Refrigerated air dryers

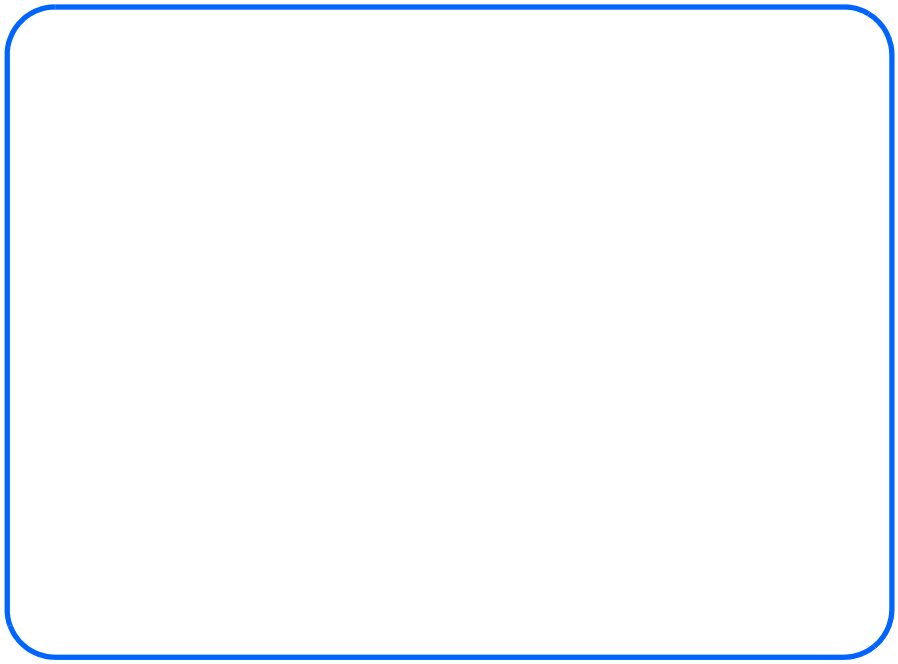
NRC0020-0200 UL

OPERATING AND MAINTENANCE MANUAL

Our contact details:
www.n-psi.com

38178800655

Original instructions



CONTENTS

CHAPTER 1

GENERAL INFORMATION

The units described in this manual are “dryers”.
They are designed to remove the moisture from a flow of “compressed gas”.
The dryers are equipped with a refrigerant circuit that is designed to cool the compressed air to a temperature designated “pressure dew point”.
Since, in the majority of applications, the gas to be dried is compressed air, hereinafter the term “compressed air” is used for the sake of simplicity, even though the specific gas in an individual application may be different. Hereinafter the expression “pressure” is used to indicate relative pressure.
The electrical cabinet is designed in compliance with standard UL508A (Industrial Control Panels), tested and approved to UL file no. E249753, and bears the appropriate marking 

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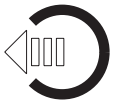
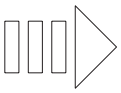
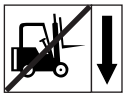
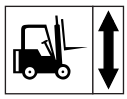
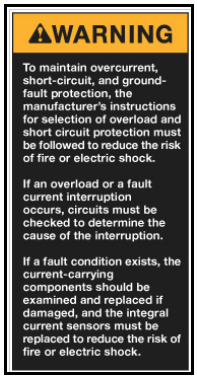
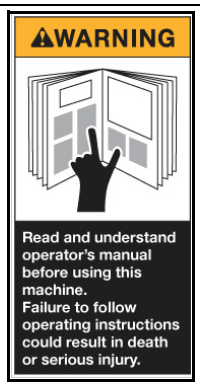
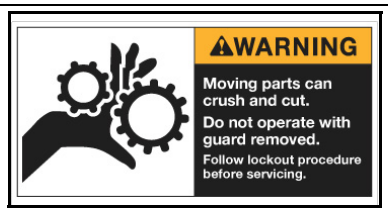
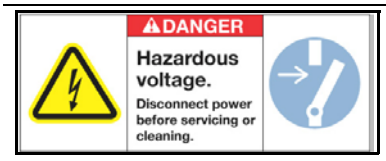
The following general symbols are to be found on the decals affixed to the unit and also in the dimensional drawings and refrigerant circuit diagrams in this manual.
The meaning of each symbol is indicated hereinafter:

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	Unit air inlet		Unit air outlet
	Condensate drain		Flow of cooling air (air-cooled models)
	Direction of fan rotation (air-cooled models)		Direction of flow of refrigerant gas
	Prohibition of using inserting lift truck forks to handle the unit in the point where the symbol appears		Indication of the axis to refer to in unit lifting operations

The following warning symbols are to be found on the decals affixed to the unit.
The meaning of each symbol is indicated below:

WARNING SYMBOL	DESCRIPTION	WARNING SYMBOL	DESCRIPTION
	To maintain overcurrent, short-circuit, and ground-fault protection, the manufacturer’s instructions for selection of overload and short circuit protection must be followed to reduce the risk of fire or electric shock. If an overload or a fault current interruption occurs, circuits must be checked to determine the cause of the interruption. If a fault condition exists, the current-carrying components should be examined and replaced if damaged, and the integral current sensors must be replaced to reduce the risk of fire or electric shock.		Hazardous voltage. All doors must be closed before energizing the panel.

WARNING SYMBOL	DESCRIPTION	WARNING SYMBOL	DESCRIPTION
	Read and understand operator's manual before using this machine. Failure to follow operating instructions could result in death or serious injury.		Moving parts can crush and cut. Do not operate with guard removed. Follow lockout procedure before servicing.
	Hazardous voltage. Disconnect power before servicing or cleaning.		

CAUTION

This manual, which is addressed to users, installers, and service personnel, supplies all the technical information required to install and work with the dryer and to perform the routine maintenance operations required to ensure a long working life.
If spare parts are needed use exclusively genuine original components.
Requests for SPARE PARTS and any INFORMATION concerning the dryer must be made to the nearest dealer or service center, specifying the SERIAL NUMBER shown on the unit's dataplate and on the first page of this manual.

