R-Series 55-75 kW (75 – 100 hp)

QUESTION INDEX (BY SUBJECT)

CRN's

38. Do I need a CRN for an air compressor?
39. Where Do I go to find information on components that are CRN approved?
40. Does an Ingersoll Rand competitor have CRN on compressor packages?
41. What should I do if an inspector audits compressor installation for CRN approval?

CSA Vs. CUL

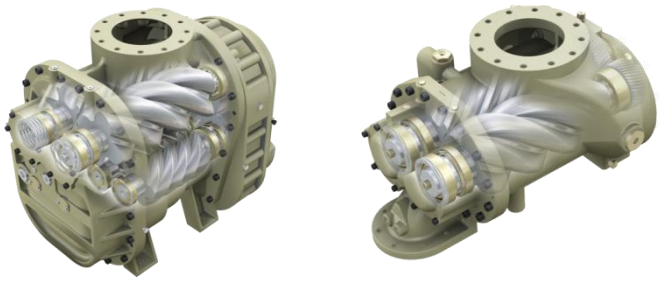
42. What is the difference between CSA and CUL?
43. Do I need a CSA for an air compressor?
44. Does Electrical panel require CSA or CUL?
45. Is R-Series CSA ready?
46. In case a field install approval is required by CSA, can it be done?

QUESTIONS AND ANSWERS

Airends and Motors

1. Does R-Series have a new airend?

Yes, the 55-75 kW range of R-Series product has an enhanced version of our 178.5mm airend. Exterior flow paths have been integrated into the castings, reducing leak paths. However, the changes did not alter the overall design of the industry's most reliable airend.



2. Are the fixed speed motors ODP or TEFC?

All R-Series fixed speed machines come with a TEFC motor standard and are designed to run in harsh environments.

3. How are these TEFC motors different?

The new R-Series motors are IE3 (NEMA Premium) rated, and the most efficient motors we offer. IE3 rated motors are standard on all R-Series fixed speed machines at no additional cost.

4. What is the difference between EFF1 and IE3 class motors (ESA only)?

IE regulations are roughly equivalent to EFF except that they require a newer more accurate test method for efficiency. The IE3 is a greater efficiency level than the EFF1 by at least one efficiency level.

5. Is the Nirvana VSD airend or motor different?

The 55-75 kW Nirvana VSD product utilizes our enhanced 178.5mm VSD airend but is similar in functionality to today's reliable airend. The HPM motor continues to be an industry leader and is still the standard motor on all R-Series VSD compressors.

6. What is the difference between the old Nirvana VSD motor and the new R-Series Nirvana VSD motor?

The new motor utilizes a different winding configuration which eliminates the skip speed on the previous model to protect it from excitation frequencies. The R-series Nirvana also has better cooling achieved by lowering the nominal winding voltage (the motor was tested for continual operation between 380-480 volts) and improved exhaust.

7. What has been done to rectify the current issues that we are running into with the Current Nirvana offering in order to make them more reliable?

- The Nirvana motor has been redesigned to eliminate skip speed requirements which eliminates any unnecessary vibrations in the drive train. There are new cooling ducts on the HPM motor to improve cooling airflow. The implementation of Sequential cooling also aides in the cooling air flow to the motor as well.
- The new hot side thermal valve design is much more robust and reliable than previous thermal mixing valves.
- A new design drive has integrated cooling fans to add significantly more cooling airflow to the drive heat sinks which adds reliability to the sensitive electrical components. Relocation of the PDM filter to inside the compressor package as well as the change to a high efficiency pleated filter adds reliability by keeping high cooling air flow in the event of a plugged filter. The PDM filter also now has the package pre-filter as a "first line of defense".

8. Do R-Series Nirvana VSD machines still require a separate line reactor?

No. R-Series Nirvana VSD machines have an integrated line reactor inside the starter box as standard.

9. Is the R-Series Nirvana VSD drive different?

Yes. The R-Series Nirvana VSD drives utilize design elements of our current product. However, R-Series drive design has additional cooling, better two stage filtration, as well as additional drive monitoring functions to deliver our most reliable drive to date.

Controls, Modulation and Warnings/Trips

10. What are the features / functionality of the new Xe controller?

- Prevent unexpected downtime with the Xe controller's PAC™ protection system, which continuously monitors and adjusts key operating parameters.
- View real time operating status, configure the controller and review faults and logs right from the comfort of your office PC, Mac or Tablet with web enabled communications.
- Reduce wasted air during off-hours by using the scheduled start and stop capability.
- Easily navigate the controls with large buttons and an intuitive menu layout.
- Know immediately when something needs attention with highly visible high intensity LED indicators and (optional) immediate email notification of warnings and trips
- Sequence up to four (4) Xe controlled compressors without any additional system controllers.
- Improve maintenance productivity with optional performance analysis and graphs and automated inspection log.

