

CENTAC COMPRESSOR®

**Field Storage, Long Term Storage and
Inspection Procedures**

Field Storage

1.0 Purpose

The purpose of this document is to provide instructions to follow for protecting Ingersoll-Rand (I-R) Centac compressors and accessories from the corrosive effects of the environment while in **storage**. (This procedure does not apply to X-Flo Single Stage Compressors.)

2.0 Scope

The field storage procedures provided apply to Centac compressors and shipped loose parts that will be in storage for any length of time after shipment from Ingersoll-Rand. The procedures include storage instructions for compressors designed for both indoor and outdoor installations. All compressors designed for indoor installations must be stored indoors regardless of the time period that the compressor is to be in storage. Compressors designed for outside installations may be stored outdoors after Customer preparation for storage according to Ingersoll-Rand's instructions for the environmental conditions at the storage site.

The procedures explain the compressor warranties applicable to given site conditions and time delays before compressor start-up. For both standard and extended shelf life warranties, this document describes the steps that both Ingersoll-Rand and the Customer must take in order to protect the equipment and accessories being purchased.

Any equipment manufactured elsewhere and purchased through Ingersoll-Rand is subject to the storing requirements as specified by the equipment manufacturer. This applies to all motors, steam turbines, expanders, diesel or natural gas engines, starters, auxiliary equipment, and accessories purchased through Ingersoll-Rand. All necessary storage procedures for this equipment will be provided and must be adhered to for adequate protection from the environment. If the equipment manufactured by others is not started up before the equipment's shelf life period expiration, then customer must work through Ingersoll-Rand to try to place the equipment into "as shipped" condition and extend the warranty at the customer's expense.

3.0 Procedure

3.1 180-DAY STORAGE – **CONTROLLED ENVIRONMENT** CONDITIONS

This procedure refers to both U.S. domestic and U.S. export shipments.
(See Definition 4.2)

The compressor, as it is shipped from the factory (flanges banked and desiccant bags placed at inlet and discharge), can be stored on a level surface in a controlled environment for up to 180 days after the ship date tagged on the compressor unit without requiring long-term storage preparation. The unit must be started within the first 180 days following shipment from Ingersoll-Rand to assure the full 12-month operational warranty after start-up.

At the termination of the storage period, the motor should be given continuity and insulation tests before connecting to a power line. Specific motor start-up instructions provided by the motor supplier must be adhered to.

Store all loose/spare parts in a controlled environment for adequate protection prior to usage.

3.2 180-DAY STORAGE – ADVERSE ENVIRONMENT CONDITIONS

(See Definition 4.3)

The following procedures apply to compressors which will either be stored indoors, but under adverse environment conditions, or to compressors that have been specially engineered for outdoor operation and will be stored outdoors. All of the procedures listed below may be necessary to protect the compressor from the environment, but the complete set of precautions that the Customer must follow depends on the actual site conditions. The Customer must contact the Ingersoll-Rand representative located nearest to the Customer site to obtain the complete set of precautions required to protect the compressor while in storage.

- 3.2.1 Ensure that desiccant bags are replaced 2 months after the unit is received at the jobsite and verify all openings to the compressor internals are tightly covered using gasketing. The desiccant bags should be placed on top of a polyethylene plastic film inside the inlet and discharge connections.
- 3.2.2 Place a lighted 100-watt incandescent lamp or similar heating device in the control panel to maintain a constant, above-ambient temperature and to drive off moisture, or energize the panel space heater where applicable.
- 3.2.3 Keep the compressor covered when storing in an area where there is exposure to an environment of dust, dirt, rain, or snow.
- 3.2.4 Keep all loose/spare parts boxed and stored indoors. Follow storage instructions as specified by the equipment manufacturer.
- 3.2.5 Remove demister and plug connection.
- 3.2.6 Bleed (continuous purge) dry nitrogen gas through the machine to absorb and displace moisture and eliminate the presence of oxygen.
- 3.2.7 Energize motor space heaters (if provided) while in storage or place a 100-watt incandescent lamp close to the air ducts.
- 3.2.8 Access and manually spray the compressor bullgear and pinions with compatible rust inhibitor oil. **Do Not Rotate the Machine.**
- 3.2.9 Prepare the compressor and accessories for long-term storage if the above procedures cannot adequately protect the machine internals for the given site conditions.
- 3.2.10 Consult the local Ingersoll-Rand office for the complete list of measures required to fully protect the compressor.

