Ingersoll Rand

SSR®
UP Series

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Rev: C
Ref: 9920
Sheet: 110
Date: 29th June 2015
Cancels: 11th February 2015
ECN: 82626

Point of Manufacture – Campbellsville, KY, USA; Unicov, Czech Republic
SSR® UP6S-15, 20, 25, & 30; UP5S-11, 15, 18, & 22
DETAIL DESCRIPTION

INLET AIR FILTER
Inlet air filtration for the SSR is accomplished through the use of a dry-type air cleaner, which is 99.9% efficient at 3 microns and above. A pressure differential indicator is included.

AIREND
Since the airend is the fundamental component in a rotary screw compressor package, reliability, performance and efficiency are determined for the most part by selection of the most effective design, manufacturing tolerances, and assembly of the airend itself.
SSR-UP Series units apply large low speed airends achieving maximum efficiency and durability.

A high efficiency asymmetrical profile is developed through a unique two-step machining process. The first step in the process develops the basic wrap angle profile and is a rough-cut. The second and final step 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 precision rotor housings are made of high quality, close grain cast iron.

Bearing configuration used on all SSR models is the tapered roller thrust 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 absorption of thrust and radial loads. The thrust bearing housing is made of a close grain cast iron.

High quality 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, vacuum degassed bearings, which provide truer, harder running surfaces for both inner and outer bearing races.

Coolant dams are machined at the duplex tapered roller bearing locations. The coolant dam provides an area for coolant to collect or accumulate when the compressor is shut off. Upon start-up the tapered roller bearing, which is resting in coolant retained by the coolant dam begins to rotate and is immediately lubricated, assuring long life. (Alternative airends, without coolant dams, have bearing systems that operate dry for approximately six seconds at each start, unless provided with a pre-lubrication system)

SHAFT SEAL
A triple lip shaft seal is fitted to the male rotor which includes a scavenge system, which returns all coolant to the inlet ensuring a leak free airend.

MAIN DRIVE MOTOR-GENERAL
The low speed four pole, main drive motor is matched to the requirements of the SSR. Torque and load requirements of the compressor are matched to specific design criteria that enable the SSR motor to develop peak efficiency and power factor at full load.

Double shaft construction with the cooling blower mounted on main shaft provides assured cooling.

MOTOR FRAME
NEMA frame, 4 pole, TEFC IP55 motors are standard for UP6S 15, 20, 25 & 30 hp and UP5S 11, 15, 18 & 22 kW applications.

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 the SSR UP6S 15, 20, 25 & 30 hp and UP5S 11, 15, 18 & 22 kW. For 60 Hz markets, standard motors are tri-voltage 208-230/460volt, 3 Phase. 380 & 575 volt motors are available as options. For 50 Hz markets, standard motors are 400 volt, 3 Phase. 220 & 550 volt motors are available as options.

MOTOR BEARINGS
Vacuum degassed ball bearings for the drive end and non-drive end provide dependable and reliable service. Bearings of TEFC motors are permanently lubricated.

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

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DETAIL DESCRIPTION

BELT DRIVE

The power transmission from the drive motor to the airend male rotor is by long life belt with maintenance free, non-overloading, automatic belt tension control. This patented tensioning system utilises compressor module weight and gas spring force, and facilitates adjustment free, constant belt tensioning eliminating bearing overload and enabling easy belt replacement.

The unique drive system protects the motor and airend bearings from over-tensioning, as well as protecting against slippage caused by under- tensioning. This assures performance integrity whilst enabling longer motor and airend bearing life as well as belt life of both motor and airend. The complete drive system is contained within a protective enclosure.

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 upstream 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 tank and the airend inlet induces coolant flow.

COOLANT / AIR SEPARATION

After compression and discharge from the airend, the air is heavily laden with coolant. A separator is used to remove the fluid from the air stream and does so with a three stage separation system. In the first stage, air and coolant mixture from the airend discharge directly enters the separator tank through a nozzle, which directs the mixture flow to the end of the vessel. This action forces heavier coolant particles to the periphery of the tank. These particles combine with the main liquid body in the sump. The airflow then passes through the separator cartridge coalescing element, which combines the second and third stage of separation. The separator cartridge is two-stage with reinforced construction. Coolant, which has collected at bottom of the separator cartridge is drawn back to the airend inlet through a scavenge system.

The compressed air then passes to the air-cooled aftercooler where coolant vapour carryover will be further removed as it is condensed and drained together with water condensate. On the SSR UP series compressors, the carryover after the aftercooler is less than 3PPM (3 mg/m^3.)

Due to the conservative sizing of the air passages and the separator cartridge, there is a minimal pressure drop. This reduces to a minimum, power required to move the air through the compressor system.

The separator tank is mounted horizontally and is close coupled to the air end forming one module. A pressure relief valve mounted on the tank protects the separator vessel. There is a drain at the bottom of the tank and a coolant filler point, which is located so that it is not possible to overfill the compressor. There is also a coolant level indicator on the side of the tank. The highly efficient separation system, combined with suitably sized sump volumes, provides for normal coolant top-up intervals of 500 hours.

A combined minimum pressure / check valve regulates the air discharge from the separator. This ensures that when the unit is unloaded sufficient pressure is maintained in the tank to propel the coolant through the system. SSR UP series compressors are supplied with an inclusive factory fill of Ingersoll Rand Premium Compressor Coolant that provides extended operating life.