11. How often can the customer extract the trended information from the Xe? How many points can they extract?

- Customers can extract the last 250 trips or alarms.
- Customers can download (via SD card) or view up to 30 days of parameter history (Xe-145M only – not on standard 90M AND contingent on the release of version 10 software that will follow Standard 90M release).

12. **How does the user interface to the Xe to extract information real-time? (is an x-IRI required or is ModBus available directly??**

- RS-485 – Modbus RTU (There are four RS-485 ports. The other 3 RS-485 ports are dedicated for X-Series system controls, the VSD interface, and future expansion modules)
- Ethernet – Modbus TCP OR web pages, not both.
- USB – Xe-Field Service Tool (for extraction of the 30 day data archive)

13. **What is the NEMA rating of the starter box for these machines?**

The starter box for the R-Series fixed speed machines is now rated IP65 (NEMA 4). The Nirvana VSD starter box is designed for IP54 (NEMA 12).

14. **How is our modulation option different?**

R-Series has a new unique, simple pneumatic modulation design. This simpler design has 37 less system components that can fail for increased reliability. The plug and play design allows for simple add-on installation in the field where required and, therefore, easier maintenance.

Feature	Current Pneumatic	Stepper Control	New Pneumatic Controls
Adjust modulation pressure setpoint	Manual	Automatic	Manual
Dynamic inlet vacuum adjustment	N/A	Yes	N/A
Unloaded sump pressure controls	Manual	Automatic	Automatic
Pressure control band	10 psi	10 psi	10 psi
Modulation on/off via controller	Yes	Yes	Yes
Reliability	Better	Good	Best

15. **Is electronic stepper motor modulation available on R-Series?**

No. Stepper modulation is not available on the R-Series product. The new pneumatic control has similar features like unloaded sump pressure control and a 10psi pressure control band.

16. **Are there any new warnings or trips (shutdowns)?**

There are additional warnings on the Nirvana VSD drive like temperature warnings for a period prior to the trip (shutdown) point. In addition, there are the PACTM protection features allowing the machine to make changes under certain conditions.

Features

17. **What is Progressive Adaptive Control™ Protection or PAC™ Protection?**

PAC™ Protection is an integrated intelligent system that continuously monitors key operating parameters to help prevent unexpected shutdowns. It allows the machine to make changes under certain conditions to protect the system.

For instance, on fixed speed machines, when under warning for high sump pressure putting strain on the motor, the system may progressively lower discharge pressure while under alarm to allow additional run time until the trip (shutdown) point is reached. On Nirvana VSD machines, the flow will be progressively reduced until the trip (shutdown) point is reached. This feature allows the customer to continue to run their operations to stay productive, while still notifying them of the condition and protecting the machine.

In addition, there are added sensors, including air filter pressure transducers vs. switches on all machines and oil-injection temperature and package discharge temperature sensors added to fixed

speed machines. The result is more information and indicators to the customer, less unexpected shutdowns, and quicker diagnosis when needed.

18. What is V-Shield™ Technology?

V-Shield™ Technology is Ingersoll Rand's new integrated leak-free design that includes stainless steel pipes, long life metal-flex hoses, o-ring face sealed (ORFS) connections with superior elastomeric seals for repeatable leak-free connections.

19. What are O-ring face seals (ORFS)?

O-ring face seals are the type of connections that the R-Series uses for pipe and fitting connections. It is far superior to other NPT or standard connections used in competitive machines today since it uses an o-ring to seal instead of a metal-to-metal seal. This also allows removal and reconnection without leaking.

20. What is sequential cooling?

Sequential cooling improves efficiency and serviceability by utilizing a centrifugal blower along with independently mounted air and coolant heat exchangers. It delivers quiet operation, reduced energy costs and higher quality air through an integrated water separator that decreases harmful condensate carryover. Sequential cooling lowers discharge temperatures overall. Discharge temperatures for the range:

- Fixed Speed 55kW (75 hp) R55i = 5°C/9°F above ambient
- Fixed Speed 75kW (100 hp) R75i = 8°C/15°F above ambient
- Nirvana VSD 55 & 75 kW (75 & 100 hp) R55/R75n = 8°C/15°F above ambient

21. How are sequential coolers different from traditional coolers?

Sequential coolers utilize independently mounted, free floating air and coolant heat exchangers that extend life by reducing thermal stress. The reduced thermal stress means more reliable coolers. By being independently mounted, they are easier to clean and easier to replace.