3.3 LONG-TERM STORAGE – PREPARED AT INGERSOLL-RAND'S FACTORY

(See Definition 4.4)

Centac compressors, which will not be started within a 180-day period from date of shipment, must be prepared for long-term storage (subject to an additional price adder to Customer) prior to shipment from the Ingersoll-Rand factory. Long-term storage preparation provides an additional 12-month shelf life machine protection against corrosion due to the environmental conditions. (i.e., warranty is 12 months from startup or 30 months from shipment, whichever first occurs). Long-term storage may be purchased for an extended shelf life period, subject to additional price adders. Motors are not included, unless the additional storage period has been purchased from the manufacturer and added to Ingersoll-Rand's proposal as a separate line item. The following sections describe the responsibilities of both Ingersoll-Rand Company and the Customer for preparing the machine for long-term storage.

3.3.1 INGERSOLL-RAND'S FACTORY RESPONSIBILITY

The Ingersoll-Rand factory responsibilities for long-term storage preparation before the compressor ships are as follows:

- 3.3.1.1. Open the Centac compressor and remove diffusers, diffuser covers, rotors, and drain traps. Plain bearings are left in-place inside the compressor.
- 3.3.1.2. Blow dry air through water manifolds, oil coolers, and through all intercoolers that were not removed in Step 3.3.1.1. Install desiccant bags in the cooling water manifolds.
- 3.3.1.3. Coat each rotor component with Tectyl 400C, a cosmoline type rust preservative, and pack securely in a carton. Label each carton with machine rotor assembly information for easy identification.
- 3.3.1.4. Wipe and dry all unprotected internal machined surfaces. Coat all surfaces with a rust preservative including diffuser and intercooler bores.
- 3.3.1.5. Thoroughly dry the intercoolers. Reinstall diffuser covers, diffusers, and intercoolers.
- 3.3.1.6. Distribute a number of 8-ounce Drierite desiccant bags in the inlet and discharge of the Centac compressor according to the machine frame size (See Table 1) and close the machine.
- 3.3.1.7. Compressor inlet and discharge air openings are sealed with gasketed steel flanges. All openings for instrument and control air connections on control panel are sealed with steel plugs.
- 3.3.1.8. Remove the demister and plug the connection. Coat the exposed portion of the bull gear shaft and coupling hub with cosmoline preservative.
- 3.3.1.9. Coat all external machined unpainted surfaces with cosmoline.

TABLE 1: Desiccant Bag Distribution per Centac Compressor Frame Size

| FRAME SIZE | Number of Eight Ounce Desiccant Bags Required (I-R Part Number 1X7481) | |
|--------------------------------------|---|-----------|
| | INLET | DISCHARGE |
| CV0/ CV1/ CV1A CH3/ CH4/ CH5/ CH6 | 2 | 2 |
| CV2 | 3 | 3 |
| 2ACII | 3 | 3 |
| 2CII | 3 | 3 |
| 3CII | 4 | 4 |
| 5CII | 4 | 4 |
| 2C | 4 | 4 |
| 3C | 5 | 5 |
| 4C | 5 | 5 |

3.3.2 CUSTOMER RESPONSIBILITY

- 3.3.2.1. Store the prepared compressor in an enclosed building at a constant temperature. Compressors that have been engineered for outdoor operation and prepared for long-term storage may be stored indoors. All loose/spare parts must be stored in an enclosed building at a constant temperature.
- 3.3.2.2. Install a 100-watt light bulb or a similar heating device in the control panel enclosure to keep the panel dry, or energize panel space heater where applicable.
- 3.3.2.3. Every 6 months, the inlet and discharge flange covers should be removed and all desiccant bags should be replaced with Drierite desiccant (W.A. Hammond Drierite desiccant, manufactured in Xenia, Ohio, USA) or equal. Immediately secure all flanges (bolt and gasket). (See Desiccant Bag Distribution Table)
- 3.3.2.4. Fill the sump with oil. Use only oil that meets specifications in the Planning and Installation Manual provided by Ingersoll-Rand. If the unit is to be stored for more than one year, the oil should be changed every 12 months. The condensed moisture must be removed from the top side of the oil reservoir at each 12 month interval using a dry cloth.

