



Oil Lubricated Screw Air Compressor

RSa4-11i & RSa5.5-11n



Product Information

- EN Product Information
- ES Información del producto
- FR Informations sur le produit



Save These Instructions



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INTRODUCTION

■ Scope and Target Audience

This manual's intent is for electricians and operators for site planning, installation and operation guidelines for the compressor.

These operating instructions contain all of the documentation required for safe operation and maintenance of the compressor. This includes installing and connecting the compressor, commissioning and operating the compressor.

■ Safety Requirements

In addition to all the other information in these operating instructions, the general safety instructions are located in the Safety Manual and must absolutely be read.

For supporting documentation, refer to Product Manual table below.

Table 1 : Product Manuals

Publication	Product	Part/Document Number by Region
		Americas
Product Safety Information Manual	All	80446313
Product Maintenance Information Manual	RSa4-11i/RSa5.5-11n	47900102
Product Information Manual	RSa4-11i/RSa5.5-11n	47900101
Product Parts Information Manual	RSa4-11i/RSa5.5-11n	47900103
XS-100 Small Controller Manual	RSa4-11i/RSa5.5-11n	47925943

Notes

■ General Notes

The operating instructions must be read and applied by any person assigned to work with and on the compressor.

It is strongly recommended the controller manual be read prior to operating the compressor package.

Regardless of these operating instructions, the laws, regulations, directives, and standards in force in the installed location and the country of use must be followed.

■ Training

Operator training at site is performed by authorized service technicians. These operating instructions serve as training documents, along with the repair instructions, which are provided only in conjunction with service training.

These measures ensure that the assigned work can be completed reliably.

■ Guarantee

Ingersoll Rand is not liable for the functional safety of the compressor if any actions are taken that are contrary to the intended use, or if used for any other purpose than those listed in the operating instructions.

Ingersoll Rand refuses any guarantee or liability for cases of:

- Operating errors.
- Use of the compressor other than as intended.
- Damages resulting from foreseeable misuse or failure to follow the operating instructions.
- Damages or injuries caused by third party components.
- Use of replacement or wear parts or consumable materials that are not provided or recommended by **Ingersoll Rand**.
- Inadequate maintenance. Modifications to the compressor.

The guarantee and liability conditions of the general terms and conditions of **Ingersoll Rand** are not expanded by the notes above.

USE ONLY INGERSOLL RAND GENUINE PARTS. USING

NON-GENUINE PARTS FOR SERVICING OR REPAIRS WHILE THE COMPRESSOR IS WITHIN THE WARRANTY PERIOD WILL INVALIDATE YOUR WARRANTY.

■ Copyright

These operating instructions are subject to copyright law and may be used solely for the agreed purpose, that is, as a reference for internal purposes.

Propagation or reproduction of this document, or the sale and impartation of its contents, are prohibited unless expressly allowed. Infringement is liable to compensation. All rights are reserved with respect to registration of a patent, utility patent, or design patent.

■ Resale

If the compressor is resold, these operating instructions must be provided to the new operator along with the compressor. If necessary, the operating instructions must be reordered from **Ingersoll Rand** by providing the order confirmation number. The compressor may not be resold without these operating instructions in any case.

■ Intended Use

The compressor uses the best available technology and meets applicable safety requirements at the time of sale, in the context of correct usage.

The design cannot prevent foreseeable misuse, nor all other residual risks, without limiting the functionality of correct usage.

The compressor is designed for the compression of atmospheric air (compressed air for driving pressure equipment). The compressor is not suitable for the compression of other gases.

The compressor is considered to be used correctly if the following points are also covered:

- The compressor is used in accordance with these operating instructions.
- The operator's work procedures and operating instructions are followed.

Any other use, or use exceeding these limits, is considered to be improper. The manufacturer is not liable for any resulting damages. The user alone bears the entire risk.

Correct usage also includes following the operating instructions and complying with the inspection and maintenance instructions.