22. Are sequential coolers sandwich coolers? How difficult are they to service?

No. Unlike previous coolers, the air and coolant heat exchangers are independently mounted and designed in the package for easy cleaning between and behind the coolers. Each cooler is connected by just a few bolts and easier to replace.

23. Is water cooling the same as previous machines?

No. R-Series water cooled machines come standard with brazed plate coolers instead of shell and tube coolers used today. There are still harsh water cooler options available.

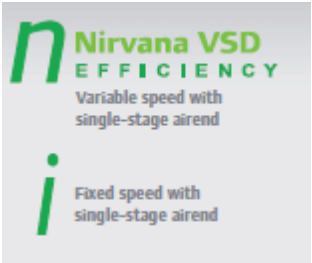
24. What are no loss drain valves?

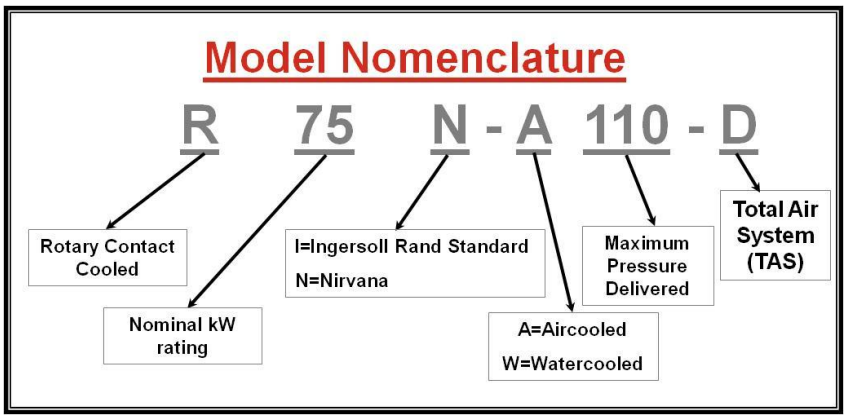
No Loss Drain valves are valves that do not eliminate any customer air while discharging condensate. They save customers money over solenoid drain valves. The ENL no loss drain is standard on all Nirvana VSD and premium efficiency machines. It is available as an option on single and two-stage fixed speed machines.

Model Numbers

25. Are the model numbers different from today's product?

Yes. Ingersoll Rand model numbers beginning with the new R-Series product are different than today's model nomenclature. All R-Series products will begin with an 'R' followed by the 'kilowatt' motor rating. This new product launch will begin with R55 or R75 followed by the 'n' for Nirvana VSD or 'i' for fixed speed.





Parts, Warranty and Field Upgrades

26. Are parts interchangeable between fixed speed and variable speed drive machines?

Yes. Many parts are interchangeable between R-Series fixed speed and variable speed machines. Only key components such as the motor, drive, airend, and inlet valves are different between fixed and variable speed. However, most other components, including consumables, coolers, separators, and door panels, all have the same parts between fixed and variable speed.

27. Are parts interchangeable between the new R-Series and previous models?

No. The new R-Series product with all new o-ring connections, higher quality consumables, and an entirely metric design, leaves a smaller number of interchangeable components from previous models.

28. What is the warranty on the new R-Series machines?

The warranty for R-Series is the standard 12/18 warranty. It is 12 months from documented start-up or 18 months from factory shipment; whichever occurs first.

29. What field upgrades are available?

Field upgrade kits are available for modulation, outdoor modification, PORO, inlet and package high dust, ERS heat recovery, and food grade lubricant with X-Tend filter.

Performance

30. Did the performance data change?

Yes. There are all new performance tables and information along with all new CAGI sheets for this product. Check your local Sales Library for this information.

31. Why change to 110 psi machines from 100 psi?

By moving to 110 psi rated machines, we are able to reach more customers who need a full 90 psi after all air treatment equipment. We are able to deliver more air in scfm to those customers vs. offering only our 125 psi machines today.

Service and Maintenance

32. Why are service intervals longer for some consumables like the coolant filter?

The voice of customer research on R-Series showed that customers wanted longer intervals and more 'up-time' on their compressor. To deliver on our customers' desire for longer service intervals, the R-Series consumables utilize industry leading filtration media that will increase machine reliability. The rated hours are in standard operating conditions and may vary in harsh environments, where it is indicated by the controller.