- 3.3.2.5. Adhere to storage requirements as specified by the motor manufacturer. All storage procedures attached from other suppliers must also be followed.
- 3.3.2.6. Immediately after the unit is received and every 3 months thereafter, the Centac compressor Frames 3C and 4C should be checked as described below.
- Remove the oil piping on the side of the bullgear casing. Blank off the center pipe feeding the plain and thrust bearings using shim stock.
 - Place a red tag on the flange noting blank is inserted.
 - The lube oil piping to the inboard and outboard bullgear bearings should remain in place. Fill the lube oil sump sufficiently to cover the lube oil heaters with a standard lubricating oil (refer to Prestart/Installation Manual oil specifications). Start the prelube pump. This will ensure the bullgear bearings are adequately lubricated before the bullgear is rotated by hand.
 - Remove bullgear locking bolts to allow rotation of the bullgear. If oil pressure exceeds 40 PSIG, back off of the oil relief valve until the pressure drops below 40 PSIG.
 - Remove the inspection covers on the side of the bullgear casing. Power spray the bullgear with standard lubricating oil (refer to Prestart/Installation Manual). Rotate the bullgear a few revolutions during the oil spraying operation to adequately cover the bullgear with oil. Replace inspection covers immediately.
 - If the unit is fitted with oil heaters, turn on the oil heaters while the prelube pump is running. This will increase the effectiveness of the corrosion protection.

3.4 LONG-TERM STORAGE – PREPARED IN THE FIELD

Preparation for long-term storage at Customer's site, after shipment from Ingersoll-Rand must be supervised by the Ingersoll-Rand Service Department Representative nearest the Customer site. The Ingersoll-Rand representative must be present to supervise the preparation for long-term storage in the field, otherwise, warranty coverage will be forfeited. This service will be provided on a regular charge basis.

Customer must notify the Ingersoll-Rand Customer Service Department if a delay in start-up beyond 180 days from shipment is suspected. This notification is necessary to minimize any future expenses for the Customer resulting from necessary correction of corrosion damage prior to activating the machine warranty.

If the equipment has not been placed into long-term storage, and the date of the start up exceeds 180 days from shipment, then Customer will be responsible for the cost associated with placing the equipment into "as shipped" condition prior to start up.

Once the equipment is started, the balance of the originally purchased warranty period shall apply. (i.e., if started in month 10 from shipment, only 8 months operational warranty remain.) Extended operational warranty on the compressor air-

end may be purchased. Extended operational warranty on the motors is subject to the motor vendor's price adders and discretion at the time of the request.

3.5 CENTAC COMPRESSOR REASSEMBLY AFTER LONG-TERM STORAGE

The Customer must reassemble the Centac compressor under Ingersoll-Rand supervision to qualify for remaining future warranty coverage. An Ingersoll-Rand Field Service Technician will be furnished on a regular charge basis.

Preparation for start-up at the end of the long-term storage period must be performed by the local Ingersoll-Rand Service Group to ensure the warranty provisions have been satisfied. An authorized Ingersoll-Rand Service Technician is required to supervise or actually clean protected parts and reassemble the machine. When the unit is ready for reassembly and start-up, steps that will be taken with Ingersoll-Rand supervision are as follows:

- 3.5.1 All loose parts shall be inspected, cleaned, or replaced as necessary and reassembled. Damaged parts will be replaced on a regular charge basis.
- 3.5.2 The lube system shall be flushed with clean oil bypassing the gear case. The oil will be drained, the reservoir will be cleaned and filter cartridges will be replaced before starting the unit.
- 3.5.3 The Service Technician will provide all instructions to the Customer pertaining to cleaning, assembly, flushing, and start-up.

3.6 PRE-INSTALLATION MEETING

One to two weeks prior to beginning preparation for installation, the Customer should request a service visit from an Ingersoll-Rand representative for an on-site pre-installation review.

The primary goal of the pre-installation meeting is to ensure that all concerned (Customers, contractors, etc.) have a clear understanding of the importance of proper installation for high reliability and reduced future maintenance costs of the compressor and to clarify any areas of uncertainty regarding the installation requirements.

Failure to fully incorporate all the specifications and recommendations for installation provided by Ingersoll-Rand will degrade the efficiency and dependability of the machine. The on-site meeting will help to determine the site readiness for the start-up and bring attention to any installation details that may have been overlooked. The meeting will also aid in preventing the need for contractor rework that could result from lack of communication.

It is highly encouraged that all specifications and recommendations for the Centac compressor installation be followed. The operating life of the machine, in large measure, depends upon proper installation.