CHAPTER 2

SAFETY

CAUTION

This unit is designed for safety in its intended use, provided it is installed, commissioned, and serviced in compliance with the instructions given in the present manual.
The unit contains electrical components that operate at mains voltage and also moving parts such as fans, it must therefore normally be disconnected from the electrical power supply before it is opened.
Operation, overhauls or repair of the unit or any maintenance operations that call for access to the unit must be executed by skilled or suitably qualified personnel who are fully aware of all the necessary precautions, preferably under the guidance of a qualified supervisor.

2.1 General

The user must ensure that all personnel involved in operating and servicing the dryer and the auxiliary equipment have read and understood all the warnings, precautions, prohibitions and notes given in this manual and affixed to the unit.

If the user adopts operational procedures or uses tools or working procedures that are not specifically recommended, care must be taken to ensure that the dryer and the auxiliary equipment are not damaged or made unsafe and that no risks emerge in relation to persons or property.

Any improper use of the machine will relieve the manufacturer from any liability for possible personal injury or property damage.

Arbitrary modifications made to the unit will automatically invalidate all forms of guarantee provided by the manufacturer.

2.2 General precautions

2.2.1 Type of compressed gases to be dried

The compressed gases that can be dried must be compatible with the unit's construction materials (carbon steel, cast iron, copper and copper alloys) and can be, for example air, nitrogen, argon and helium.

CAUTION

The compressed gases must not give rise to phenomena of corrosion that could impair the condition of pressurised containers and they must not be able to cause fire or explosions in the event of leakage or expulsion.

2.2.2 Precautions during lifting and transport

When a load is lifted from the ground keep well clear of the area beneath the load and the immediately surrounding area.

Keep accelerations and lifting speed well within safety limits and never leave a suspended load attached to a hoist any longer than strictly necessary.

Handling of dryers must be carried out in compliance with the diagrams given (see the final part of this manual).

The manufacturer does not supply bars, belts and lifting hooks with the unit.

CAUTION

The unit's weight is shown on the dataplate and on the label affixed to the crate.

2.2.3 Precautions to be adopted during installation and operation

For connection to the mains power supply follow the instructions given in Chapter 5 “Installation” and refer to the electrical diagrams.

Check the direction of rotation of the motors (in particular three-phase fans) when starting the unit for the first time after work has been performed on the electrical connections or on the power supply sectioning device.

All piping must be painted and marked clearly in compliance with local safety prescriptions in force in the place of installation.

Do not remove or tamper with safety devices, protections, or the insulating materials installed in the unit or in the auxiliary equipment.

The dryer and its auxiliary equipment must be connected to earth and protected against short circuits and overloads.

When the unit is powered, the voltage in the electrical circuit assumes potentially lethal values so the maximum precautions must be adopted if work is to be carried out on the electrical circuit.

Do not open the electrical equipment enclosure panels while the electrical system is powered unless this is strictly necessary for the execution of tests, measurements or settings.

This work must be carried out exclusively by qualified personnel equipped with suitable tools and wearing all the relevant protective equipment to safeguard against electrical hazards.

2.2.4 Precautions for maintenance and repair

If spare parts are required, use exclusively genuine original parts.

Keep a written record of all work carried out on the unit and the auxiliary equipment.

The frequency and nature of the work required in a certain period can reveal abnormal operating conditions that require correction.

Use exclusively the refrigerant specified on the machine dataplate.

Make sure that all the instructions concerning operation and maintenance are followed scrupulously and that the entire unit and all the accessories and safety devices are maintained in proper working order.

Always keep the unit clean.

Protect components and exposed openings, plugging them, for example with clean rags during maintenance and repair work.

Precautions must be taken when before welding or performing repair operations that may generate heat, flames or sparks.

Components in the vicinity must be protected with non-inflammable material.

Do not weld or perform work that generates heat close to a system that contains oil.

Systems that may contain oil must be completely drained and flushed, for example, with steam, before performing any operation.
Do not weld or modify a container that may be subject to pressurisation.
To prevent an increase in working temperature and pressure values check and clean the heat exchange surfaces (e.g. the fins of condensers) regularly.
For all dryers establish a convenient time interval for cleaning procedures.
Never use an open flame as a light source to inspect parts of the dryer.
Before dismantling parts of a unit ensure that all mobile and heavy parts are securely fixed, and ensure electrical power has been disconnected.
When a repair has been completed make sure that no tools, detached parts or rags are left in the dryer.
Check the direction of rotation of the electrical motors (in particular three-phase fans) when starting the unit for the first time after work has been performed on the electrical connections or on the power supply sectioning device.
All the protections must be refitted following maintenance or repair work.
Do not use inflammable liquids to clean components while the dryer is running.
If non-inflammable hydrocarbons containing chlorine are used all the relevant safety precautions must be adopted to protect against the toxic fumes that may be given off.
Before removing any panels or dismantling any parts of the unit perform the following steps:

- Isolate the unit from the electrical power supply by disconnecting the supply upstream of the power feeding line.
- Lock out the breaker (if present) in the “OFF” position by fitting a padlock.
- If an 0/1 switch is present, **i.e. not a sectioning device**, ensure the breaker upline from the unit has been locked out in the “OFF” position by means of a padlock. The breaker must be sized in compliance with the indications of the electrical diagram.
- Attach a warning label to the main switch (if present) reading: "WORK IN PROGRESS - DO NOT SWITCH ON".
- Do not set the electrical power switch to ON or attempt to start the unit if the warning label is attached.

Colored tracers can be used in service-maintenance operations.
Inspect all refrigerant circuit joints including connectors, flanges, and more generally all critical points (open joints) in order to prevent possible leakage of refrigerant gas.

2.3 Refrigerant gases

The units can be charged only with R134a.
The use and storage of cylinders containing refrigerants must be in compliance with the prescriptions of the manufacturers of the cylinders and in compliance with the applicable safety laws and prescriptions in force in the place of installation.

2.3.1 Characteristics of R134a refrigerant

At normal temperature and pressure conditions, this is a class A1 colourless gas (classification EN 378-1).
Concentrations significantly above 1000 ppm v/v can cause narcotic effects.
In the event of leakages provide adequate ventilation of the room before entering.

