

nano



STR series open-frame refrigerated process dryer  
user guide

## 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.

The logo for nano, consisting of the word "nano" in a bold, lowercase, sans-serif font. The letters are dark blue with a slight shadow effect, set against a white circular background.

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## open-frame refrigerated process dryer

### 1.1 general information

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**range:** R<sup>3</sup> open-frame refrigerated process dryers  
**models:** STR 1250 - STR 7500  
**doc no:** 17-110-8013  
**issue:** 000

### 1.2 manufacturers details and support

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#### 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 R<sup>3</sup> open-frame refrigerated process dryer. The STR refrigerated 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. The user of this manual should ensure they have the most recent revision. Consult **nano-purification solutions** for verification.

### 1.4 warranty guidelines

All products are supplied with an 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 must be installed and maintained in accordance with the manufacturers guidelines. Pre-filters and non-corrosive upstream piping required. Only genuine service parts should be used and no modifications made.

### 1.5 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 the smallest doubts 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 units.



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](http://www.P65Warnings.ca.gov).

### 1.6 basic safety rules



The installer must provide an emergency stop button on the unit. They should ensure that this is done before the unit is started.



Replace all the supply lines of the different power sources which are damaged or missing.



The unit is equipped with protective covers for the components. If the unit is installed outdoors, it is important to arrange for a canopy to protect it from direct sunlight and inclement weather, which could constitute a risk while using the unit if the fan blades freeze.



Depending on the model, the refrigerants used can be either R404A or R407C. They are not harmful unless inhaled. They constitute a hazard only if they saturate the environment. Some fluids are flammable under certain conditions. Refer to the specifications of each fluid on the [safety data sheet at the end of the manual](#).



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The compressor lubricant is not hazardous. However, it is always compulsory to wear safety gloves while working with it. Do not swallow the lubricant.



For any operations relating to the installation, commissioning, fitting, use, modifications of the conditions of use and methods, routine maintenance, inspection and scheduled maintenance, follow the procedures given in the corresponding chapters of this manual. Keep this manual at hand for quick reference.

The unit must be used under the conditions specified in this service and maintenance manual.



There are some recommendations given (right) for the **USER** that should help to avoid abnormal operating conditions. Avoid any operating conditions other than those expressly described in this manual.



Do not climb on the unit;



Operate the unit only after it is properly installed in the recommended position;



Do not start the unit without the protecting covers properly in place;



Do not remove the protecting covers while the unit is functioning;



Do not remove the protecting covers when the unit is switched on;



Do not clean the unit when it is in operation;



Do not install the unit in corrosive or explosive environment;



Do not disconnect or remove the safety devices and parts;



It is prohibited to operate the unit under conditions other than those specified in this manual.

**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.**



## 1.7 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 air-conditioning.

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 air-conditioning.

The maintenance technician is authorized to carry out only the specific operations stated in this manual by meticulously following the associated instructions.

### Refrigeration technician

The refrigeration technician should be refrigeration certified from a technical institute and/or regulatory body for similar equipment and should only conduct service as per authority of competent service personnel.

The refrigeration 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.



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### 1.8 safety

#### Essential safety rules



**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, affix new labels in the place of the earlier ones. Contact support@n-psi.com for assistance.

#### 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.



**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.**



**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.**



**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.**







## 1.9 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 and that there is no oil or refrigerant leakage. 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 strong sunshine because the ambient temperatures can affect the triggering values of the safety devices.



The water circuit should be completely drained before the unit is handled as appropriate.



**The equipment should be preferably lifted using a forklift truck. Use a spreader bar if belts or slings are used and ensure that there is no pressure on the external edges of the units or the packing case.**



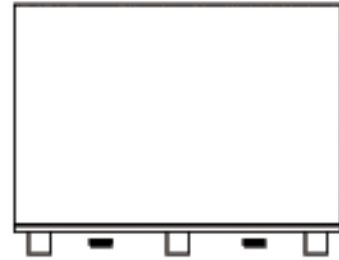
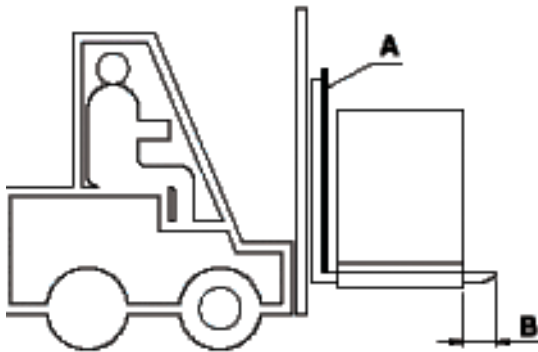
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During transport, do not place the dryer on the ground, on its side, in order to avoid any possible problem.

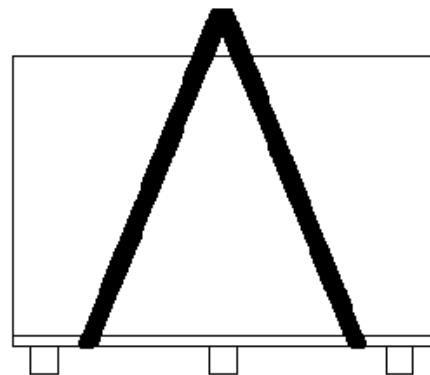
Example of lifting using a forklift truck:

- Insert the protection for the external structure of the unit, e.g. polystyrene or board sheet (A).
- Ensure that the forks of the truck jut out min. 4 inches (B) from the unit.



Example of lifting using slings:

- Place the slings as shown.
- Place the rigid structures on the upper sides of the unit in order to avoid damaging it (only when there is a point on which the pressure acts).
- Tighten the slings **gradually**, while ensuring that they remain in the correct position.
- Start lifting the unit.





### 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 and monitoring down stream.



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### 2.1 installation site

Note: These instructions help to improve the service durability of the equipment. Please read them carefully and follow them.