33. How is the R-Series coolant filtration different from today?

R-Series coolant filtration utilizes a higher efficiency multi-stage fiberglass filter and has higher contaminant holding capacities than current filtration. R-Series coolant filtration has up to 20x more capture ability than current coolant filters and is 99.5% efficient at 10 micron and 95% efficient at 5 micron. This increased filtration means longer life for the system and less wear on the machine.

34. What is different with the new separator element?

The R-Series separator element design with the R-Series swing out separator lid is the easiest to service design in the industry. The new drop-in self-sealing element is exclusive to Ingersoll Rand and eliminates the need for replacing gaskets or o-rings on the tank.

35. How is the machine easier to service?

From an open and accessible design, to swing out separator lids, easier to replace heat exchangers and consumables, and simpler valve maintenance, the R-Series product is easier to service and allows the lowest amount of downtime to customers. Service technician reviews of R-Series have verified the increased serviceability of this machine.

Total Air System (TAS)

36. What is the difference between the integrated dryers used on our current machines and the R-Series?

Several key design changes were incorporated in the R-Series design to increase the reliability (see Sales Facing Presentation for more detail). The R-Series dryer uses its own dedicated cooling fan which allows it to run independently of the compressor. This increases reliability by preventing freeze up and prevent refrigerant compressor cycling. The R-Series also has a 3-in-1 heat exchanger/pre-cooler re-heater/moisture separator which dramatically reduces potential leak paths.

37. Why doesn't the TAS dryer have a by-pass as an option?

The customer is only required to bring in a single power supply for the complete compressor unit. There is no need to bring in a separate power supply for the dryer itself. The purpose of a bypass is to allow the compressor to remain running while the dryer is being serviced. As such, there is a concern if a technician tries to work on the dryer while it has live electrical power and has no ability to lock out tag out.

38. 1-Whats the difference between the 2 modes of operation on the integrated dryers?

- **Dew point Mode**
  Dew point mode is where the dryer runs continuously once the start button is pushed which ensures constant and stable dew point performance up to 100F ambient regardless of compressor operation. Pushing the stop button on the compressor controller will stop the dryer as well. This feature is better suited for specific class 4 dew point performance where energy efficiency is not a major concern.
- **Energy Mode**
  Energy Mode has functionality to prioritize energy efficiency over dew point performance. The dryer will run continuously when the compressor is running, however there is logic associated with

auto start/stop operation. It works where there are time delays in the starting and stopping of the dryer based on compressor operation. This prevents any nuisance tripping and reliability issues associated with short cycling an integrated dryer as the compressor starts and stops automatically. Since there will be a time delay on restarting the dryer when the compressor starts, there will be a dew point spike in the air for a brief moment.

CRN

39. Do I need a CRN for an air compressor?

No – we do not need a complete machine CRN, however all the major components need CRN such as coolers, separator tank, as well some internal fittings and external receiver tanks - but not the complete unit.

40. Where Do I go to find information on components that are CRN approved?

All CRN approved components are listed on sales library see engineering data section on product you are looking for to see components that are CRN approved with CRN numbers.

41. Does an Ingersoll Rand competitor have CRN on compressor packages?

No – All of our competitors operate the same way and do not carry CRN on the complete package.

42. What should I do if an inspector audits compressor installation for CRN approval?

Auditor will find CRN numbers on the major components and for smaller components such as fittings, piping, valves if questioned provide the CRN component approval list for R-Series from sales library.

CSA Vs. CUL

43. What is the difference between CSA and cUL?

CSA is a provider of product testing services and certification similar to UL. Both CSA and UL can test to each other's standards and provide certification marks. If tested by CSA standards it will bare CSA marking, if CSA tests to UL standards it will bare cUS markings. Similarly, if UL tests to Canadian CSA standards, it will bare "cUL" markings.

44. Do I need a CSA for an air compressor?

No – we do not need a complete machine CSA, however electrical panel must be constructed per CSA standard and must bare appropriate CSA or cUL markings for use in an installation.

45. Does Electrical panel require CSA or cUL?

Yes – electrical panel either requires CSA or cUL mark for inspector to approve installation. If panel does not bare these marks electrical panel has to be modified to CSA inspectors satisfaction and approved prior to shipment.

46. Is R-Series CSA ready?

Yes, R-Series compressors come with pre-approved markings avoiding modifications in field.

47. In case a field install approval is required by CSA, can it be done?

Yes, field installation approvals are possible at a cost by contacting CSA inspector, in which case inspector will review installation to CSA guidelines and provide approval markings for that installation.