■ Other Provisions

The use of the compressor can cause hazards to life and limb of the user or third parties, or damage to the compressor or other property, if the compressor:

- Is not used properly.
- Is operated by untrained personnel.
- Is modified or altered.
- The safety instructions are not followed.

The following apply in addition to these operating instructions:

- Applicable accident prevention regulations. Generally recognized safety rules.
- Country-specific regulations.

■ Installation Site / Altitude

The compressor is intended to be installed in a suitable compressor room.

Depending on the operating pressure, ambient humidity, and ambient temperature at which the compressor is operated, the permissible altitude of the installation site is limited. The permissible site altitude is determined by **Ingersoll Rand** for each individual case in consultation with the customer.

Above 1,000 meters above sea level (3280 feet above sea level), end user may have to adjust (lower) working pressure to compensate for the cooling efficiency of the motor. Maximum recommended altitude is 1,500 meters above sea level (4921 feet above sea level).

■ Pressure Equipment

A pressure relief valve that conforms to the applicable specifications must be provided for the pressure equipment and systems installed in the compressed air supply network, considering the weakest pressurized component.

■ Work Environment

The lighting intensity in the area of the compressor must be ≥ 200 lumens in normal operation.

The lighting intensity must be ≥ 500 lumens for inspection and maintenance work.

The ambient temperature for operation.

■ Foreseeable Misuse

■ Incorrect Usage and Abuse

The following rationally foreseeable applications (incorrect usage) do not comply with the intended use:

- Compressing gases other than atmospheric air.
- Operation outside of the permissible operating limits, even if exceeded for only a short time, or if not immediately detectable.
- Operation outside of the permissible ambient temperatures.
- Intake of non-atmospheric air (over pressure or under pressure).
- Use as a respiratory air compressor. Manipulation of sensor signals.
- Changing signals from sensors.
- Operation without protective and safety devices.
- Operation with defective, deactivated, or manipulated protective and safety devices, or safety values, or operation with other safety-related defects.
- Use by private users or users without technical training.
- Operation outside of industrial premises.
- Failure to comply with maintenance intervals.
- Failure to perform maintenance and repairs.
- Incorrectly executed maintenance and repairs.

■ Limitations on Use

Operation of the compressor is not permitted:

- Outside of the permissible ambient temperatures.
- Above the permissible elevation of the installation site.
- On a foundation that does not have sufficient load capacity.
- In areas with explosive atmosphere.

■ **Service**

In case of questions, problems with compressor or spare parts orders, contact your **Ingersoll Rand** distributor/dealer.

Trained expert staff will quickly and properly make repairs with genuine **Ingersoll Rand** replacement parts. Genuine **Ingersoll Rand** replacement parts are manufactured with state-of-the-art technology and guarantee reliable operation.

With inquiries or when ordering replacement parts, please provide the package model name, package serial number, and year of manufacture as listed on the unit nameplate. Providing this information helps to ensure that you will receive the right information or the necessary replacement part.

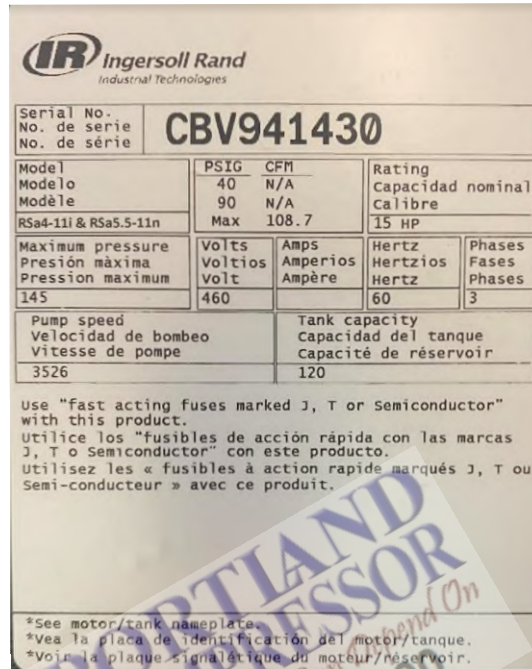


Figure 1

Serial Number	
Model	
HP	
CFM	
Voltage	
Phase	
Amp	
Hz	
Maximum Pressure	

Your **Ingersoll Rand** Distributor:

Name:	
Address:	
Telephone:	Fax:
Contact:	Spare Parts:
	Service:

■ **Product QR code**

Ingersoll Rand product QR codes will be attached to the machine. It serves as a gateway for our customers to access information about their compressors, contact their customer center or distributor for service, parts, and general inquiries.



EXAMPLE ONLY – Please refer to QR code on the compressor.

■ **User Benefit**

The QR Code will allow any user with a new compressor to easily scan and get access to a mobile web application that provides a host of information and access points to get in contact with their **Ingersoll Rand** Distributor or Service Provider. It is specific to his/her compressor. It will provide information about the compressor and access to electronic documentation, parts and kit information, link to our website, and access to request information, parts quote, or request service.

■ **Service Point Application**

The new mobile web application that we are making available to our customers is called “Service Point” and will be the new central point for user to get access to information and new means to contact their distributor or service provider:

		This is where customers can access their compressor documents electronically: service manuals, user guide, etc.
		This is where customers can look up parts available for their compressors, and request to be contacted by their distributor or service provider with a quote.
		By pressing this tile, the customer can scan another compressor and look at information about that compressor.
		The contact tile is for the customer to request to be contacted for other reasons, such as to get information, request service, etc. This request is similar to a customer’s request from the web.
		The customer can also easily get access to our website for additional information if needed.

Examples of the screens show under the tiles:



TRANSPORT AND INSTALLATION

■ **Transport**

■ **Delivery**

The compressor is bolted down to a shipping pallet and covered in plastic sheet packaging.



■ **Receiving**



When received, check for shipping damage.

1. Check the delivery for visible damage.
2. Use the packing list to check the delivery for completeness.
3. Immediately inform the freight forwarder, insurance, and **Ingersoll Rand** of any missing parts or damage.

■ **Weight**

Dependent on type, the compressor weight is stated on the Engineering Data Sheet.

⚠ CAUTION	
 	<ul style="list-style-type: none"> • Lift compressor unit under base only. Do not use other places such as motor, compressor or discharge manifold piping as lifting points. • The eyebolts or lugs provided on the motor are for lifting the motor only and should not be used to lift any additional weight. All eyebolts must be securely tightened. When lifting the motor, the lifting angle must not exceed 15°. Failure to observe this warning may result in damage to equipment or personal injury. • Do not electric weld on the compressor or base; bearings can be damaged by passing of current.

⚠ DANGER	
 	<p>Danger to life</p> <p>Danger to life from tipping or falling parts.</p> <ul style="list-style-type: none"> • A suitable forklift with sufficiently long forks must be used to transport the compressor. • Use forks only at the labeled lifting points. • The compressor, even in its packed state, may not be transported by crane. • During transport, no persons may be present in the hazard area. In particular, do not reach in or allow the feet to pass beneath the suspended compressor.

NOTICE	
<p>Property damage</p> <ul style="list-style-type: none"> • Do not lift up or latch the compressor system by its enclosure. • Note fork length of forklift. • Use only lifting points identified in manual. 	