CHAPTER 3

TECHNICAL DATA

3.1 Data plate and meaning of abbreviations

The main technical data of the unit are indicated on the data plate::

MODEL and CODE	Identify the size of the unit and its type of construction.
MANUAL	Code number of the present manual.
SERIAL NUMBER	Unit serial number or manufacturing number.
YEAR OF CONSTRUCTION	Year of unit's final testing.
VOLTAGE/PHASES/FREQUENCY	Power supply characteristics.
SHORT CIRCUIT CURRENT	Short circuit current.
HIGHEST MOTOR FULL LOAD AMPERAGE	Maximum current input.
MAX CURRENT DRAW (I max)	Sum of FLA of all loads.
INSTALLED POWER (P max)	Sum of the maximum power input of all loads.
PROTECTION RATING	According to European standard UL508A and EN60529.
ELECTRICAL DIAGRAM	Identifies the electrical diagram number.
REFRIGERANT	Type of refrigerant charge with which the unit is filled.
REFRIGERANT CHARGE	Quantity of refrigerant supplied to circuit.
MAX. REFRIGERANT PRESS.	Refrigerant circuit design pressure.
MAX REFRIGERANT TEMP.	Refrigerant circuit design temperature.
USER CIRC. FLUID	Fluid cooled by the machine.
MAX. WORKING PRESSURE	User circuit maximum design pressure.
MAX TEMPERATURE	User circuit maximum design temperature - not to be confused with the maximum working temperature, which is specified at the time of the offer.
SOUND PRESSURE LEVEL	Free field sound pressure level in hemispherical radiation conditions (open field) at a distance of 1m (39.37in) from the condenser side of the unit and a height of 1.6m (63.0in) from the ground.
AMBIENT TEMPERATURE	Cooling air minimum and maximum temperature values.
WEIGHT	Approximate weight of the unit without packaging.
CONDENSER COOLING FLUID	Fluid used by the machine to cool the condenser (this information is not given if the machine condenser is air-cooled).
MAX. WORKING PRESSURE	Condenser cooling circuit maximum design pressure (this information is not given if the machine condenser is air-cooled).
MAX TEMPERATURE	Condenser cooling circuit maximum design temperature (this information is not given if the machine condenser is air-cooled).

The following abbreviations are present on the data plate and wiring diagram:

FLA full load amperage;
PMAX maximum power;
ILR locked rotor current;

3.2 Performance data

CAUTION

The performance of the dryer (dew point, power consumption, pressure drops, etc.) depends mainly on the flow rate and pressure of the compressed gas to be dried and on the condenser cooling fluid temperature (ambient temperature).
These data, which are usually defined at the time of the offer, constitute the basic point of reference in relation to dryer performance.

3.2.1 Sound Level Measurements

The noise emission values measured are below 70 dB(A).

CHAPTER 4

DESCRIPTION

4.1 Operating principle

A refrigerant circuit cools a patented “thermal mass” through which the humid compressed air to be dried flows.
The air cools, resulting in condensation of the water vapor it contains, which is subsequently separated and discharged.
The temperature of the thermal mass is regulated by an electronic controller, which stops the refrigerant compressor when the programmed set-point is reached.

4.2 Air and refrigerant circuits

(See attached refrigerant circuit diagrams)

4.2.1 Air circuit

The warm and humid compressed air entering the dryer flows through the air/air exchanger section of the thermal mass.
Here the air is precooled by the cold and dry compressed air leaving the air/refrigerant or evaporator section of the thermal mass.
The precooled air then enters the evaporator section of the thermal mass where it is cooled (in most applications to a temperature of approximately 3°C/37.4 °F) exchanging heat with the refrigerant fluid and the silica thermal mass.
Heat is exchanged by a process of conduction through the aluminium fins that join the copper tubes through which the compressed air flows, to the copper tubes in which the refrigerant fluid evaporates.
The aluminium fins exchange heat also with the silica thermal mass keeping it at a temperature of approximately 0°C (32°F).
At this point the compressed air is saturated and conveys with it the condensation produced during the cooling process.
The precooled air then enters a high efficiency condensate separator (demister type with stainless steel mesh) where the condensate is precipitated and collected on the bottom of the enclosure.
A condensate drain either of the timer controlled or capacitive type, depending on the unit's configuration, opens periodically and drains the condensate which is expelled by compressed air pressure.
The dry cold air at the outlet of the separator flows for the second time through the air/air section of the thermal mass, where it absorbs the heat of the warm and humid compressed air entering the dryer and thereby cools the inlet flow.
This air/air exchanger both reduces the amount of energy required to dry a given flow of air and also has the benefit of reducing the relative humidity thereby avoiding the risk of the formation of condensate at the dryer outlet.

4.2.2 Refrigerant circuit

The high pressure compressed refrigerant gas flows into the condenser.
In the condenser the refrigerant changes from the gaseous to the liquid phase.

- The condenser is a heat exchanger of the finned core type and it is cooled by an air flow provided by fan.
  The condenser is generously sized in such a way that it can function partially also as a liquid receiver.

Downstream from the condenser the refrigerant enters a filter drier and a capillary tube where refrigerant pressure is reduced to lower its boiling pressure.
The refrigerant then enters the tubes of the evaporator section of the thermal mass, cooling both the compressed air and the thermal mass itself.
The refrigerant at the dryer outlet is now in the form of a cold vapor, which is returned to the compressor to repeat the cycle.
Since the heat provided by the compressed air to cause the refrigerant to evaporate varies significantly because of fluctuations in the compressed air temperature and flow rate, the dryer is equipped with an electronic system to control the temperature of the thermal mass. This system fulfils 3 important roles:

- it ensures an almost constant pressurised dew point (approx. +3°C (+37.4°F));
- it prevents the compressed air temperature from falling below 0°C (32°F) with consequent freezing of the condensate;
- it ensures that all the refrigerant is evaporated in the evaporator, thus avoiding the risk of any liquid entering the compressor suction side.

When the load is low or zero, the temperature of the thermal mass tends to fall.
When it reaches 0°C (32°F) the electronic controller stops the compressor.
The compressed air that continues to flow in the evaporator is cooled by the cooling energy stored in the silica.
When the silica temperature starts to rise, the refrigerant compressor is started automatically so that it can cool it down again.
This system offers the benefit of reducing average energy consumption of the dryer in such a way as to make it approximately proportional to demands.

