

NIRVANA TAS

CCN: 23754203
Rev: D
Ref: 9903
Sheet: 930
Date: 04th June 2012
Cancels: 01st January 2011
ECN: 80805

Point of Manufacture –
IRN20H-TAS, IRN25H-TAS, IRN30H-TAS, IRN40H-TAS (Campbellsville, US)
IRN15K-TAS, IRN18K-TAS, IRN22K-TAS, IRN30K-TAS (Unicov, Czech Rep)

PACKAGE

The NIRVANA “*Total-Air-System*” (TAS) is a unique compressor package, comprising a fully integrated rotary screw compressor with a high efficiency, cycling, air dryer, general purpose and high efficiency air filters. This is all mounted on to a horizontal air storage receiver. The TAS package occupies less space, costs less to install, and delivers high quality compressed air to maximise operating efficiency and reduce costs. The TAS control system delivers the most efficient control available.

All NIRVANA TAS units come complete with the following equipment -

INLET AIR FILTER

Inlet air filtration for NIRVANA is accomplished through the use of a dry-type air cleaner which is 99.9% efficient at 3 microns and above.

AIREND

Since the airend is the fundamental component in a rotary screw compressor package, reliability, performance and efficiency are determined by selection of the most effective design, maintenance of close manufacturing tolerances, and precise assembly of the airend itself. NIRVANA units apply proven airends achieving high levels of efficiency and durability.

A high efficiency asymmetrical profile is developed through a unique two-step machining process. The first stage develops the basic wrap angle profile and is a rough-cut. The final stage is a finish grinding process, which

ensures a hard, true rotor surface. The rotor shafts are precision ground to tolerances within 12 microns (0.0005 of an inch). The rotor housings are made of high quality, close grain cast Iron.

Bearing configuration used on all NIRVANA models is the tapered roller thrust bearing and parallel roller journal bearing. These roller bearings are able to handle all loads, radial, thrust or a combination of both. With this bearing configuration, the discharge end of the male and female rotors are each equipped with a pair of tapered roller bearings offset at opposing axis for maximum positional stability and absorption of thrust and radial loads. The thrust bearing housing is made of a close grain cast iron. Cylindrical roller bearings are used to carry the radial loads on the inlet end of the rotors. All bearings whether thrust or radial, are premium specification, which provide truer, harder running surfaces for both inner and outer bearing races. A triple lip shaft seal configuration is fitted on the main input shaft.

Coolant dams are machined at the bearing locations. This provides an area for coolant to accumulate when the compressor is off. Upon start-up the bearings, which are resting in coolant retained by the coolant dam, is immediately lubricated, thus assuring long life.

COOLANT / AIR SEPARATION

The highly efficient separation system, combined with suitably sized sump volumes, provides for normal coolant top-up intervals of 500 hours. A pressure relief valve

mounted on the housing protects the package. The coolant filler is designed so prevent overfilling the compressor. A visual coolant level indicator is located on the side of the module. A drain is provided at the bottom of the sump.

Following compression, the air is heavily laden with coolant. The method applied to remove the fluid from the air stream is a three-stage separation system. In the first stage, air and coolant mixture from the airend discharge enters the separation void which directs the mixture flow swirling into the separation area. This action forces heavier coolant particles to the periphery of the sump. These particles readily combine with the main liquid body in the sump. The airflow then passes through the coalescing separator cartridge, which combines the second and third stage of separation.

The two-stage separator cartridge is steel reinforced. Coolant which collects at the bottom of the cartridge is drawn back to the airend inlet through a scavenge system. After separation, the compressed air passes to the aftercooler where any vapour carryover will be further removed as it is condensed and drained together with condensing water vapour. The carryover after the aftercooler is less than 3 mg/m³. Due to the conservative sizing of the air passages and the separator cartridge, there is a very low, pressure loss. This reduces to a minimum, the power required to move the air through the system.

A combination, minimum pressure and check, valve regulates the air

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discharge from the separator. This ensures that if the unit discharges into a low-pressure air system, sufficient internal pressure is maintained to propel the coolant through the system. NIRVANA compressors are supplied with a factory fill of Ingersoll Rand Premium Compressor Coolant that provides extended operating life.

INTELLIDRIVE

The IntelliDrive is the power unit component of the NIRVANA compressor. IntelliDrive incorporates a variable frequency drive controlling the speed to deliver the right amount of air to the system. NIRVANA **Total Air System** reacts to system demand, decreasing or increasing speed, to deliver appropriate volume to meet demand and maintain system target pressure.