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

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DETAIL DESCRIPTION

COOLERS
SSR UP Series compressors come with an integrally mounted air-cooled heat exchanger that cools both the coolant and compressed air and is of tube and fin design. Constructed from aluminium, it is designed to operate in ambient temperatures from 35°F (2°C) up to 104°F (40°C) The after cooler cools the compressed air to 18°F (10°C) above ambient air temperature at 104°F (40°C) and 60% RH. Centrifugal cooling fan is mounted in an internal segregated cooling compartment. A partial vacuum is formed within a plenum, which then draws cooling air across the cooler with even velocity over the full surface area of the cooler matrix.

The cooler assembly is accessed through single simple opening, providing access to both sides of the cooler, for quick and effective cleaning.

The cooling airflow is pre-filtered through an easy to clean filter panel, which protects the cooler matrix from heavy dirt ingress and reducing maintenance requirement.

PIPING
The compressor utilises flexible SAE hoses with JIC fittings, rigid steel piping, Bundy weld tubing, flexible connectors and nylon tubing as appropriate to provide vibration free operation. SAE "O" Ring fittings are applied on all connections larger than 3/8" diameter. Coolant circuit utilises PTFE hoses and ORFS fittings. Each compressor system, after manufacturing and assembly, will be 100% inspected and tested to provide a piping system with minimum potential for leaks, which is easy for maintenance.

CONTROL PANEL – Xe-70M
The compressor is monitored, controlled and protected by an intuitive Xe Series controller. The controller continuously monitors the status of the compressor and takes immediate action if an abnormal operating condition occurs. The controller also has several features which make operating the compressor easier and more efficient. The controller is mounted on the front of the compressor, directly above the starter for good visibility when either floor or receiver mounted.

All the Xe Series controllers provide bright & intuitive screens, with a simple tab/page layout, which makes it easy to get to the information you are looking for.

COMPRESSOR/CAPACITY CONTROLS
As standard, SSR UP Series units are provided with online/offline control with auto start and stop. Online/ offline allows the compressor to operate at 2 points on the capacity curve. The first is 100% full-flow. The second is no-flow. The online/offline control is a power saving mode of operation. The unloaded operation provides for immediate compressor internal system blow-down to minimise power requirements. The compressor will automatically reload to 100% capacity when the system falls to the online pressure setting. SSR UP Series units are fitted with automatic stop/start with run on timer as standard. This allows the compressor to run unloaded for a predetermined time. All compressors are factory set to a minimum of 10 minutes. This can be adjusted to a maximum of 32 minutes. If there is no demand within that period the unit shuts down to standby and will automatically restart & reload if the system pressure falls to the online pressure setting.

STARTER
The compressor has an integrally mounted, NEMA 4 enclosure with wye-delta starter and control transformer to 120V/24V 60 Hz or 110V/24V 50 Hz control voltage. Motor overload protection is designed and sized to match the specific characteristics of the motor.

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

BASEPLATE
A one piece folded mild steel, base-plate protected from corrosion with a high grade of powder coated paint finish, supports all of the components within the package The base-plate is provided with fork truck slots to enable easy handling from front or end of the package

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ENCLOSURE

The package enclosure is carefully designed to provide effective sound emission control and suppression, whilst retaining easy access for maintenance and eventual refurbishment.
The front door is hinged to the side and also lifts off if required to provide easy access to all routine maintenance points. This door provides easy access to carry out the following maintenance procedures

- Check and top up coolant
- Check intake filter condition
- Change intake filter
- Change coolant filter
- Change separator cartridge
- Service Intake valve
- Service load solenoid valve
- Service blow down solenoid valve
- Drain & refill coolant
- Set and adjust load and unload operating pressures

Starter

The starter is accessed through a single front mounted door, which provides access to all starter components.

Drive System

The drive system is accessed by removal of the end panel.

Cooler cleaning

Cooler cleaning operations are simplified by removing a top panel, which provides easy access to the inside face of the cooler.

Inlet Duct and or discharge duct can easily be connected to the machine to single point connections.
Back pressure provision available for cooling airflow is ½" (12.5 mm) water gauge

HIGH AMBIENT PACKAGE (Optional)

Rated for operation in ambient conditions up to 122°F (50°C) and as low as 35°F (2°C) The High Ambient units are available in power sizes of 15, 20 & 25 hp (11, 15 & 22 kW) with capacities from 45 through 102 CFM and pressures 125, 145 and 200 PSIG (1.27 through 2.89 m^3min at 7, 8,10 & 14 bar)

FROST PROTECTION (Optional)

Is designed for field installation and intended to protect the machine from the effects of ambient temperatures down to 14ºF (-10ºC)
(see separate specification sheet)

POWER OUT RESTART (Optional)

Is designed for field installation and intended to safely return the compressor to the original operating condition, following the restoration of an interrupted power supply.
(See separate specification sheet)

MODULATION CONTROL (Optional)

A retrofit option, which enables the machine to reduce capacity in response to a rising pressure by throttle effect. This control is particularly suited to control excessive cycling resulting from insufficient system storage.
(See separate specification sheet)

OUTDOOR ENCLOSURE (Optional)

Intended to further protect the NEMA 4, compressor package from rainwater ingress through either the cooling air intake or discharge.
(See separate specification sheet)