CHAPTER 5

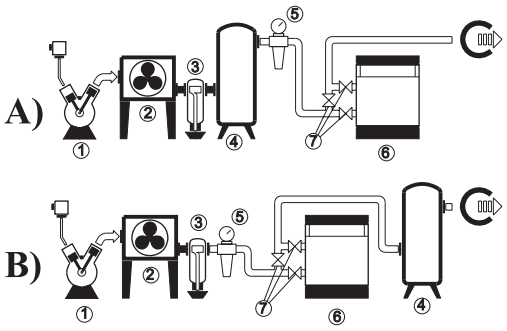
INSTALLATION

DANGER

Before installing or operating these dryers, ensure that all personnel involved have read and understood Chapter 2 "Safety" in this manual.

5.1 Location

1. Install the dryer in a well-ventilated place, where the ambient air is clean and free from flammable gases or solvent vapors.
2. Avoid installing the dryer in excessively cold places; this could cause the discharged condensate to freeze in the drainage systems. The minimum ambient temperature for installation of these dryers is shown in the dataplate affixed to the unit.
3. The dryer can be positioned on any flat surface that is sufficiently solid to support its weight.
   Leave free space around the dryer as indicated in the installation drawings to allow unimpeded access during servicing operations and to avoid obstructing or disturbing the condenser cooling air flow.
   Position the dryer in such a way that the cooling air can not recirculate to the intake grilles.
   Ensure that the dryer is not subject to hot air flows deriving from systems for cooling, for example, the air compressor, the refrigerant compressor, or any other equipment in the vicinity.
4. The position of the dryer in the compressed air distribution system depends on the methods of use of the compressed air (see installation drawing).
   A The dryer must be installed downstream of the tank when the air compressor runs intermittently and the maximum compressed air working flow rate is no higher than the flow rate delivered by the compressor (this is the most common type of installation).
   B The dryer should be installed upline from the tank when it is sized in order to allow wide fluctuations of the air flow rate utilised with peak values that are significantly higher than the maximum flow rate of the compressor.



1. Compressed air compressor
2. Final refrigerant
3. Condensate separator
4. Compressed air tank
5. Prefilter
6. Dryer
7. By-pass

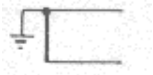
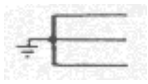
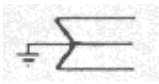
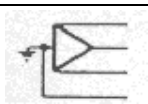
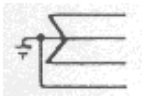
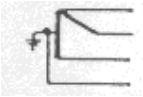
5.2 Piping

(see installation drawing)

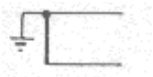
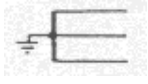
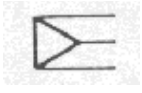
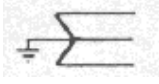
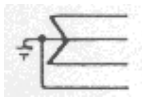
1. The inlet and outlet connections are clearly marked (see Chapter 1 "General Information"). The piping and connections must be correctly sized and suitable for the working pressure of the application. Remember to remove the protective caps from the connections. Make sure to use the NPT adaptor fittings for the dryers that require them. Ensure that no debris or other material enters the connections during installation procedures. Any foreign material that enters the connections can result in clogging of the filter or jamming of the condensate drain valve.
2. All piping must be equipped with suitable supports. **Flexible couplings should be installed to prevent the transmission of vibration**.
3. Connect the condensate drain hose to a suitable drain point. The drain line of the dryer should not be connected to the drain lines of other equipment; ideally the line should end in an open funnel type drain. Do not route the condensate to a common drain header because of the possibility of oil contents. Oil/water separators should be installed to separate any oil out of the condensate. Make sure that the drainage system complies with local regulations and bylaws.
4. It is advisable to install a prefilter up-line of the dryer and, if necessary, a coalescent deoiler filter down-line of the dryer.
   Install shut-off valves on the compressed air inlet and outlet connections so that the dryer can be isolated if necessary.
   Fit as suitably sized pressure relief valve upline from the shut-off valves.
   Contact nano - purification solutions for information on prefilters and afterfilters, www.n-psi.com
5. Install a bypass line with shut-off valves so that dryer maintenance operations can be carried out without interfering with the compressed air supply.
6. Piping and other parts whose temperature may exceed 60°C (140°F) and that may be accidentally touched by personnel must be protected or insulated.
7. In order to discharge the compressed air from the dryer so that the unit can be depressurised prior to maintenance operations, fit a venting valve in the pipe between the dryer and one of the shut-off valves.

5.3 Electrical connections

The unit's connection to the power supply must be made in compliance with laws and prescriptions in force in the place of installation, after having consulted the electrical diagram supplied with the unit.
The voltage, frequency and number of phases must comply with the data on the unit's dataplate.
Main distribution systems in the USA:

System	Rated Voltage	User voltage	
	120	115	110
	240/120	230/115	220/110
	600 480 240	575 460 230	550 440 220
	480	460	440
	480/277 208/120	460/266 200/115	440/254 190/110
	240/120	230/115	220/110
	240/120	230/115	220/110

Main distribution systems in Canada:

System	Rated Voltage	User voltage	
	240 480 600	230 460 575	220 440 550
	240/120	230/115	220/110
	600 480 240	575 460 230	550 440 220
	600 480 240	575 460 230	550 440 220
	600/347 480/277 416*/240 208/120	575/332 460/266 400*/230 200/115	550/318 440/254 380*/220 190/110

For the electrical power supply:

1. To access the electrical panel, remove the lateral screws fixing the top cover to the side panels of the cabinet and remove the front panel by undoing the screws securing the panel to the base.
   To access the electrical panel components undo the nuts fixing its protective cover to the front panel.
2. Connect the unit (terminal  in the electrical panel) to the electrical earthing system of the building;
3. Make sure the level of protection against indirect contact at the source of the power feeding cable is equivalent at least toNEMA Type 1;
4. At the start of the power feeding cable or the power cable supplied with the unit install a device that protects the cable from overcurrent (short circuits) (refer to the indications in the electrical diagram)
   All protection devices must be approved (“listed”) for this purpose.