#### LOCATION OF THE COMPRESSED AIR DRYER

Air-cooled dryers must have cool ambient air made available to prevent a heat build-up in the area where the dryer is installed. An exhaust system is recommended to avoid recirculation of ambient air which will adversely affect the condenser performance.

Ambient temperature at the selected location should not exceed 100°F (38°C) and should not be lower than 50°F (10°C). High ambient temperature can affect the efficiency of the dryer. Every 10F increase in ambient temperature above 100°F (38°C) will result in 6% decrease in air cooled dryer performance, resulting in higher dew points and increased operating costs. If ambient temperatures below 50°F (10°C) are anticipated, the dryer should be equipped with an optional ultra-low ambient package. Ambient temperatures cannot ever be below 35°F (1.7°C) as water will freeze.

To assure an unrestricted flow of cool air through the refrigeration condenser, a minimum distance from the cabinet to the nearest wall of 24 inches must be maintained.

All outside installations must have weather protection. Minimum protection should include a shed roof. Air-cooled units must be protected against the wind.

#### FOUNDATION

All dryers are completely free-standing units. Any reasonably level floor that has sufficient strength will serve as a foundation.

#### PIPING

**The compressed air pipework should be installed using standard tools and connected in such a way that there is no AIR leaking from the connections. Any malfunction and leakage in the system can be avoided with an installation that is properly adjusted taking into account the possible movements and loosening of the connections for due to vibration and temperature change.**

When piping the main air lines to the dryer, the use of flexible connections or union joints is recommended to avoid piping stress and vibration when used with reciprocating compressors. Bypass piping and valves are recommended. The bypass will permit isolation of the dryer for servicing and will eliminate the need to shut down the complete compressed air system. The bypass must be provided and installed by the customer.

In keeping with good compressed air piping design, the air dryer should be installed on the downstream side of the air receiver and after cooler. A **nano-purification solutions-purification solutions** pre filter(s) for oil and dirt removal installed at the inlet of the dryer is recommended. Contamination can be present in a compressed air system and can reduce the ability of the dryer heat exchangers to achieve the proper heat transfer. **nano-purification solutions** recommends the use of after filter(s) to remove final trace contaminants.

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All water-cooled dryers are factory piped for cooling tower water, unless ordered otherwise. A dryer that is piped for city water cannot be used on cooling tower water without necessary piping changes because of: the higher water temperature, lower water pressure and the increased water flow needed. All water-cooled dryers are supplied with a factory mounted automatic water regulating valve which is designed to maintain the proper working refrigerant head pressure under all dryer load conditions. No adjustment will be necessary. (Full water pressure and flow should be supplied to the water line inlet. Refer to Section 2.7 for water cooled water requirements.)

All dryers are supplied with automatic drain valve(s). On models STR 1250 to STR 2000, an isolation valve/strainer and solenoid drain valve is provided. Models STR 2500 to STR 7500 dryers are supplied with two drain outlets with zero air loss valve provided for each outlet. Larger models are supplied with four drain outlets and two zero air loss drain valves. **Solenoid drain valves with isolation valve/strainer and zero air loss drain valves are to be installed at destination.**

Refrigeration piping will need to be run from the compressor skid to the remote air cooled condenser. Ball valves have been supplied. The condenser and dryer skid both have refrigerant in the lines. Access ports should be provided to vacuum the air from the connecting piping. When piping has been completed and a vacuum has been pulled. Open all 4 ball valves before starting dryer.

**During installation of a Remote Condenser option, nano-purification solutions recommends the use of check valves or P-traps at condenser inlet and outlet.**

### ELECTRICAL

The dryer is completely wired at the factory. A terminal box at the rear of the dryer, or a control box on the side of the dryer, is provided for the main power connection. Power connections can be made through any knock-out on the terminal box or through the side or top of the control box. The dryer data name plate must be checked to verify voltage, phase and cycle. Connect the power leads to the terminal block which is conveniently located within the box. Always be sure adequate power is available to maintain efficient operation of your dryer.

A properly sized fused main disconnect switch (supplied by the installer) must be located near the dryer. Check the wiring diagram supplied with the dryer for the recommended fuse size. The use of FUSETRON time-delay fuses will permit smaller fuse sizes and, in some instances, a smaller fused disconnect switch may be used.

The dryer wiring must be independent of the air compressor so as not to cycle along with the air compressor.

The condenser has a non-fused disconnect switch located on the electrical box end of the condenser.

Fan rotation must be checked to assure proper air flow. Air must be drawn through the finned condenser and exit through the fan guard. To change fan rotation, switch any two hot power leads on the terminal block located in the box.

On units supplied with crankcase heaters, the crankcase heaters are pre-wired at the factory to be energized when power is supplied to the dryer. It is important that the crankcase heaters be energized at least 24 hours before initial start-up or after prolonged shut-down. (See Section 2.5 Start-Up).



