



Subfreezing Dryers

SF Dryer, -20°C (-4°F) PDP



More Than 145 Years of Compressed Air Innovation



Ingersoll Rand introduced its first air compressor in 1872. Over the next 145 years, we have continued to develop rugged and reliable industry-leading compressed air technologies. Our latest innovation, subfreezing air dryers, takes clean, dry air to new levels of cost-efficiency across a broad spectrum of operating conditions.

SF Dryers Optimized for Class 3 Air Quality

Many applications require very dry, high-quality air with subfreezing dew points. Ingersoll Rand's family of desiccant dryers are the best option for the most stringent requirements—ISO Class 1-2 with a pressure dew point (PDP) as low as -70°C (-94°F). However, ISO Class 3 air, with a PDP of -20°C (-4°F), is sufficient for a large portion of the market.

For applications that only require Class 3 air, we've expanded our family of high-quality air dryers with our new SF dryers. They combine the ease of maintenance and operation of a refrigerated dryer with the subfreezing pressure dew points typically associated with a desiccant dryer.

Reliability

- Class 3 air quality -20°C (-4°F) PDP delivered consistently over the full range of compressor utilization (0-100%)
- Ideal for systems that have piping exposed to subfreezing temperatures
- High-quality air prevents damage or loss due to moisture related problems, like system corrosion or product degradation

Efficiency

- No energy-consuming devices such as heaters or blowers required for regeneration
- Does not require purge air, resulting in significant energy savings versus conventional desiccant dryers

Productivity

- Assures 100% air compressor utilization by eliminating wasteful purge air requirements
- Refrigeration-based drying system does not require periodic drying media replacement
- Removable side panels provide easy access for inspection and routine maintenance
- Advanced controller permits remote viewing of critical parameters via standard internet browser

Low Cost of Ownership. High Air Quality.

The regenerative SF dryer uses refrigerant instead of desiccant in the drying process. This unique approach has many benefits that makes it ideal for compressed air applications that require ISO Class 3 air, with a PDP of -20°C (-4°F).



LOWER MAINTENANCE COSTS

The SF dryer has no costly consumables that require periodic replacement such as drum wheels or desiccant beads. In addition, no external heaters or blowers are required for regeneration, reducing the need for high-maintenance equipment.



IMPROVED ENERGY EFFICIENCY

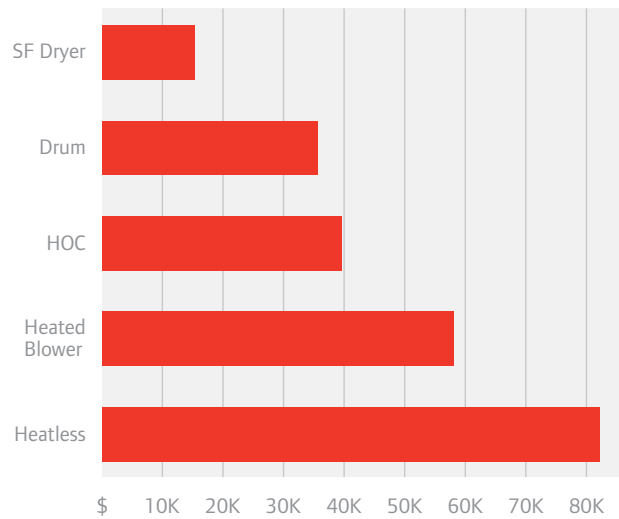
Typical desiccant dryers use upwards of 15% purge air for regeneration, which equates to 15% of the energy cost of the compressor. The SF dryer does not require purge air, eliminating this wasted energy cost.



REDUCED EQUIPMENT AND OPERATING COSTS

Since the SF dryer does not consume purge air, 100% of the air supplied by the compressor is available downstream to the dryer. This eliminates the need to upsize the compressor to compensate for the dryer's purge requirements, saving both equipment and operating costs.