5. Use connectors rated for the maximum required voltage at the maximum operating ambient temperature, according to the chosen installation type (see the indications on the electrical diagram). Use exclusively copper cables marked UL in compliance with NEC (NATIONAL ELECTRICAL CODE) and CEC (CANADIAN ELECTRICAL CODE).
6. The unit's power feeding cable must first be connected to the terminals/breaker (as shown in the electrical diagram) and must then be routed out of the unit through the specific cable outlet hole in the rear panel, identified by means of a decal showing the power supply voltage.

CHAPTER 6

START-UP

CAUTION

Before starting this type of dryer, ensure that all personnel involved have read and understood Chapter 2 "Safety" in this manual.

1. Check that the dryer shut-off valves are closed and the by-pass valve is open.
2. If the unit is equipped with a capacitive condensate drain, check that it is correctly installed.
3. Check that the ambient temperature is within the range indicated on the unit's dataplate.
4. Power the dryer by means of the line protection device.
5. When the unit is powered the control unit display switches on (see Chapter 7 "iDRY Electronic Controller").
6. Press button ⏻ of the control unit.

   Once the programmed delay has elapsed the compressor and fan will start.

   - On three-phase power supply models, make sure the fan rotates in the correct direction.
     If necessary, invert two phase wires to reverse the direction of rotation.
7. Wait for the compressor to stop when the thermal mass has reached the programmed temperature.
8. Slowly open the dryer inlet valve to pressurise the unit.
9. Slowly open the dryer outlet valve.
10. Close the dryer by-pass valve.
11. Press the manual condensate drain button to check that the discharge solenoid valve opens.
12. If the unit is equipped with timer controlled condensate drain, check that the discharge solenoid valve opens again after the time interval set on the control panel.
13. If the unit is equipped with a capacitive condensate drain, check that it is working correctly.

The dryer is now ready for normal operation (see Chapter 9 "Operation and Maintenance").

CHAPTER 7

iDRY ELECTRONIC CONTROLLER

7.1 User interface

7.1.1 Display

The controller displays the unit status with messages shown on the LCD display. The display messages can be:	
	Unit OFF
	Unit running (normal operation)
	High Dew Point temperature

7.1.2 Buttons

BUTTON	FUNCTION
SET	Displays or edits the set-point. During programming, selects a parameter or confirms a value.
∧	Displays data of a temperature alarm. During programming, scrolls through parameter codes or increments the relative value.
∨	Displays data of a temperature alarm. During programming, scrolls through parameter codes or decreases the relative value.
⏻	Turns the unit on or off.
	Condensate drain test.
∧ + ∨	Locks or unlocks the keypad.
SET + ∨	Enters programming mode.
SET + ∧	Exits programming mode.

7.1.3 Icons

ICON	ICON STATUS	FUNCTION
	Off	Compressor OFF
	On	Compressor ON
	Flashing	Compressor stopped at timed intervals
	Off	Condensate drain deactivated
	On	Condensate drain activated
	On	Winter set point in use
	Off	Winter set point function disabled
	Off	No alarm condition
	Flashing	Indicates an alarm condition
	On	Unit of measurement in degrees Centigrade
	Flashing	Unit in programming
	On	Unit of measurement in degrees Fahrenheit
	Flashing	Unit in programming

7.2 Main functions

7.2.1 Unit start-up

After having made the electrical connections, the message "---" appears on the display showing that the board is powered, after which the message "OFF" appears (see paragraph *"7.1.1 Display"*) showing that the unit and the refrigerant compressor are off.

To turn on the unit, press  .

The unit starts to operate automatically according to the temperature read by probe -BDPT and according to the temperature control logic.
Note that when the temperature detected by the probe reaches a value such that calls for the compressor to start, instead of starting immediately the compressor will start only after the time lag set on the electronic controller (see paragraph *"7.4 Description of settings and parameters"*).
When the unit starts the message "hdP" (see paragraph *"7.1.1 Display"*) will appear on the display to indicate a high dew point temperature; once the unit has reached steady-state operating conditions the display will show the message "dry". The icon  indicates compressor operation.
In the event of sudden power failure when the unit is running, the unit will resume operation automatically when the power is restored according to the procedure described above.

NOTE
The electronic controller can be programmed with the unit ON or OFF.

7.2.2 Unit shutdown

With the unit ON, press  for the unit to set to stand-by, indicated by the message OFF.

7.2.3 Condensate drain test

Press  to activate the condensate drain relay (if the condensate drain is set in timed mode). The relay is deactivated when the button is released.

7.2.4 Dual set point management

The controller has a dual set point:

- Summer
- Winter

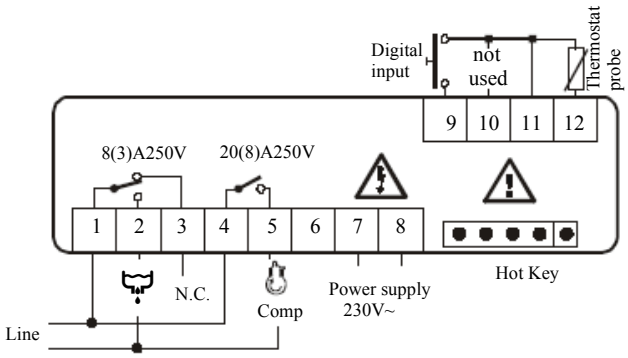
To select the set point to use, set the parameter "SSt" (For more information, see paragraph *"7.4 Description of settings and parameters"*).
Setting parameter "SSt" to d serves to enable switching from a digital input (see paragraph *"7.2.5.5 Dual set point from digital input"*).

7.2.5 Digital input

A digital input is present with different configurations settable via parameter "i IF".

The image below shows the electronic controller wiring diagram. Terminals 9 and 11 indicate the digital input.

The maximum control range is 20m with a Belden type shielded cable. If control from more than 20 metres is required, a support relay must be installed.



7.2.5.1 External alarm function (i IF=EAL)

After the timeout set in parameter "d Id" has elapsed after activation of the input, an alarm is generated , the message "EA" is displayed and the output status remains unchanged.

The alarm is reset automatically when the digital input is deactivated.

7.2.5.2 External shutdown alarm function (i IF=bAL)

After the timeout set in parameter"d Id" has elapsed after activation of the input, a shutdown alarm is generated , the message "CA" is displayed and the compressor output is deactivated.

The alarm is reset automatically when the digital input is deactivated.

