Nirvana Cycling
REFRIGERATED AIR DRYERS
10 to 125 SCFM, Models D17EC – D212EC

Point of Manufacture – West Chester, PA, USA

Industrial Technologies
Davidson, NC 28036

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Cancels: All Previous

NIRVANA CYCLING PRODUCT SPECIFICATION

SCOPE

This specification describes a complete mechanical refrigerated drying system for the removal of moisture, oil aerosols and other contaminants from a compressed air stream. This is accomplished by cooling the air to a temperature at which the contaminants condense and are separated from the stream. The dryer shall be complete and shall only require connection to utilities furnished by others.

OPERATING CONDITIONS & PERFORMANCE DATA

The dryer shall be rated for the following conditions:

Inlet Air Flow:	XXX SCFM
Inlet Air Pressure:	100 psig
Inlet Air Temperature:	100 °F
Ambient Temperature:	100 °F

The maximum design pressure shall be 200 psig.

INTERNAL AND EXTERNAL AIR SIDE CONNECTIONS

All airside connections are made with ¾" to 1 ½" NPT for 60Hz designs. The aluminum heat exchanger connections are integrated into the exchanger.

ELECTRICAL CONNECTIONS

115V/1/60Hz dryers are supplied with a three wire, grounded 115V cord assembly as standard. The dryer must be powered by a dedicated circuit.

COMPONENTS AND CONSTRUCTION

Each dryer system shall be complete with the following items:

1. Integral heater exchanger that incorporates a Pre-cooler / Re-heater exchanger, three layer heat exchanger section, condensate removal section, and internal flow path section.
2. Thermal mass cooling and circulation system
3. Refrigeration system equipped with hermetically sealed compressor and air cooled condensing system
4. Electric solenoid drain with clean out port
5. Full featured electronic controller with LED display and digital temperature sensors.
6. Full cabinet enclosure to protect internal components.

EXCHANGER TECHNOLOGY

The dryers shall be provided with a multi-function compact heat exchanger that is comprised of a pre-cooler / reheater, three layer chiller section, condensate discharge section, and internal flow path in a single device.

The heat exchanger sections are comprised of a stacked array of extruded aluminum plates that contain a plurality of uniform internal passages for optimal heat transfer. The plates are fully brazed to ensure that the fluid flow paths are properly segregated.

The precooler / reheater and heat exchanger sections are brazed to aluminum end-plates which unify the assembly and create the internal flow path for the entire exchanger.

PRECOOLER / REHEATER SECTION

The air-to-air heat exchanger shall simultaneously precool the incoming hot & saturated compressed air stream and reheat the outgoing compressed air utilizing the cool air leaving the three layer heater exchanger section. The pre-cooler / re-heater reduces the refrigeration compressor capacity required for drying the compressed airstream.

THREE LAYER CHILLER SECTION

The three layer heat exchanger is comprised of three isolated fluid circuits; i.e. compressed air, refrigerant, and thermal mass fluid.

THREE LAYER CHILLER SECTION (CONTINUED)

The cooled compressed air leaving the pre-cooler / re-heater section enters the three layer chiller section via an internal flow path within the exchanger.

Further cooling & drying is achieved as the air stream contacts the cold surface area generated by circulating cold refrigerant gas when the compressor is operational. The refrigerant gas will also simultaneously cool the thermal mass fluid through a heat transfer process.

The dehumidified airstream is then directed to the inlet of the pre-cooler / re-heater section after this process. The condensate produced by mechanical cooling will separate through gravity and collect at the bottom of the sump.

The thermal mass fluid circulates constantly when the dryer is activated for operation. When the refrigeration system is automatically turned off during reduced compressor load conditions, the compressed air continues to be cooled by exchanging cold energy that is stored in the thermal mass fluid. When the temperature of the thermal mass fluid rises above the design set-point condition, the controller will activate the compressor and condenser fan to resume the cooling process.

CONDENSATE REMOVAL

Condensate that is removed from the air stream by mechanical cooling is designed to collect at the bottom of the internal sump. The condensate is discharged from the sump through a solenoid drain that is operated by the main unit controller.

THERMAL MASS COOLING SYSTEM

The thermal mass cooling system shall consist of a thermal mass reservoir, thermal mass fluid, circulator pump, and interconnecting tubing to the three layer heat exchanger section.