SF Dryers Reduce Cost of Ownership



The SF dryer offers a lower total cost of ownership compared to other dryer technologies



INSTALLATION MADE EASY

With a 40% smaller footprint, the SF dryer uses less floor space and is fully compatible with all compressor types (both oil-flooded and oil-free) without requiring any costly modifications to the air compressor or downstream particulate filtration.

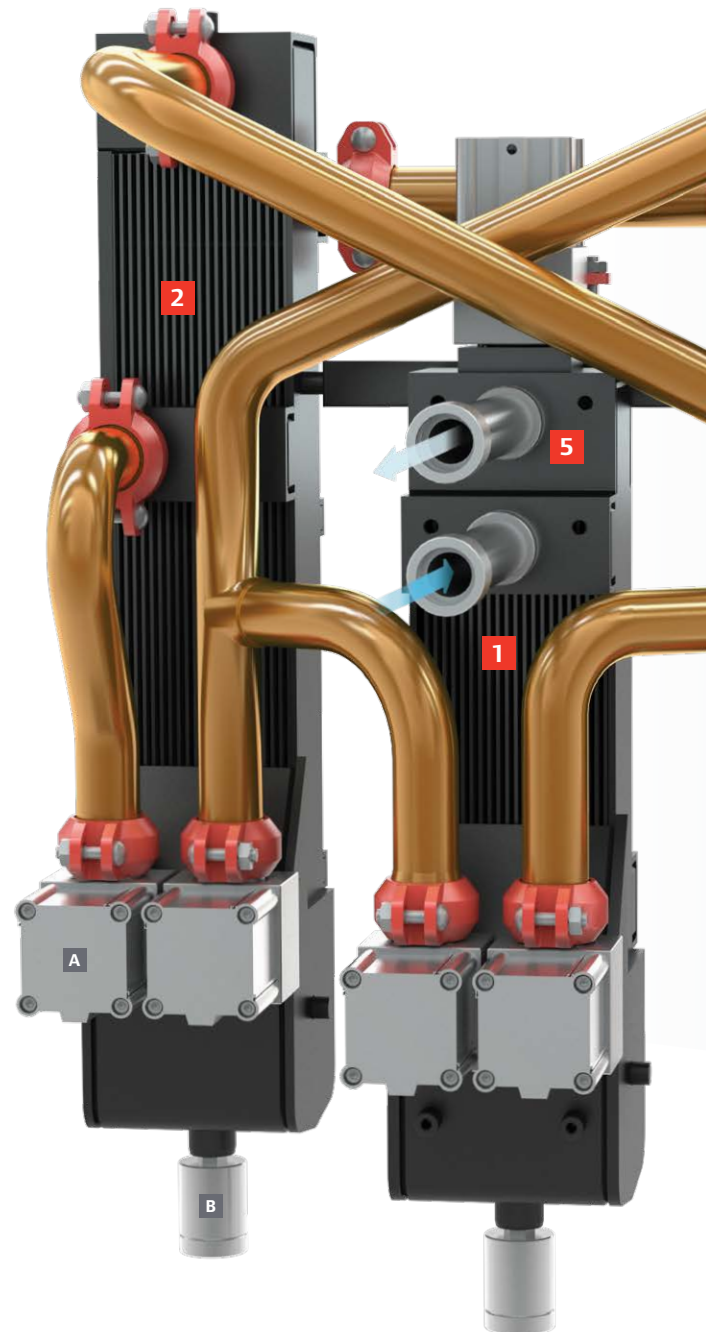
Innovative Design. Efficient Operation.