■ **Transporting the Compressor**

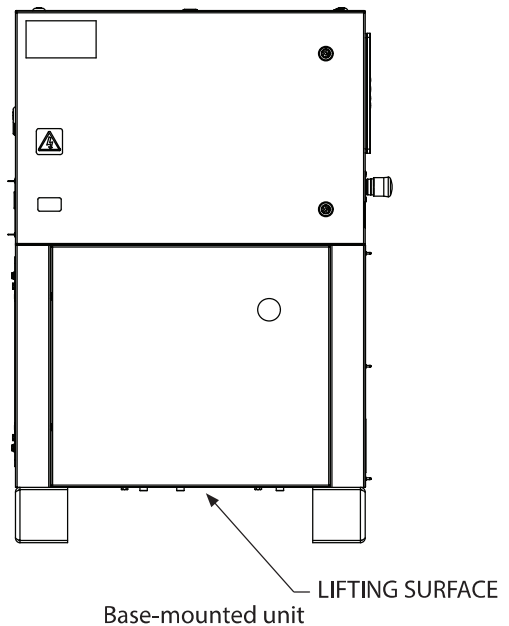
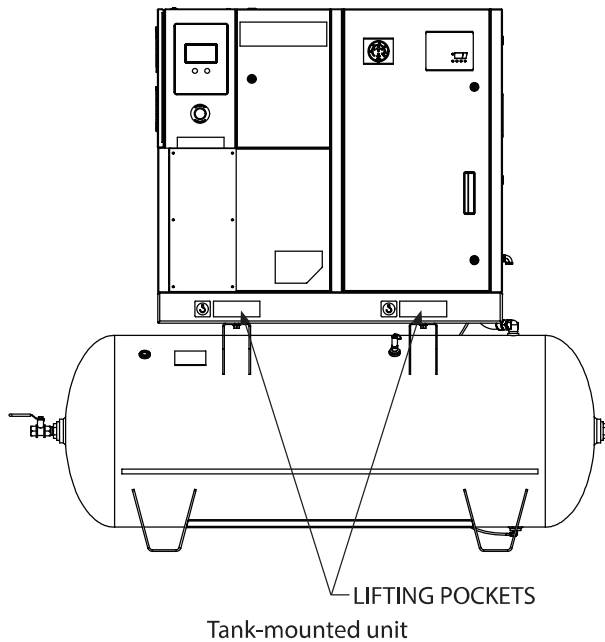


Figure 2: Lifting points

■ Installation

■ Requirements for the Installation Site

The compressor should be installed, whenever possible, in a clean, well-lighted, well ventilated indoor area with ample space all around for maintenance. Select a location that provides a cool, clean, dry source of air.

It is not recommended to relocate inlet filter or duct to the inlet filter. This is due to enclosure modifications that would be required that could negatively affect the structural integrity of the enclosure.

The compressor must be installed with full contact on a foundation with sufficient structural strength. The mounting surface must be level to within 3mm (0.12").

The installation site (compressor room) should be of sufficient size that on side ("A") a minimum clearance of .91m (36") and on side ("B") a minimum clearance of .91m (36") may not be undershot. The clearance above the compressor should be at least .91m (36"). There should also be appropriate access space for maintenance work.

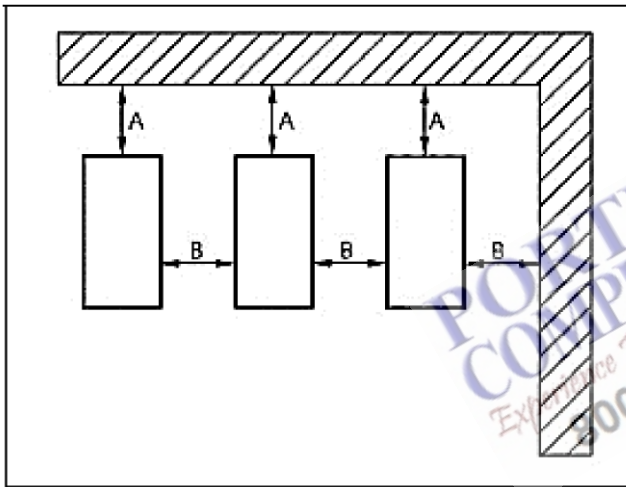


Figure 3: Installation / Clearances

- Set up the compressor so that there is sufficient access and that the required cooling is ensured.
- Do not block the air inlet.
- Avoid moisture.

■ Ventilation and Exhaust

⚠ DANGER	
	<p>Danger of asphyxiation</p> <p>Danger from asphyxiation due to insufficient ventilation and exhaust.</p> <ul style="list-style-type: none"> • The operator must provide sufficient ventilation and exhaust of the compressor room.