Thermal mass fluid shall be transferred to the air chiller via the thermal mass fluid pump. Pump shall be maintenance-free, cartridge circulator pump. Pump shall run continuously to maintain flow through the air chiller at all times when the controller is activated for operation.

The thermal mass shall thus allow the refrigerant compressor to cycle on and off automatically depending on the heat load to the dryer. The reservoir and inter-connecting piping system shall be fully insulated.

REFRIGERATION SYSTEM

The refrigeration system shall be designed to dry a set amount of compressed air. The refrigeration system shall consist of one hermetic reciprocating type compressor, refrigerant feed system and air cooled condensing system. No hot gas by-pass valve or similar capacity modulating device shall be used in the refrigeration system.

Refrigerant R-134A shall be used to minimize environmental hazard. The amount of refrigerant shall be minimized through use of a measured charge system. The refrigeration system shall consist of one fully-hermetic reciprocating compressor, thermal mass circulation system, air-cooled condenser and refrigerant evaporator.

COMPRESSOR

A hermetically sealed reciprocating compressor is utilized throughout the Ingersoll Rand Nirvana Cycling design range. All compressors have internal motor overload protection for single phase units. The compressor is installed on isolation mounts to reduce noise and vibration.

PIPING

To ensure proper oil return to the compressor, all velocities through refrigeration piping meet or exceed the required specification.

All suction-side refrigeration piping is covered with insulation to prevent condensation formation.

THERMAL MASS CIRCULATING SYSTEM

Thermal mass fluid is transferred to the air heat exchanger via the thermal mass fluid pump. Pump shall be maintenance-free, cartridge circulator pump. Pump shall run continuously to maintain flow through the air chiller at all times.

TIMED SOLENOID DRAIN

Condensate drain valve automatically discharges based on the timing setting of the controller. The time setting should be set based on ambient conditions.

An electronic no-air loss drain can be provided as an option. The drain shall be shipped loose and shall be powered separately from the dryer.

CONTROL SYSTEM

The dryer shall be provided with an electronic controller that automatically operates the refrigeration system and the timed operation of the condensate drain valve. The controller shall utilize a temperature sensor to continuously monitor the temperature of the thermal mass fluid and activate the refrigeration system as required to maintain the temperature set-point.

The controller shall also continuously monitor the compressor discharge temperature via a surface mounted temperature sensor that is mounted to the refrigerant discharge line. The controller will automatically disable the compressor if the measured temperature value exceeds the high limit temperature set-point.

The controller shall be provided with a display that provides operational status and functional alarms and incorporate function keys that permit the user to activate & de-activate the dryer for operation, adjust drain timing settings, activate the solenoid drain valve, and check energy savings values.

The controller shall be a UL listed component.

ENCLOSURE AND BASEPLATE

The cabinet forms a NEMA 1 / IP 21 rated enclosure.

The sheet metal enclosure is formed using 18 gauge steel that is coated with an electro-statically applied powder coated paint that incorporates a textured finish. The base is galvanized steel

The removable access panels are IR beige and the fixed outer panel is IR black.

Paint specification:
Flexibility: ASTM D522
Adhesion: ASTM D3369 Method B
Hardness: 2H pencil hardness test to ASTM D3363
Impact Resistance: ASTM D2794
Salt spray and humidity resistance: ASTM B117, ASTM D2247
Surface Prep: SSPC-SP8
Dry Film Thickness (DFT): 2.0 - 3.0 MILS (typical)

TESTING

Final package and functional testing is performed on all dryers:

- 100% electrical functionality test
- 100% tracer gas leak test of the refrigeration side
- 100% refrigeration leak test at designed system pressure and vacuum rate of rise leak test.
- 100% Airside pressure leak test at 125Psig /8.6 barg
- Heat exchanger assemblies are factory tested for leakage.

CONFORMANCE COMPLIANCE (60Hz)

The following codes shall apply:

- Performance Testing: ISO Guidelines, CAGI ADF-100
- Electrical: NEMA 1 design is ETL Listed to UL1995 and CAN/CSA C22.2 STD 236.
- US/Canada/Mexico Free Trade: General Rule 2, Article 301-NAFTA
- ISO 8573.1 Class 4-5

WARRANTY

Standard Ingersoll Rand warranty is provided for 60 Hz Nirvana Cycling Dryer designs.