7.2.5.3 Pressure switch trip function (i IF=PAL)

If the number of pressure switch trips as set in parameter "d Id" is reached within the time interval set in parameter "nPS" the alarm is activated. The message "CA" is displayed, the compressor is shut down and control is suspended. To resume normal operation, the device must be switched off and on again. When the input is active, the compressor remains switched off.

7.2.5.4 Remote On / off from digital input (i IF=OFn)

If the parameter is set as "OFn" the input is configured for remote on/off control of the device (see 7.2.5.6).

Contact	Function	i IP
Open	ON	CL
Closed	OFF	CL
Open	OFF	oP
Closed	ON	oP

Only if SSt is different from d.

7.2.5.5 Dual set point from digital input

If the parameter "SSt" is set to d none of the above functions can be selected for the digital input.

The input serves to set which of the two set points is to be used for temperature control (see 7.2.5.6).

Contact	Function	i IP
Open	Winter	CL
Closed	Summer	CL
Open	Summer	oP
Closed	Winter	oP

7.2.5.6 Digital input polarity

The polarity of the digital input depends on the parameter "i IP":

i IP=CL: active on contact closed;

i IP=oP: active on contact open.

7.2.6 Compressor operating hours alarm

The controller memorises the compressor operating hours.

It is also possible to set a threshold value for the operating hours in the relative parameter "AhF".

When the operating hours exceed the set threshold, an alarm message is displayed to notify the user of the need for prompt routine maintenance intervention (alarm "H-C"). The alarm message does not shut down the unit.

NOTE

On completion of routine maintenance, the operator must reset the compressor operating hour counter timers.

To reset the compressor operating hours alarm, press SET *; the device displays the message "rSt", and after 2 seconds the text "hF" starts flashing. This resets the alarm.*

7.3 Programming

7.3.1 Editing parameters PR1

To edit a parameter value:

A Press and hold buttons SET + ▼ to access programming mode (°C flashes).

B Select the required parameter.

C Press the SET button to display the value.

D Modify the value by means of ▼ or ▲ .

E Press SET to save the new value and go to the next parameter.

To quit the programming procedure display a parameter and then press SET + ▲ .

You can also quit the procedure by waiting for 15 seconds without pressing any buttons.

7.3.2 Keypad lock/unlock function

Press and hold buttons ▼ and ▲ for a few seconds until the message "POF" flashes on display.

The keypad is now locked: only display of the set point, maximum and minimum temperatures is possible.
If a button is pressed for more than 3s, the text "POF" is displayed.

Press and hold buttons ▼ and ▲ for a few seconds until the message "POn" flashes on display.

The keypad is now unlocked:

NOTE

The new value entered is saved to the memory also when you quit programming mode without pressing button SET .

7.4 Description of settings and parameters

Parameter	Level	Description	Range	Setting
SSt	Pr1	Selection of set point type: (E, I, d): selects whether the unit operates with the summer set-point (SSt=E), winter set-point (SSt= I) or whether the selection is to be made by the digital input (SSt=d).	E, I, d	I
odS	Pr1	Compressor output activation delay from start-up Compressor activation is inhibited for the preset time interval from the time of unit start-up.	0÷255 sec	10
AC	Pr1	Anti-hunting delay; identifies the minimum time interval between compressor shutdown and subsequent restart.	0÷50 min	2
Con	Pr1	Compressor running with faulty probe; time for which the compressor remains active in the presence of a probe fault. With "Con"=0 the compressor always remains stopped. Note: If "Con"=0 and "COF"=0 the compressor remains stopped.	0 ÷ 255 min	0
COF	Pr1	Compressor off with faulty probe; time for which the compressor remains stopped in the event of a probe fault. With "COF"=0 the compressor is always on.	0 ÷ 255 min	0
CF	Pr1	Temperature unit of measurement: °C = Celsius; °F = Fahrenheit.	°C ÷ °F	°F
tSC	Pr1	Condensate drain type: tP=timed; FI=fixed.	tP÷FI	tP (if timed condensate drain) FI (if capacitive condensate drain
tSO	Pr1	Condensate drain activation: S= always active; O= active only when machine is ON.	S÷O	S

Parameter	Level	Description	Range	Setting
tdS	Pr1	Condensate drain ON time, sets the condensate drain valve opening time.	0÷255 sec	2
tdA	Pr1	Condensate drain ON time with compressor running, sets the condensate drain valve opening time with compressor running.	0÷255 sec	4
tdO	Pr1	Condensate drain OFF time, sets the condensate drain valve closing time.	0÷255 sec	120
ALC	Pr1	Temperature alarm configuration Ab= absolute temperatures; rE = related to SET POINT.	Ab÷rE	Ab
ALd	Pr1	Temperature alarm delay; time interval between detection and display of a temperature alarm.	0÷255 sec	120
dAO	Pr1	Temperature alarm inhibition from start; the temperature alarm is inhibited from unit start-up for the time interval set in this parameter.	0÷255 min	15
hF	Pr1	Compressor operating hours: calculates the compressor operating hours. Read-only parameter. Each unit is equivalent to 10 hours.	0 ÷ 999	-
AhF	Pr1	Compressor maintenance alarm; compressor maintenance alarm set-point. Each unit is equivalent to 10 hours. "AhF" when set to 0 shuts off the alarm.	0 ÷ 999	0
i1P	Pr1	Digital input polarity: oP= the digital input is activated on opening of the contact; CL= the digital input is activated on closure of the contact.	oP ÷ CL	CL
i1F	Pr1	Digital input configuration: EAL= external alarm; bAL= external shutdown alarm; PAL= pressure switch; OFn= remote On/Off. Htr= disabled;	EAL, bAL, PAL, OFn, Htr	EAL
d1d	Pr1	Alarm delay from digital input: i1F=EAL or bAL: alarm signal delay from digital input : delay between detection and signalling of an external alarm i1F=PAL time for pressure switch function: if "nPS" starts in time interval "d1d" are reached, restarting is manual only and is performed by switching the unit off and then on.	0÷255 sec	5
nPS	Pr1	Number of starts for pressure switch function: At each activation of the digital input the control is blocked; if "nPS" activations are reached in time "d1d" restarting is manual only by powering off the unit and then powering it on again.	1÷15	15
PbC	Pr1	Probe type selection.	PtC ÷ ntc	ntc
rEL	Pr1	Software release (read-only).	-	-
Ptb	Pr1	Parameters table (read-only) serves to identify the factory set parameters map.	-	-