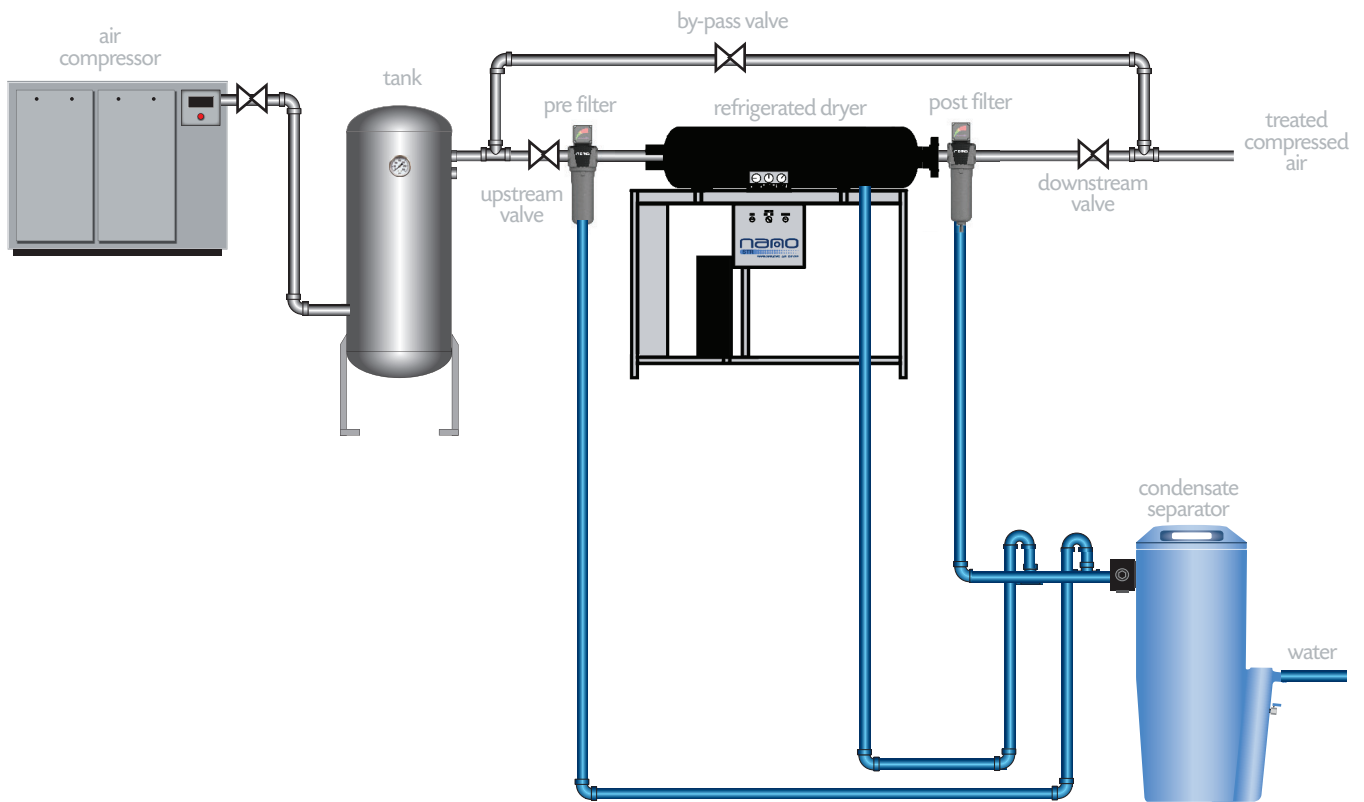
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### 2.2 installation layout



**A backup wrench must be used when tightening air inlet and outlet pipework connections. Failure to properly tighten inlet and outlet pipework without use of a backup wrench could result in damage to the dryer and void warranty.**



## open-frame refrigerated process dryer



## 2.3 dryer specifications

specifications	standard
heat exchanger type	shell and finned-tube
design operating pressure range	0 to 150 psig
design/max ambient temperature	100°F / 110°F
design/max inlet temperature	100°F / 120°F
condenser cooling options	air-cooled (-A) or water-cooled (-W)
refrigerant type	R404A or R407C
control panel enclosure	NEMA 1
power supply requirements	230V/3Ph/60Hz or 460V/3Ph/60Hz

## 2.4 correction factors

correction factor for inlet air pressure				
psig	50	100	125	150
barg	4	7	9	10
F1 factor	0.85	1.00	1.05	1.10

correction factor for inlet air temperature				
F	90	100	110	120
C	32	38	43	49
F3 factor	1.20	1.00	0.80	0.70

correction factor for pressure dew point			
F	37	45	50
C	3	7	10
F2 factor	1.00	1.13	1.20

correction factor for ambient temperature				
F	80	90	100	110
C	27	32	38	43
F4 factor	1.10	1.05	1.00	0.95

### SIZING A DRYER

In compliance with ADF 100 specifications for compressed air dryers: inlet temperature: 100°F, ambient temperature: 100°F, inlet pressure: 100 psig, pressure dew point 33°F to 39°F. For all other conditions, please contact support@n-psi.com.



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### 2.5 operation

#### START UP

After the installation of your air dryer to a suitable location, the following check should be made:

1. Bypass piping installed and valves set to bypass the dryer.
2. Before start-up, the refrigerant analyzer gauge should indicate a dryer shutdown pressure of 153-210 psig for R404A or 100-210 psig for R407C. Check to verify data tag type of refrigerant in dryer. If analyzer pressure is above or below normal shut down pressure, do not start the dryer. Pressure may vary with ambient temperature. Dryers with pump down may read lower.
3. The operational switch must be in the OFF position.
4. The main electrical disconnect energized.

**ON UNITS SUPPLIED WITH CRANKCASE HEATERS, THE CRANKCASE HEATERS MUST BE ENERGIZED 24 HOURS BEFORE INITIAL START-UP OR AFTER ANY PROLONGED SHUT DOWN. AFTER THE 24 HOUR PERIOD, THE DRYER MAY BE STARTED. THE REFRIGERANT ANALYZER PRESSURE WILL DROP AND BRING ITSELF TO THE NORMAL RUNNING PRESSURE OF 69-81 PSIG FOR R404A OR 50-56 FOR R407C. WHEN THE RED HIGH TEMPERATURE LIGHT GOES OUT, THE DRYER IS READY TO ASSUME FULL LOAD OPERATION.**

5. When the operational switch is turned to the ON position, the amber dryer running light should be ON.

**DRYERS HAVING DUAL CONDENSER FANS WILL HAVE ONE (1) FAN WHICH MAY START WHEN THE OPERATIONAL SWITCH IS TURNED ON. THE CYCLING OF THE FAN(S) IS CONTROLLED BY THE LOW AMBIENT FAN CONTROLS WHICH ARE FACTORY PRESET TO MAINTAIN THE PROPER HEAD PRESSURE WITHIN THE REFRIGERANT SYSTEM.**

**DRYERS WITH SCROLL COMPRESSOR(S) NEED TO BE CHECKED WITH PROPER ROTATION BY MAKING SURE THE DISCHARGE PRESSURE IS GREATER THAN THE SUCTION PRESSURE. TO CHANGE ROTATION, SWITCH INLET POWER LEADS L1 AND L3. ANY QUESTIONS OR PROBLEMS, CONSULT FACTORY.**

6. Open water supply valve (water-cooled units only).
7. Adjust solenoid drain valves for appropriate OPEN time.
8. Once dryer is operational, minor adjustments may need to be made to the hot gas bypass valve based on ambient conditions.