The SF dryer is a regenerative refrigerant dryer that has been designed specifically for ISO Class 3 applications that require high-quality compressed air -20°C (-4°F) PDP. It operates similarly to a desiccant dryer, with twin drying chambers that continuously cycle between drying and regenerating to remove moisture while maintaining a constant subfreezing PDP. During the subfreezing drying process, moisture (condensate) forms as a thin layer

How the SF Dryer Works

- 1 PRE-COOLING:** Air enters the dryer through the pre-cooler/re-heater, where it is cooled and dried to 15°C (59°F) PDP, removing 70% of the moisture content in the air.
- 2 REGENERATION:** Leaving the pre-cooler/re-heater, the air enters the first heat exchanger for regeneration by removing a thin layer of frost that has accumulated on the inner walls during the previous drying cycle. Simultaneously, the air is cooled and dried to 3°C (37°F) reducing the moisture content to $<10\%$.
- 3 DRYING:** With only 10% of the moisture remaining, the air now enters the subfreezing dryer heat exchanger where it is cooled and dried to -20°C (-4°F) PDP. The removed moisture begins to form a thin layer of frost on the inner walls of the heat exchanger.

- A** High performance switching valves precisely control the flow and sequence of the drying and regeneration cycles.
- B** Electronically actuated smart solenoid drain valves located at the bottom of each drying chamber completely remove all condensate based on demand.



of frost on the inner walls of the heat exchanger. To regenerate, the dryer switches the airflow path, allowing warm incoming air to pass through the heat exchanger, melting the frost and discharging the water through a no-loss drain. The key advantage of this process is the significant reduction in energy required to remove moisture from compressed air.



4 REHEATING: The air dried to -20°C (-4°F) PDP is reheated before exiting the dryer in two steps. First, the air re-enters the upper part of the second heat exchanger and is heated by the incoming air to -5°C (23°F) while still maintaining a -20°C (-4°F) PDP.

5 REHEATING: Next, the air re-enters the common pre-cooler/re-heater unit and is heated by the incoming air to 25°C (77°F) while still maintaining a -20°C (-4°F) PDP.



Precision Control. Optimized Performance.



Delivering Class 3 air quality cost-effectively requires advanced logic integrated with precise timing. The Xe-90 controller manages drying efficiency and air quality automatically. It monitors up-to-the-second operating conditions and provides precise control over continuous drying and regenerating cycles to ensure a constant -20°C (-4°F) PDP, regardless of changes to compressed air demand or ambient temperatures. Advanced real-time monitoring of the air system ensures air quality and efficiency with full integration with the plant system.

The SF Dryer Advantage

The innovative SF dryer surpasses traditional high-quality air dryer performance because it is designed specifically for ISO Class 3 -20°C (-4°F) PDP.

Why Class 3 Air Quality is Critical

Saturated air, aerosols and water can compromise efficiency and raise maintenance costs. Class-3 air helps protect against:

- Corroded air storage and distribution systems
- Damaged valves, cylinders, tools and production equipment
- Ruined products or packaging
- Bacterial growth

How the SF Dryer Compares to Other Technologies

Feature/Attribute	Dryer Technology			
	HOC	Drum	Desiccant	Subfreezing
Delivers Class 3 air quality dry air at -20°C (-4°F) PDP	✓	✓	✓	✓
Dries to a constant PDP regardless to changes in air demand or ambient temperatures	✓	✗	✓	✓
Protects pipes from freezing when they are exposed to low ambient temperatures	✓	✓	✓	✓
Compatible with all compressor types (oil-flooded and oil-free)	✗	✗	✓	✓
Provides 100% compressed air availability at all flow rates	✓	✓	✗	✓
Operates without drying agents that require particulate filtering	✗	✗	✗	✓
Low maintenance costs	✗	✗	✗	✓
No additional cost required for compressor modifications	✗	✗	✓	✓

Your Trusted Partner in Compressed Air

Optimize your total cost of ownership, while maximizing reliability, efficiency and productivity with our full complement of services that span the entire lifecycle of your compressed air system.



CARE Maintenance Programs | RELIABILITY FOR LIFE

Compressed air is critical to your operation. A proper maintenance strategy is crucial to avoiding unplanned, unbudgeted downtime and production interruptions. By choosing an Ingersoll Rand CARE maintenance service program — from full risk transfer to routine maintenance or parts coverage — you are investing in your future with a trusted global partner.



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