The NIRVANA Total Air System is unique in the way that the air system pressure is sensed downstream of the air dryer and filters. This enables the machine to save energy and cost by operating the compressor air end at the lowest pressure available, consistent with the system requirement.

On sensing a low demand, below the speed control range, the machine will stop immediately and restart when required.

When applying variable speed control, IntelliDrive, operating at part load, and without the need to raise operating pressure, avoids load cycling and maintains a steady state of operation. This reduces both energy and maintenance costs.

NIRVANA provides the operator a choice of selecting Variable speed, or Auto Start/Stop control.

A simple to set pressure trim adjustment allows NIRVANA to operate at an adjustable target pressure rating between 4.5 barg (65 psig) to 10 barg (150 psig).

NIRVANA TAS can be set to operate effectively at different power limits. And can be arranged to operate to nominal output duties of 15kW (20 hp) to 18kW (25hp) and 22kW (30hp) to 30kW (40hp). This means that NIRVANA can be selected for a given duty and allow for future changes which may be required via the IntelliKey.

The IntelliDrive allows flexibility with its capability to operate over a range of input voltages. The IntelliDrive is designed to be tolerant towards occasional voltage imbalances.

The soft start of the IntelliDrive gives a low inrush current, that can allow frequent stop and re-start cycles (up to 20 times/hr) without the risk of overheating the motor or overloading the power supply, thereby extending mechanical life.

INTELLIKEY

The simple installation of 15kW (20 hp) to 18kW (25hp) and 22kW (30hp) to 30kW (40hp), rated power and capacity settings is achieved via the IntelliKey. There are no mechanical components to upgrade and the new requirements are reliably programmed into the NIRVANA IntelliDrive from the IntelliKey. This provides increased duty flexibility and reduces the risk of getting it wrong on pressure or

the need to oversize, when allowing for future growth.

MAIN DRIVE MOTOR-GENERAL

The variable speed main drive motor is matched to the torque, speed and load requirements of NIRVANA at varying duties to specific operating criteria that ensure that the NIRVANA motor and drive is highly efficient.

In addition to controlling the motor speed in order to load the compressor and meet the duty, the drive electronics also deliver outstanding protection from the abnormal operating conditions such as:

- Over temperature of motor or drive
- Under or over voltage conditions
- Over speed
- Phase failure or Reversal
- Excessive voltage imbalance
- Short circuit of main or control power.

MOTOR FRAME

Totally enclosed motors are supplied as standard for the full NIRVANA range.

ELECTRICAL DESIGN

Speed, torque and operating characteristics have been designed to match the load of the compressor. Motor efficiency and power factor have been optimised to cover the entire capacity range of NIRVANA compressors. Standard motors are low voltage range at 208-230v and high voltage range at 380-480v, both ranges at 3 phase and 50 or 60Hz.

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MOTOR BEARINGS

There are no drive end bearings, due to the motor rotor being carried on the compressor shaft. The non-drive end bearing provides stability and is permanently lubricated requiring no regular maintenance

MOTOR INSULATION

The selected motor has a minimum of class F insulation as standard, and is specified to operate in ambient conditions up to 40°C (104°F). In addition the motor is specified such that when operating at maximum compressor load, the winding temperature rise is limited to 15°C (27°F) below that permitted by the design code.

ENLCOSURE

The enclosure is powder coated steel with acoustic foam to keep sound levels to a minimum and is separated into three distinct divisions that include the blower/cooler, the IntelliDrive and the airend/separation module. This gives a managed environment for each enclosure. The airend section is designed to reduce noise levels to a minimum and reduce surface cooling. The blower/cooling section is designed to segregate and deal with the heat rejection of the NIRVANA. The IntelliDrive section contains the package pre-filtration.

The easily removed end enclosure gives single point easy access for service and maintenance.

It gives access to the following -

- Check and top up coolant
- Coolant filter change
- Air filter change
- Separator cartridge change
- MPV change

- Inlet valve service
- Coolant sampling

CONTROL PANEL - GENERAL

The control panel incorporates a an User Interface for the IntelliDrive - which has Start / Stop Keys, Display Keys, Navigation Keys, Information Key, LED status indicators and LCD display screen. The LCD display screen shows the status of the machine, percentage savings, maintenance intervals, warnings and alarms, Setup and Service Screens. The control Panel also includes an emergency stop and dew point indicator.