#### SHUT DOWN

All dryers may be shut down by simply turning the operational switch to OFF. All models require the main power disconnect to remain on unless service or maintenance work is to be performed. They have one fan motor wired to run to lower head pressures after shut-down.





## 2.6 operating principle of the dryer

STR open-frame refrigerated process dryers are of the high-efficiency type, designed to effectively remove moisture from compressed air by means of a refrigeration process. The compressed air pressure dew point is reduced to 38°F and then reheated to prevent in-plant air lines from sweating. The 38°F dew point can be maintained under varying conditions from zero load to 100% of the design conditions.

### COMPRESSED AIR CIRCUIT

#### 1. AIR TO AIR HEAT EXCHANGER

This unique high-efficiency dual action heat exchanger is of a shell and finned-tube design. The tubes are of high quality copper and are enhanced by outer fins of corrugated aluminum. The 100°F (38°C) air is first directed into the shell of the heat exchanger and is baffled back and forth across the finned tubes giving off its heat to the cool, dry air as it exits through the tube side of the heat exchanger. At this pre-cooling/reheating stage, the compressed air is cooled 20°F (11°C) which condenses out approximately HALF of the water load at 100°F (38°C). Additionally, the water is actively removed by use of a condensate drain to eliminate the moisture as it is condensed out of the air stream.

#### 2. AIR TO REFRIGERANT HEAT EXCHANGER

This dual action heat exchanger is also of the shell and finned-tube design. The evaporator is engineered with maximum efficiency in mind. It also incorporates the high-quality copper tubes with corrugated aluminum fins and is baffled in the same manner as the air-to-air heat exchanger. The heat is transferred from the compressed air to the liquid refrigerant within the tubes and is then dissipated to atmosphere through the condenser coil in the refrigeration system. Designed into the lower half of the heat exchanger is an ultra-low velocity separator section which extracts and discharges the moisture as it is condensed. This separation process traps and keeps the moisture from re-entering the compressed air flow.

#### 3. DRAIN VALVES

Type: Solenoid Drain Valve (STR 1250 - STR 2000)  
Zero Air Loss Valve (STR 2500 - STR 7500)



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### REFRIGERANT CIRCUIT

#### 1. REFRIGERANT COMPRESSOR

The refrigerant compressor used is an industrial type, scroll or semi-hermetic reciprocating design depending upon the model. These compressors are 3-phase. The compressors used are designed for high temperature applications which allow an evaporation temperature range of 20°F (-7°C) to 50°F (10°C). Each compressor motor is fully protected by either an internal or external overload which is of the automatic reset type. All compressors used are suction gas-cooled and have a wide working range. The connected electrical load can vary with the compressor load, ambient temperature or cooling water temperature.

#### 2. AIR-COOLED CONDENSER AND CONDENSER FAN CYCLING CONTROL (LOW AMBIENT):

All air cooled condensers used in the STR dryers are industrial plate fin type coils, designed for maximum ambient conditions. Each condenser has a sub-cooling system which permits the condensed refrigerant to be sub-cooled below the normal condensing temperature to within 10°F of the ambient temperature.

The condensers are forced convection type and the fan motor(s) are controlled by the pressure switch(-es) (low-ambient control). This pressure switch is activated by the condenser head pressure. This pressure will vary with the ambient temperature and evaporator load.

As the pressure increases to a factory set cut-in pressure, the fan switch closes and the fan motor(s) start(s). The fan removes the heat within the condenser and lowers head pressure to the factory set cut-out point. With the fan switch controlling the upper and lower pressure limits, the dryer can operate through a wide range of ambient and load conditions. When the ambient is high and the dryer is operating at full load, the condenser pressure and temperature will stabilize and the fan(s) will run continuously.

#### 3. THE EVAPORATOR AIR-TO-REFRIGERANT HEAT EXCHANGER

The evaporator is constructed of high quality copper tubing that utilizes an extended surface of corrugated aluminum fins. The tubes are set in a staggered pattern for maximum heat transfer. Each refrigerant circuit is fed by a venturi type refrigerant distributor which insures that cold liquid refrigerant is efficiently distributed to the bottom of each circuit.

The circuit within the evaporator is serpentine in such a manner as to guarantee a completely flooded evaporator. Each evaporator is designed to insure adequate refrigerant velocity to eliminate the problem of oil return to the crankcase.

#### 4. EXPANSION VALVES

The thermostatic expansion valve (TXV) is used on all models.

# open-frame refrigerated process dryer



This expansion valve is controlled primarily by temperature and requires a hot gas bypass valve to maintain suction pressure.

The temperature that is sensed by the (TXV) thermal bulb is the superheat temperature of the refrigerant at the outlet of the evaporator. Superheat temperature is the temperature increase of the refrigerant above its saturation temperature corresponding to the existing evaporator pressure

## 5. HOT GAS BYPASS VALVE

The hot gas bypass valve or capacity regulator permits medium to larger type refrigerated dryers to operate through the range from zero load to 100% load while maintaining evaporator and suction line pressure and temperature.

## 6. LOW PRESSURE SWITCH

The low pressure switch is a safety device that protects the refrigeration compressor from running with low suction pressure that could result from a loss of refrigerant charge.