7.5 Alarms

7.5.1 Alarm display

When  flashes, the unit sets to alarm status and the display shows an alarm code, which can be:

Code	Meaning	Cause	Output
P1	Thermostat probe faulty	Probe -**BDPT** faulty or resistive value out of range	Compressor output according to parameters "Con" and "COF"
AdP	High temperature alarm	Dew Point Temperature above alarm set point	Not modified
LdP	Low temperature alarm	Dew Point Temperature below alarm set point	Compressor output OFF
EA	External alarm		Not modified
CA	External alarm (i1F=bAL)		Compressor output OFF
PA	External alarm (i1F=PAL)		Compressor output OFF
H-C	Compressor maintenance alarm	When the number of compressor operating hours exceeds the maintenance threshold value of parameter "hF" the maintenance request signal is activated	Not modified

CAUTION

Alarms are displayed exclusively with the unit ON.

NOTE

Probe alarm "P1" trips a few seconds after the probe develops a fault; this alarm is reset automatically few seconds after the probe resumes normal operation. Before replacing the probe, check the connections.
The "AdP" and "LdP" temperature alarms are reset automatically as soon as the thermostat temperature returns to normal values.
The external alarms EA and CA (i1F=bAL) are reset as soon as the digital input is deactivated.
If the digital input is configured as pressure switch (i1F=PAL) the alarm must be reset manually by switching the instrument off.

7.5.2 High and low temperature alarm memorization

When the icon illuminates, the unit is in alarm status:

Flashing=Alarm active;

Steady=Temperature alarm reset and memorised.

To check the type of alarm and its duration proceed as follows:

A Press either or .

B The display shows:
"HAL" for the high temperature alarm ("LAL" for low temperature alarm), followed by the "Duration" "tiM" in h.mm.

C The device then resumes the normal display presentation as set.

NOTE

The duration is to be construed as a partial value if the alarm is still in progress.

7.5.2.1 Deleting saved or currently active alarms

Proceed as follows:

A With the alarm shown on the display, press and hold SET .

B The message "rSt", will appear immediately and after 2 seconds it will start flashing to confirm that the values have been deleted.

C If pressed again, the display shows the text "noA" (no alarm present).

7.5.3 Serial line for monitoring systems

The TTL serial line, available via the HOT KEY connector, enables interface with a compatible **ModBUS-RTU** monitoring system.

CHAPTER 8

SAFETY PRESSURE SWITCH / CONDENSATE DRAIN

8.1 High pressure switch HP

The presence of the pressure switch depends on the model of the unit.
For information refer to the attached refrigerant diagram.

1. **High pressure switch (HP)**
   This switch monitors the compressor discharge pressure and prevents it from increasing to dangerous levels for correct operation of the compressor and personal safety.
   The pressure switch is of the ”manual reset” type.
   Tripping of the pressure switch disconnects the power supply to the compressor and electronic circuit board (see electrical diagram).

The pressure switch TRIP and RESET values are shown below; for further information refer to the refrigerant circuit and electrical diagrams at the end of this manual.

COMPONENT	REFRIGERANT	TRIP				RESET			
		barg	psig	°C	°F	barg	psig	°C	°F
High pressure switch HP	R134a	20.0	290	69.8	157.6	14.0	203	55.5	131.9

8.2 condensate drain

Each unit is equipped with a condensate drain which can be either of the timer-controlled or capacitive type.
The type of condensate drain system fitted on the unit will be agreed at the time of the offer.
The timed condensate drain system is controlled automatically by the electronic controller, on which the intervals between condensate drain cycles can be programmed (see Chapter 7 “iDRY Electronic Controller“).
The capacitive condensate drain is equipped with a condensate electronic level control system based on a capacitive sensor operating on two levels.
The discharger electronic board monitors the signal sent by the capacitive sensor continuously.
When the condensate level reaches the sensor lower limit, the solenoid valve is de-energized, thereby interrupting condensate drain.

8.2.1 Timed condensate drain

The condensate drain must be checked and serviced carefully to ensure that the condensate produced and separated is not entrained in the compressed air stream in the distribution network.

8.2.1.1 Filter cleaning

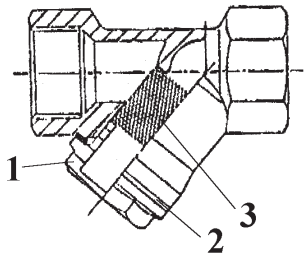
When a dryer is installed for the first time, it is common for particles of rust, pipe scale, metal filings, etc. to find their way into the separator and then into the condensate drain strainer protecting the discharge solenoid valve.
This component should therefore be removed and cleaned approximately one month after installation.
Thereafter the condensate drain strainer should be cleaned once every three months and in certain cases more frequently.

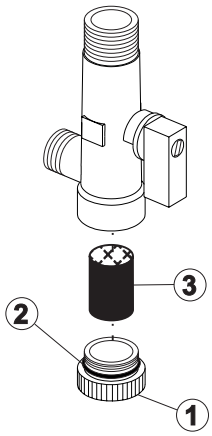
Depending on the type of unit either a standard mechanical filter or a condensate drain strainer with integral filter (see figures below) may be installed.

- Close the shut-off valve upline from the dryer to remove strainer mesh [3].
- If the timed condensate drain is equipped with condensate drain strainer, it is sufficient to simply close the valve.
- Press the manual condensate drain button  to check that the filter is not pressurised.
- Set the line switch to OFF in order to disconnect the power supply to the dryer
- Carefully unscrew filter cap [1] retaining seal [2] and remove strainer mesh [3].
- Once cleaned, refit the mesh making sure it is properly seated, and refit and tighten cap [1].
- Renew seal [2] if it is damaged.
- After re-opening the shut-off valve or the condensate drain strainer, power on the unit again and restart it.