USER INTERFACE

Advanced UI has highly visual LCD screen and includes the following -

- Hour meter
- Maintenance indicator
- Package discharge pressure indicator - choice of PSI, Bar or kPa.
- Real time clock
- Load and Pressure curves
- Fault indication
- Percentage cost savings
- Service due warning
- Service overdue
- Alarms and Warnings
- Setup and Service Screens

COOLING SYSTEM

Coolant Filtration

The full capacity coolant filter is a high capacity 5-micron, replaceable spin-on element with pressure bypass.

Coolant / Lubricant Temperature Control

A thermostatic control valve is mounted downstream of the oil cooler. The temperature sensitive

element controls the flow of coolant through the oil cooler. This provides the proper injection temperature and assures fast warm-up.

Coolant Injection

The coolant is injected through ports near the airend inlet and directed back toward the inlet cover. This ensures the best possible pre-sealing of the rotors, and an optimum mix of coolant with air. The differential pressure between the separator and the airend inlet induces coolant flow.

COOLERS

NIRVANA compressors come with an integrally mounted air-cooled air / coolant combination cooler of tube and fin design. Constructed from aluminium, it is designed to operate in ambient temperatures from 2°C (35°F) up to 40°C (104°F). The after cooler cools the compressed air prior to discharge from the package.

A centrifugal cooling fan is mounted in an internal segregated cooling compartment. Cooling air is forced across the cooler with even velocity over the full surface area of the cooler matrix and discharges vertically to avoid recirculation and thus simplifies ducting.

The cooler assembly is accessed through the side panel, providing access to the cooler, for quick and effective cleaning.

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PACKAGE PRE-FILTER

The cooling airflow is pre-filtered through a cleanable filter panel, which protects the cooler matrix from heavy dirt ingress and reduces maintenance requirement.

COOLANT

Ingersoll Rand Premium Compressor Coolant is a PAG advanced synthetic lubricant, providing better cooling characteristics and a longer life than other synthetic lubricants. Condensate containing traces of the fluid should be treated to meet local environmental requirements before disposal in approved manner. Ingersoll Rand Premium Compressor Coolant has simple gravitational water separation characteristics.

TEMPERATURE PROTECTION

Should the compressed air temperature exceed 109°C (228°F) at the airdend discharge, the controller will shut down the compressor, and illuminate the fault indicator.

COMPRESSED AIR FILTRATION

Two stages of high grade filtration are standard within the *Total Air System*. Filtration is effective to 0.01 micron for particles and coolant removal to 0.01 mg/m³ (1 ppm) at 21°C (70°F)

This grade of filtration is selected to most effectively reduce total system operating costs, and in combination with the dryer extend effective life of production equipment, which is powered from the compressed air system.

CYCLING REFRIGERATED AIR DRYER

Totally integrated within the package and using the same cooling air flow. The air dryer which cycles on and off with the compressor, uses a unique stainless steel plate heat exchanger, environmentally sound R-134a refrigeration cycle and a high efficiency "micro channel" condenser. Water is removed from the airflow directly after the evaporator by a high efficiency, external cyclone separator. A bypass system is provided for the dryer and filters. **CONDENSATE** is discharged by solenoid drain from a manifold which is connected to the drain from each compressed air filter and the dryer, and discharges through a common condensate discharge point

BASEPLATE

A one-piece folded mild steel base, with steel strengthening supports. It is protected from corrosion with a high grade of powder coated black finish. The baseplate supports all the components in the package.

PIPING

The compressor utilises flexible SAE hoses with JIC fittings, rigid steel piping or copper tubing, flexible connectors and nylon tubing as appropriate to provide vibration free operation. Each compressor system after manufacturing and assembly is 100% inspected and tested to provide a piping system with minimum potential for leaks.

RECEIVER MOUNTED

When supplied, the receiver provides dry compressed air storage and is an integral part of the capacity control system.

The CSA approved unit specified for North American compliance is supplied mounted on standard ASME 8 DIV 1 horizontal air receiver, designed for 200 psi maximum working pressure. Receivers are available in 120 GAL and 240 GAL capacities.

The CE marked unit specified for European Union compliance is supplied mounted on standard EN87/404 horizontal air receiver, designed for 12-bar maximum working pressure. Receivers are available in 500 litre and 750 litre capacities.

The receiver is supplied with mounting feet and lifting bars, running the length of the receiver, to allow for easy manoeuvrability.