHA 4300	460 VAC/60 Hz	75	6″	150	132.00	96.00	110.50	16,300
EHA 5000	460 VAC/60 Hz	100	6″	150	116.00	83.00	119.50	17,600

(1) 3″ and below are NPT(F) threaded. 4″ and above are flanged. All units with 3″ piping and above will be ANSI welded pipe
(2) approx. weight for all models does not include desiccant installed

Experience. Customer. Service.

nano-purification solutions
charlotte, north carolina
tel: 704.897.2182
support@n-psi.com
www.n-psi.com

nano-purification solutions
new bethlehem, pennsylvania
tel: 724.297.3416
airtak@airtak.com
www.airtak.com

nano-purification solutions
st. catharines, ontario, canada
tel: 905.684.6266
support@n-psi.com
www.n-psi.com

nano-purification solutions
gateshead, united kingdom
tel: +44 (0) 191.497.7700
sales@n-psi.co.uk
www.n-psi.co.uk

nano-purification solutions
erkelenz, germany
tel: +49 (0) 2151.482.8218
sales@n-psi.de
www.n-psi.de