Condensate drain strainer

Mechanical condensate filter





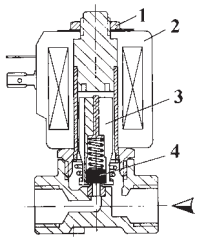
1. Plug
2. Seal
3. Metal mesh strainer

8.2.1.4 Solenoid valve maintenance

The solenoid valve must always be protected by an appropriate filter to prevent solid particles preventing it from opening and closing properly. However, if these particles manage to pass through the filter and cause the valve to malfunction, all its internal components must be cleaned. Proceed as follows:

- isolate and depressurise the dryer;
- open the line switch to disconnect the power supply to the dryer;
- undo the screw in the center of the cap for the valve power supply;
- lift and remove the cap;
- remove the solenoid valve from the pipe and clamp the body tightly in a vice;
- unscrew nut [1] securing solenoid valve [2] and withdraw the latter from tie-rod [3];
- unscrew the tie-rod from the valve seat; check the condition of O-ring [4], and of all other components and clean thoroughly;
- re-assemble the components by performing the above procedures in reverse sequence;
- make sure that the valve is re-installed with the arrow pointing in the right direction.

Condensate drain solenoid valve



1. Fixing nut
2. Solenoid
3. Tie-rod
4. O-ring

DANGER

Do not tighten nut [1] excessively as it could obstruct movement of the valve element and cause the valve to open and close incorrectly.

8.2.2 Capacitive condensate drain

The capacitive condensate drain unit is supplied packed in a carton located on the unit base and it must be installed.
The condensate drain is already wired and electrically connected to the unit's electrical panel, and is therefore ready to operate.
Before starting the unit, install the capacitive condensate drain following the indications given in the diagrams at the end of this manual.
Before installing the condensate drain remove the protective cap from the insulated condensate drain pipe, which protrudes from the underside of the dryer.
The pipe fittings of the condensate drain are supplied in a plastic bag secured to the condensate drain insulated pipe.
It is advisable to assemble the pipe fittings using a thread sealant and apply a thermal insulation material on the fittings once they are installed.
The indications concerning operation and maintenance of the capacitive condensate drain are given in the discharge unit instruction manual which is in the condensate drain carton pack.

CHAPTER 9

OPERATION AND MAINTENANCE

9.1 General operation

Do not switch the dryer off in the absence of a flow of compressed air.

The dryer will switch on and off automatically.

The number of starts/stops depend mainly on the flow rate and temperature of the compressed air and the ambient temperature.

As explained in Chapter 7 “iDRY Electronic Controller”, the control unit will switch the compressor off automatically in the absence of a flow of compressed air.

In this case the refrigerant compressor will run occasionally and for short periods to compensate for heat losses between the thermal mass and the external atmosphere.

In this way the dryer will be ready to dry the air when the flow is restored.

If so desired, the user can switch off the dryer overnight or during weekend breaks without any problem.

In this case remember, when the unit is required for duty again, to switch the dryer on at least 10-15 minutes before the air compressor.

9.2 Maintenance

CAUTION

Before installing or operating these dryers, ensure that all personnel involved have read and understood Chapter 2 “Safety” in this manual.

These dryers will give many years of trouble-free duty if they are properly maintained and serviced.

9.2.1 Access to the dryer

To access the electrical panel, remove the lateral screws fixing the top cover to the side panels of the cabinet.

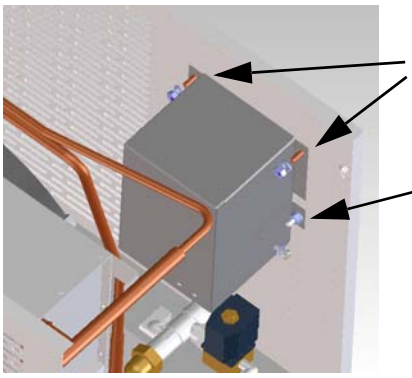
Once the top cover has been removed, access the electrical panel components by unscrewing the nuts fixing the protective cover to the front panel.

9.2.2 Special maintenance of electrical panel (Mod. from NRC0125÷0250)

In the case of any maintenance operation on the electrical panel, do not detach the earthing wire connected to the bracket, but proceed as follows:

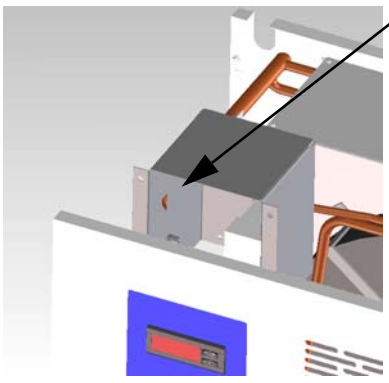
Remove the protection cover via the screws as shown in the figure.

Do not remove the screw connected between the bracket and front panel.



Remove the protection cover via the screws as shown in the figure.

Do not remove the screw connected between the bracket and front panel.



Remove the laminated terminal.

9.3 Planning of checks and maintenance operations

TASK	1 day	1 month	6 months	1 year
Check to ensure there are no alarm signals.	•			
Press the manual condensate drain button to check that the valve drains properly.	•			
If the dryer is equipped with a timed condensate drain, check for possible excessive production of condensate; in this case increase the valve opening time (ON). Check that the solenoid valve opens properly, in compliance with the times set on control unit.	•			
Check that compressed air inlet temperature is lower than the limit for which the dryer was selected (normally 35-40°C 95-104°F).		•		
When the compressor is running, check that its upper part is not too hot (more than approximately 50°C / 122°F). Check that the dryer's current draw is within the rated values.			•	
Remove, clean and refit the condensate drain filter. If the filter is always clogged with material, it may be necessary to dismantle and clean the solenoid valve.		•		
Make a visual inspection of the refrigerant circuit to make sure the piping has not deteriorated and there are no traces of oil, which may indicate a leak of refrigerant.			•	
Check the condition and soundness of piping connections.			•	
Check the condition and soundness of the electrical connections.			•	
Check that ambient air temperature is lower than the limit value used to select the dryer (normally 25-30°C / 77-86°F). Check that the area in which the dryer is installed is well-ventilated.		•		
Check that the fan switches on automatically and does not produce excessively high noise levels. Clean the condenser fins with a jet of clean compressed air. Make sure the grilles are free from dirt and any other obstructions.			•	
Clean the condenser fins with mild detergent.				•

CAUTION

The above maintenance schedule is based on average operating conditions.
In some cases it may be necessary to increase maintenance frequency.

CHAPTER 10

TROUBLESHOOTING