## 7. HIGH PRESSURE SWITCH

The high pressure switch is a safety device that limits the discharge pressure from the refrigerant compressor. If the discharge pressure exceeds the factory set point, the high pressure switch opens the electrical circuit to the compressor and the system is shut down. High discharge pressures may result from conditions such as: plugged or dirty condensers, high ambient temperature, high compressed air inlet temperatures, high compressed air flows, non-condensables (air inside the refrigeration system) or fan motor failures.

## 8. CRANKCASE HEATER (WHEN REQUIRED)

The crankcase heater is standard. The crankcase heater is a low wattage heater that is connected to or immersed in the refrigerant compressor crankcase. The wattage of this heater is normally 50 to 65 watts. This heater is not controlled by the operational switch of the dryer, but is factory wired directly to the incoming power.

The purpose of the crankcase heater is to prevent liquid refrigerant migration back to the crankcase while the compressor is not in operation. This migration of the liquid refrigerant occurs when the compressor crankcase is at a lower vapor pressure than the evaporator and other system components.

The crankcase heater must raise the temperature of the crankcase and oil to a temperature higher than the evaporator and all of the interconnecting piping. To accomplish this, the crankcase heater must be energized 24 hours before the dryer is started. This is accomplished by turning the dryer operational switch to "OFF" and switching on the main power. The dryer is then allowed to warm up for 24 hours after which time the operational switch may be turned to the "ON" position.



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## open-frame refrigerated process dryer

### 11. DE SUPERHEATING VALVE (STR 1250 AND LARGER)

This valve is used on larger capacity dryers. Due to the larger refrigerant charges associated with these models the addition of the de superheating valve is necessary. The purpose of the valve is to provide liquid refrigerant to de superheat hot discharge gas used to establish suction gas pressure.

### 12. HIGH TEMPERATURE CONTROL

This control is used to protect the compressor from excessive return gas temperature. During the start-up phase, the high temperature light may be lit until the refrigeration system reaches its normal running temperatures and pressures. (See Start-up).

On models 2500 SCFM and above, this control will activate the high temperature light and will also open the electrical circuit on the compressor and shutdown the dryer. The dryer will not restart without the customer turning the selector switch to off and then back on. Customer evaluation should be undertaken to determine the cause of the high temperature condition.

After start-up, the high temperature light condition may result from: plugged or dirty condensers, high ambient, high compressed air inlet temperatures or high compressed air flow.



## 2.7 water-cooled models: cooling water requirements

All dryers may be shut down by simply turning the operational switch to “OFF” or “Pump Down”. All models require the main power disconnect to remain on unless service or maintenance work is to be performed. Dryers have a fan motor wired to run to lower head pressures after shut-down.

model	cooling water requirements				KW input <sup>(4)</sup>
	heat to		cooling water		
	cooling water	ambient <sup>(1)</sup>	GPM <sup>(2)</sup>	GPM <sup>(3)</sup>	
STR 1500-W	9845	7366	18	7.3	6.82
STR 1750-W	10945	8920	23	9.1	7.9
STR 2000-W	128646	10431	26	10.3	9.4
STR 2500-W	135330	10185	27	10.8	9.4
STR 3200-W	186550	14040	37	15	12.9
STR 4000-W	206480	15540	41	16.5	14.2
STR 5000-W	268075	20175	54	21.5	18.9
STR 6250-W	367117	27632	73.4	29.4	28.9
STR 7500-W	472231	35544	78.0	31.4	34.5

### Notes:

- (1) Approximately 7% of the total heat load is rejected to ambient air, the balance to the water-cooled condenser.
- (2) Based on cooling tower water 85°F to condenser, 95°F out of condenser, 78°F ambient wet bulb temperature.
- (3) Based on water into condenser @ 60°F (city water). Water temperature out of condenser, 85°F.
- (4) Kilowatt (Power) consumption by the refrigeration compressor motor.
- (5) Heat amounts are expressed in B.T.U.H.



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## open-frame refrigerated process dryer

### 2.8 installation of remote condenser

During installation of a Remote Condenser option, nano-purification solutions recommends the use of check valves or P-traps at condenser inlet and outlet.

### 2.9 maintenance

A properly installed STR open-frame refrigerated process dryer requires very little maintenance to provide years of trouble-free service. A very simple routine maintenance program is all that is required. This program will consist of (3) check points.

1. DRAIN VALVE(S): Inspect and clean the drain valve(s) on a periodic basis.
2. REFRIGERATION CONDENSER: Inspect the refrigeration condenser for lint and dirt.
  - a. The refrigeration condenser should be checked for lint and dirt monthly in a clean environment and more often in a dirty environment. If the condenser is found to be dirty, it must be cleaned with low pressure dry air.

Inspect condenser fans for bent or broken blades and for free rotation.

- a. Check condenser fan(s), brackets and on motor shaft for tightness.
3. Check refrigerant lines for oily connections and vibration in lines. Check wiring for loose and broken wire ties. Check refrigerant sight glass for moisture (see trouble shooting).

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# open-frame refrigerated process dryer



## 2.10 trouble shooting

problem	cause	solution
Dryer NOT running. High temperature light off, analyzer gauge normal	Disconnect open	Close disconnect
	Fuse blown	Replace fuse
	Wiring, improper or broken	Check wiring diagram or repair
	Control transformer defective	Replace
	Unit not turned on	Turn unit on
Dryer NOT running. High temperature light on, analyzer gauge normal	Overload tripped	Allow to cool and reset. Check for overload
	High pressure switch open (if supplied)	Reset and check for cause
	Low water pressure (water-cooled)	Increase water pressure
	Low oil pressure switch (if supplied)	Reset and check oil level
	High suction gas temperature	Check for high ambient or overloaded condition
Dryer running. Analyzer gauge high	High inlet temperature	Check after cooler
	High ambient temperature	Cool ambient or relocate unit
	Dirty or plugged condenser coil	Clean condenser coil. Blow with compressed air
	Defective water regulator (water-cooled)	Repair or replace
	Defective fan control	Replace
	Defective fan motor	Replace
	Defective refrigerant compressor valves	Repair or replace compressor
	Suction pressure too high	Adjust hot gas bypass valve
Dryer running. High temperature light ON, analyzer gauge pressure low	Leaky refrigerant circuitry	Locate and repair
	Suction pressure too low. Check refrigerant charge	Adjust hot gas bypass valve
	Defective hot gas bypass valve	Replace
Dryer running. High temperature light OFF, analyzer pressure gauge low	Defective fan control (low ambient control)	Replace
	Low ambient temperature	Heat ambient or relocate dryer
	Low refrigerant charge	Repair leak and add refrigerant