3.7 WARRANTY

The standard operational warranty period for Centac compressor is 12 months after being placed in operation or 18 months after shipment, whichever first occurs. The addition of long-term storage will add 12 months of storage (or shelf) life to the equipment manufactured by Ingersoll-Rand. The warranty period after adding long-term storage is 12 months from start up or 30 months from the date of shipment, whichever first occurs. The number of months of storage life beyond the 12 that the Customer receives by adding long-term storage, depends upon the customer's storage needs, and is subject to an additional price adder. In addition, the extended shelf life for major accessories, such as motors and starters, may only be extended subject to approval by the manufacturer and subject to additional price adders.

Refer to Ingersoll-Rand's Form LD-102 (U.S.) and Form LD-110 (U.S. Export) for warranty coverage, which shall apply to this order. These forms outline Ingersoll-Rand's policies regarding the obligations of both the Customer and Ingersoll-Rand during the operational warranty period.

Form LD-126 entitled "Extended Warranty" outlines Ingersoll-Rand's policy regarding extended shelf life or deferred warranty.

The Customer shall strictly adhere to any Long-term storage requirements as furnished by Ingersoll-Rand for the Customer and to secure (at the Customer's expense) the services of Ingersoll-Rand's Service Supervisor at six-month intervals after shipment of the equipment, and again prior to placing the equipment into operation, to determine that such equipment is in appropriate operating condition. The Customer shall reimburse Ingersoll-Rand for the Service Technician at the per diem rates in effect at the time such services are performed, plus travel and living expenses, and upon such terms and conditions as Ingersoll-Rand ordinarily furnishes such Service Technician.

(See Ingersoll-Rand Form LD 146)

It is also understood that any and all costs relating to the dismantling or reinstallation of the equipment, and any repairs or replacements deemed necessary to place such equipment into appropriate operating conditions shall be to the account of the Customer.

Long-term storage is an option that will not guarantee zero corrosion damage during field storage, but it will help to minimize such damage.

Failing to properly store the compressor and accessories and contracting inspections by an Ingersoll-Rand service supervisor as required, may jeopardize the performance as well as the warranty of the machine. It is the Customer's responsibility to hire the services of an Ingersoll-Rand service representative to restore the unit to an "as shipped" condition, at the Customer's expense, before start-up of the compressor.

Once the equipment is started, the balance of the originally purchased warranty period shall apply (i.e. if started in month 10 from shipment, only 8 months operational warranty remain). Extended operational warranty on the compressor air-end may be purchased. Extended operational warranty on the motors is subject to the motor manufacturer's price adders and discretion at the time of the request.

4.0 Definitions

- 4.1 A compressor is considered to be in **storage** for any of the following instances:
 - 4.1.1 The equipment has been delivered to the jobsite and is awaiting installation.
 - 4.1.2 The equipment has been installed, but operation is delayed pending completion of plant construction.
 - 4.1.3 There are long periods (30 days or more) between operating cycles.
 - 4.1.4 The plant (or department) is shutdown.
- 4.2 Storage in a **controlled environment** means storage in an enclosed building at a constant and uniform temperature with relatively clean air free of chemical fumes. To avoid the formation of condensate and, ultimately, corrosion, the ambient temperature must be maintained at least 10 degrees Fahrenheit above the dew point temperature and the relative humidity must not exceed 50%.
- 4.3 Storage in an **adverse environment** is one in which the temperature, humidity, and/or air quality of the enclosed building is uncontrolled. Any environment that does not meet the requirements above (4.2) is an uncontrolled climate. This storage option includes all compressors designed for outdoor operation.
- 4.4 **Long-term storage** procedures apply to any Centac compressor that will not be started within a 180-day period from date of shipment. All compressors that will not meet the required start-up date after shipment must be prepared for long-term storage (at an additional cost) in order to provide additional machine protection.

Centac Compressor Inspection Procedure

Centac compressors that leave Mayfield are prepared for a standard 180-day storage period unless otherwise specified by the order. At times, a Centac compressor will go over the 180-day storage period due to unforeseen circumstances. If this happens, the machine must be inspected. The following procedure is a guideline for inspection. It does not supercede the Centac Long-term Storage Procedure.

The purpose of the inspection is to insure the machine is in "as shipped" condition when started. The following steps will cover inspecting the unit in most instances. The Ingersoll-Rand Technical Representative performing the start-up should insure the Customer performs the following steps. If the Customer does not agree to the procedure, a release of liability must be obtained.