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## open-frame refrigerated process dryer

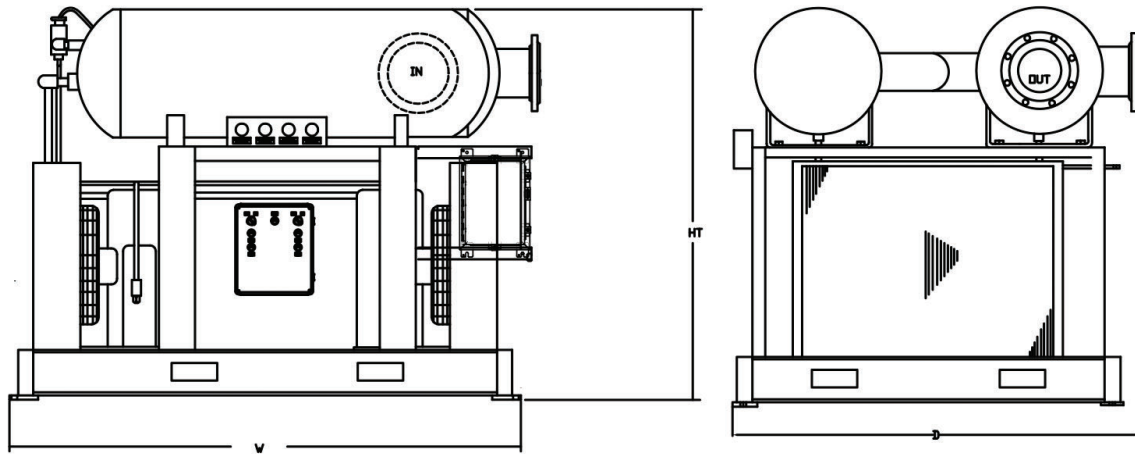
problem	cause	solution
Dryer NOT running. High temperature light ON, analyzer gauge pressure low	Low pressure switch open	Check for leak and repair
	Service valves closed	Open valves
	High suction gas temperature	Check for leak
Water downstream of the dryer	Trap not functioning	Clean or repair trap
	High inlet temperature	Check after cooler
	Excess flow	Dryer undersized. Replace with larger dryer
	Low air pressure	Dryer undersized. Replace with larger dryer
	Bypass valve open	Close valve
High pressure drop across dryer inlet and outlet	Excess flow	Dryer undersized. Replace with larger dryer
	Low air pressure	Dryer undersized. Replace with larger dryer
	Partially frozen	Shut dryer off until ice melts
Power light ON but dryer not running	No cooling water supply to dryer	Check cooling water supply. Reset refrigerant HI/LO pressure switch if interrupted





### 3.1 general arrangement drawings

STR 1250 to STR 3200



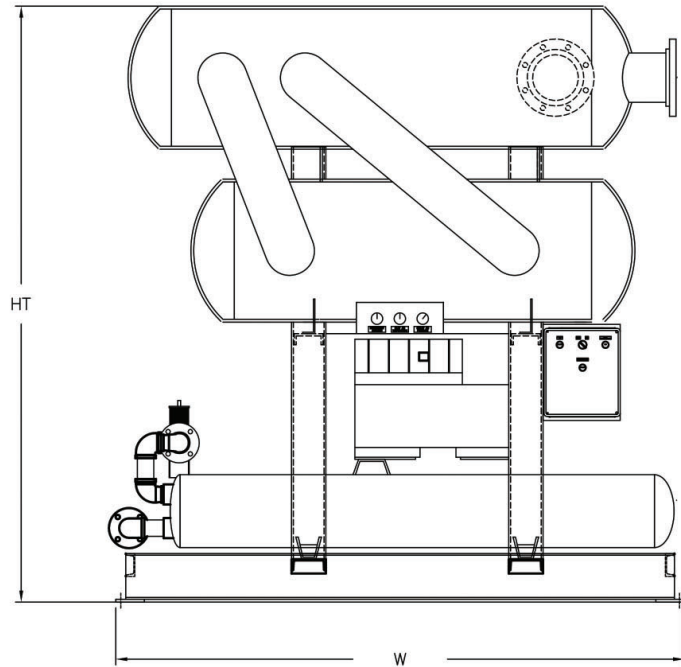
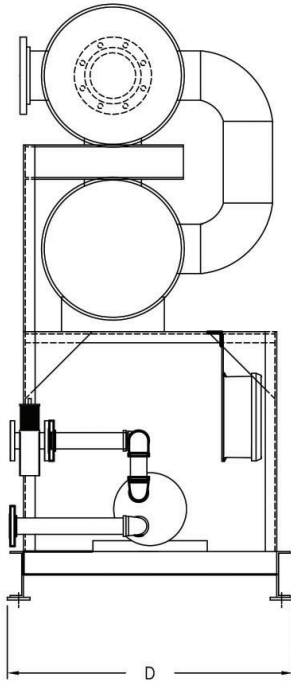
model	dimensions							
	w		d		h			
	in	mm	in	mm	in	mm		
STR 1250-A	73	1981	51	1295	60.5	1537		
STR 1500-A	73	1981	51	1295	60.5	1537		
STR 1500-W	73	1981	51	1295	60.5	1537		
STR 1750-A	73	1981	51	1295	60.5	1537		
STR 1750-W	73	1981	51	1295	60.5	1537		
STR 2000-A	73	1981	51	1295	60.5	1537		
STR 2000-W	73	1981	51	1295	60.5	1537		
STR 2500-A	90	2286	70	1778	67.5	1715		
STR 2500-W	90	2286	70	1778	67.5	1715		
STR 3200-A	90	2286	70	1778	67.5	1715		
STR 3200-W	90	2286	70	1778	67.5	1715		



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# open-frame refrigerated process dryer

**STR 4000 to STR 7500**



model	dimensions					
	w		d		h	
	in	mm	in	mm	in	mm
STR 4000-A-RC	100	2540	41	1041	92	2337
STR 4000-W	100	2540	41	1041	92	2337
STR 5000-A-RC	100	2540	41	1041	92	2337
STR 5000-W	100	2540	41	1041	92	2337
STR 6250-A-RC	100	2540	50	1270	104	2642
STR 6250-W	100	2540	50	1270	104	2642
STR 7500-W	100	2540	50	1270	104	2642

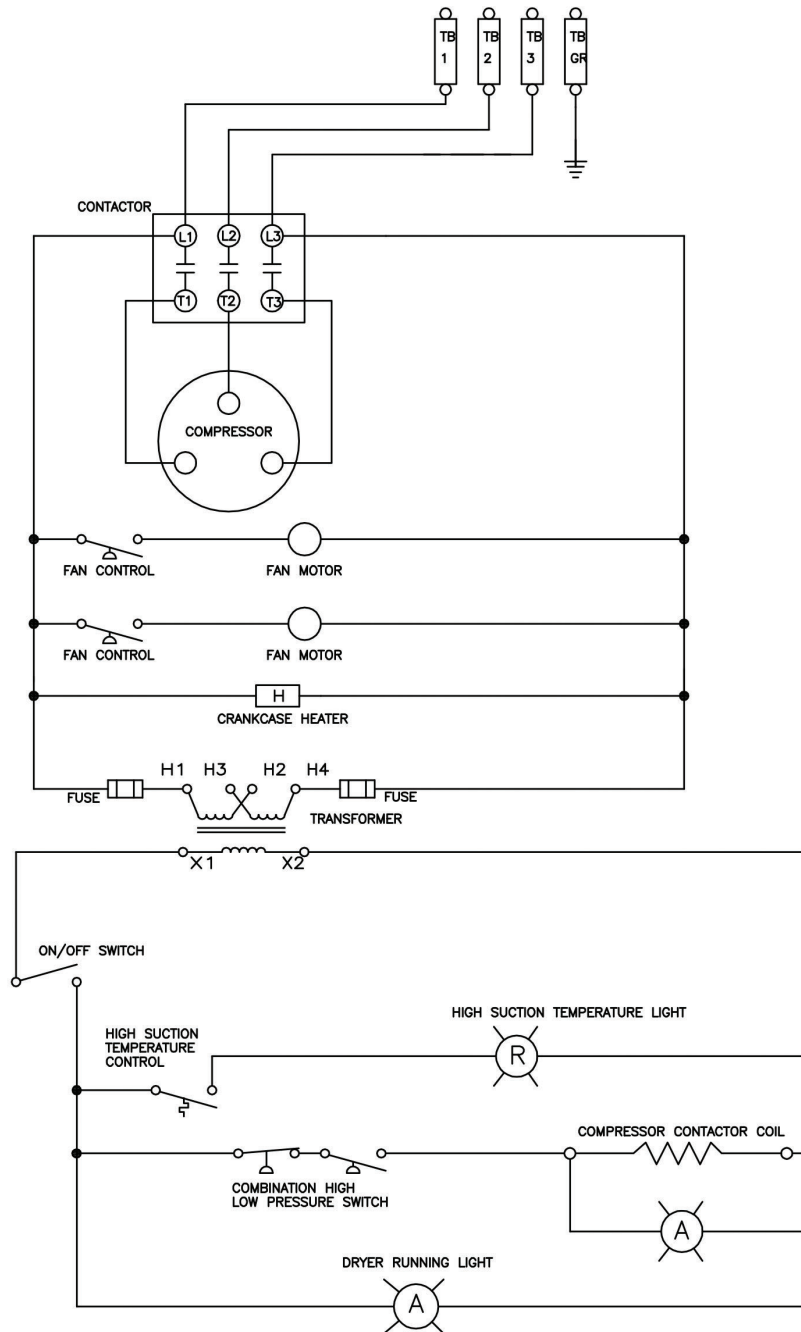
# open-frame refrigerated process dryer



## 3.2 electrical drawings

air-cooled

\*the number of fans will change with the size of the dryer



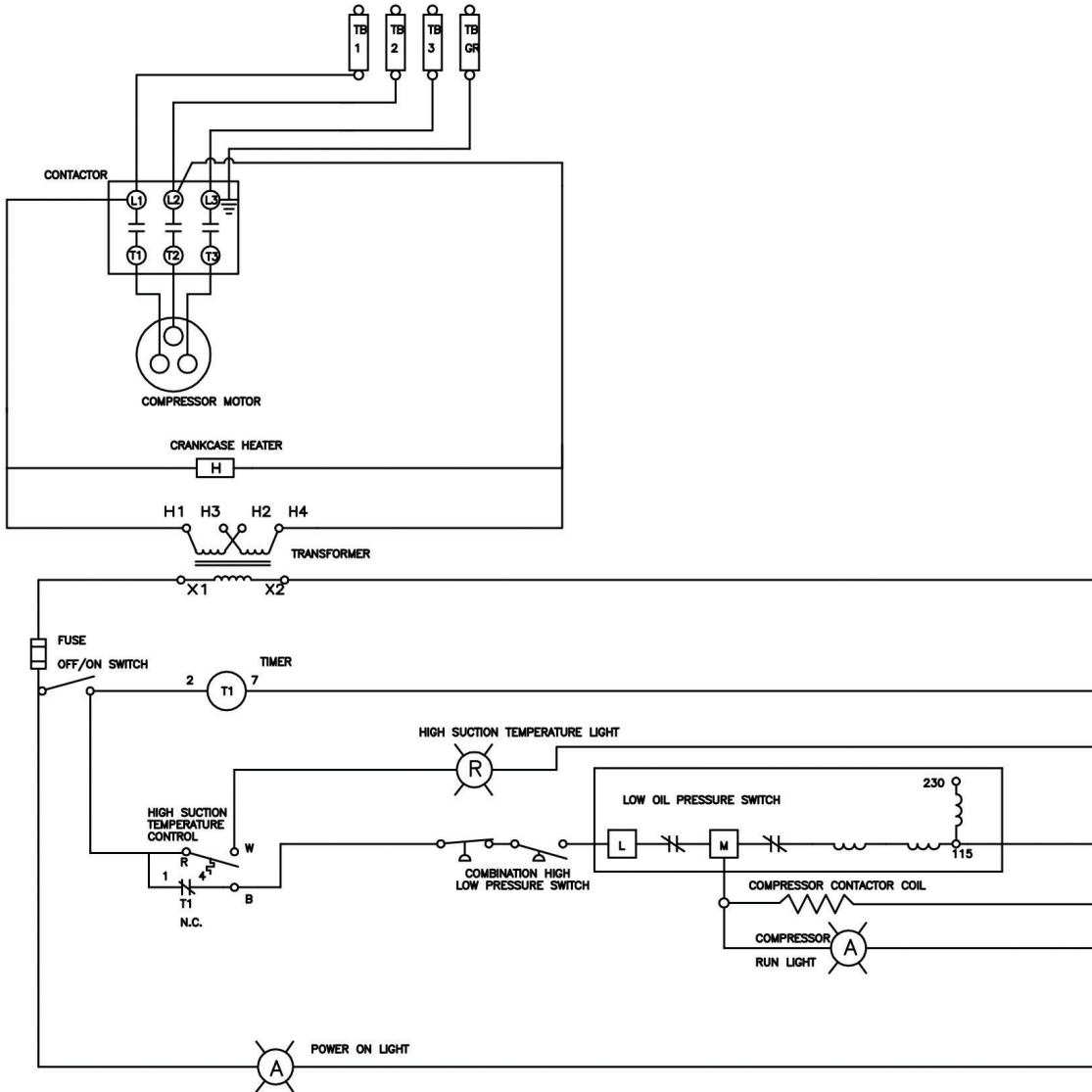


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## open-frame refrigerated process dryer

water-cooled

\* fuse and compressor sizes will change with dryer sizes



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# open-frame refrigerated process dryer



## 3.3 appendices

reference	power supply	compressor(s)			absorbed power		air connections/ pressure		refrigerant gas	weight
model	60 Hz only	qty	hp	type	(kW)	(A)	NPT(M)/ Flg	max working pressure (psi)		lbs
STR 1250-A	3/460V/60Hz	1	8	scroll	10.4	16.4	3"	150 psig	R404A	1925
STR 1500-A	3/460V/60Hz	1	9	scroll	11.8	17.5	3"	150 psig	R404A	1950
STR 1500-W	3/460V/60Hz	1	7.5	semi-hermetic	7.5	14.1	3"	150 psig	R404A	1950
STR 1750-A	3/460V/60Hz	1	10	scroll	13.9	17.8	4"	150 psig	R404A	2075
STR 1750-W	3/460V/60Hz	1	7.5	semi-hermetic	7.5	14.1	4"	150 psig	R404A	2075
STR 2000-A	3/460V/60Hz	2	12	scroll	15.1	18.6	4"	150 psig	R404A	2125
STR 2000-W	3/460V/60Hz	1	10	semi-hermetic	10.7	20	4"	150 psig	R404A	2250