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| NOTE |
| Adverse conditions and controlled environment are defined in the attached Centac compressor LTS instructions. |

Standard Inspection

(Minimum requirement for controlled environment units exceeding 180-day storage.)

WARNING



Observe all standard electrical and pneumatic safety precautions.

1. Open the inlet valve and inspect the first stage inlet bore and impeller for corrosion. In most instances, this will serve as an indicator as to the condition of the other stages. Remove desiccant from inlet and bypass valves areas.

Remove each stage vibration probe and seal air tube. Using a maglite or other suitable light source, look into the cavities and inspect the seal and the pinion for corrosion. Also inspect the seal air tubes.

NOTE

If removing the probe or seal air tubes is not adequate for inspection, remove casing plugs as required to complete the inspection.

2. Remove a minimum of one thrust bearing. Inspect the bearing, thrust collar, and pinion. Rotate the bullgear one full turn (360°) and inspect. Inspect unprotected surfaces in the casing.

WARNING



Do not exceed one rotation and do not turn machine backwards.

3. Inspect the motor and check insulation (megger) per the motor manufacturer's guidelines outlined in the motor instruction manual. (If in doubt, contact the motor manufacturer.)
4. If no signs of corrosion are found, reinstall the removed parts and proceed with normal start-up procedures.
5. If corrosion is found in any of these areas, total inspection is required as defined in the total inspection section.

Adverse Conditions – When storage on a compressor exceeds 180 days then do a standard inspection; if corrosion is found, proceed with a total inspection.

Total Inspection

1. Remove all electrical connections, as well as associated air and water piping.
2. On Centac I models, split the casing and remove the coolers as applicable. On Centac II models, remove the cooler barrels.
3. Remove the diffusers, rotor assemblies, and thrust bearings. Inspect them for corrosion. Clean or replace as required to bring them to “as shipped” condition.
4. Inspect the thrust and plain bearings for corrosion. Inspect the seals at this time. If corrosion is found, remove the plain bearings and seals for clean up or replacement.
5. Inspect bullgear for corrosion. If severe corrosion (i.e. pitting) is found, clean or replace as required. (Inspect bullgear bearings and main oil pump at this time.) Clean casing as necessary.
6. Inspect the motor and check insulation (megger) per the motor manufacturer’s guidelines in the motor instruction manual. (If in doubt, contact the motor manufacturer.)
7. When the Service Technician is satisfied with the condition of the parts and the linebore, reassemble the unit and proceed with normal start-up.

Centac Compressor Warranty Responsibility Policy

1. The Customer has the ultimate responsibility to ensure that the 180-day inspection is performed and will be responsible for the cost of inspection by an Ingersoll-Rand Representative. Failure to inspect the compressor if it has gone beyond the 180-days could void the warranty. If an inspection is not preformed, any damage to the unit at start-up due to improper storage will result in the cost being born by the Customer.
2. If the Branch, Air Center, or Distributor is informed that a substantial delay beyond 180-days will occur, the unit should be prepared for long-term storage, or extended storage per the Centac compressor Field Storage and Inspection Procedure. The cost of this will be the responsibility of the Customer.
3. Most Centac air compressors are shipped with a standard 12/18 warranty (18 months from the day of shipment, 12 months from the date of start-up, whichever first occurs). The 12-month warranty requires the unit to be started within the 180-day (6-month) period. If the unit goes past the 180-day period, the actual warranty is lessened by that amount. Example: Unit is shipped with the standard 12/18 warranty. It sits for 240-days (8 months), is inspected, and then started. Operational warranty is now only 10 months because the unit went past the 180-day period. The warranty terms can be found by checking the order pages or by contacting the Centac Compressor Division.

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| NOTE |
| An inspection by a certified Ingersoll-Rand Technical Representative is still required in these situations. |

4. For the air end to have a 12-month operational warranty if it goes beyond the standard 12/18 period, the following guidelines apply.

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| NOTE |
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| This also applies to units which are shipped in long-term storage and have extended shipping warranties (i.e. 12/24) and go beyond that period. |
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- A. The Customer must pay for an inspection to put the unit in “as shipped” condition. This money will be paid to the local I-R service entity responsible for the compressor.
- B. For machines that are not started prior to the shelf life purchased, the equipment must be inspected, placed into “as shipped” condition, and re-warranted, all at the Customer’s expense.
- C. For the motor to have a full 12 month warranty, the motor manufacturer must be contacted to inspect and warranty the motor. The expense of such inspection and operational warranty extension will be the responsibility of the Customer.