STR 2500-A	3/460V/60Hz	2	16	scroll	15.1	18.6	6"	150 psig	R404A	2800
STR 2500-W	3/460V/60Hz	1	10	semi-hermetic	10.7	20	6"	150 psig	R404A	3100
STR 3200-A	3/460V/60Hz	2	20	scroll	27.7	35.6	6"	150 psig	R404A	2900
STR 3200-W	3/460V/60Hz	1	15	semi-hermetic	15.1	29	6"	150 psig	R404A	3200
STR 4000-A-RC	3/460V/60Hz	1	28	semi-hermetic	30.5	45.8	8"	150 psig	R407C	3300
STR 4000-W	3/460V/60Hz	1	20	semi-hermetic	20.1	53.6	8"	150 psig	R407C	3300
STR 5000-A-RC	3/460V/60Hz	1	35	semi-hermetic	38.5	57.5	8"	150 psig	R407C	3600
STR 5000-W	3/460V/60Hz	1	30	semi-hermetic	38.3	48.1	8"	150 psig	R407C	3600
STR 6250-A-RC	3/460V/60Hz	1	40	semi-hermetic	44.4	65.2	8"	150 psig	R407C	4400
STR 6250-W	3/460V/60Hz	1	35	semi-hermetic	42.3	53.2	8"	150 psig	R407C	4400
STR 7500-W	3/460V/60Hz	1	40	semi-hermetic	37.5	79.3	8"	150 psig	R407C	4500

(1) -1250 and -1500 are NPT(M); -1750 and above are 150# ANSI Flg connections



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## open-frame refrigerated process dryer

### **4.1 R404A gas chemical safety data sheet**

For R404A gas chemical safety data sheet, visit

<http://www.globalrefrigerants.com.sg/sds/Global-SDS-R-404A.pdf>

### **4.2 R407C gas chemical safety data sheet**

For R407C gas chemical safety data sheet, visit

<http://globalrefrigerants.com.sg/sds/Global-SDS-R-407C.pdf>

# additional nano products



**F-series industrial filters**

**F-series high capacity flanged filters**



**D-series desiccant dryers**

**B-series breathing air purifiers**



**GEN<sub>2</sub>-series nitrogen generators**

**R-series refrigerated dryers**



**S-series oil water separators**



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