⚠ DANGER	
	<p>Risk of injury</p> <p>Danger from improper installation</p> <ul style="list-style-type: none"> • Consider the permissible load capacity of the foundation. • Make sure the foundation is solid and flat. • The compressor must be installed with full contact on a foundation with sufficient structural strength. • The compressor must not be operated on the transport pallet. • No flammable or explosive materials may be stored near the compressor. • Do not operate the compressor with the fan and belt guard removed. Exposed fan and belts may cause injury to personnel.

In order to be able to dissipate the heat produced during operation, the compressor room must have sufficient volume and good ventilation.

The fresh air opening should be located as low as possible. The exhaust opening should be located as high as possible.

Cover ventilation openings with screens in order to prevent dirt from entering the compressor room.

The design of ventilation system is based primarily on the required amount of cooling air.

The minimum cooling air volume required by these screw compressors are as follows:

RSa5.5-11i	1368 cfm (38.74 m ³ /min)
RSa7.5-11n	1436 cfm (40.67 m ³ /min)

If local conditions are unfavorable, install air ducting. The flow speed of the cooling air should not exceed 17 ft./sec. We recommend a minimum channel cross section of 2.4 sq. ft.

The following illustration shows the recommended ventilation requirements.

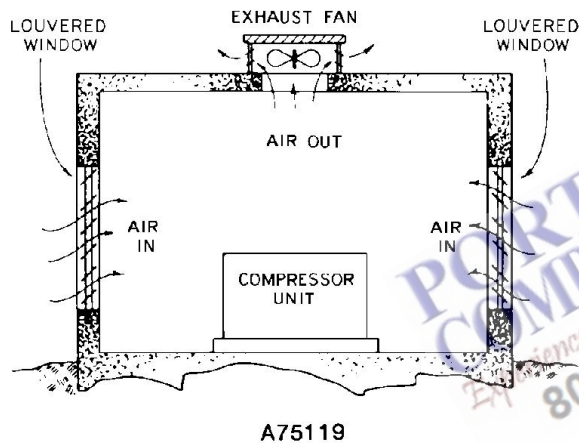


Figure 4: Compressor Room Ventilation

1. Place the compressor down at the correct location.
2. Ensure that the mounting surface must be level within 3mm (0.12"). The compressor does not have any leveling means fitted on it.

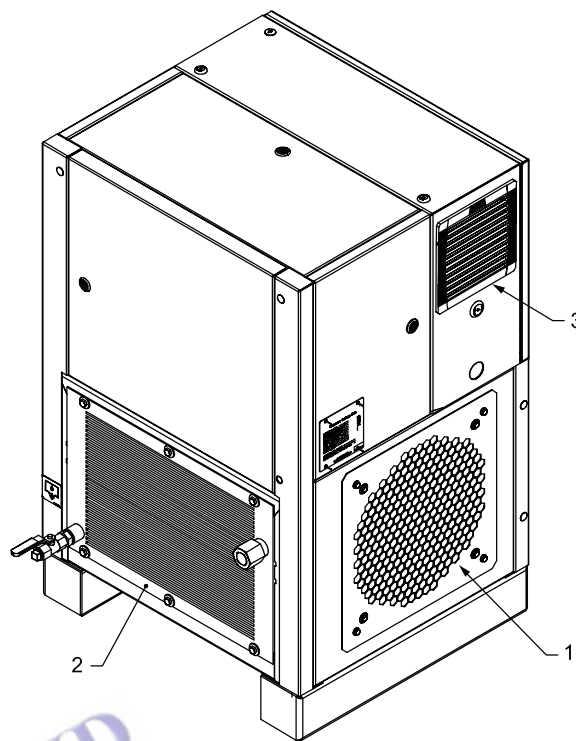


Figure 5

1. Package Air Intake
2. Package Air Exhaust
3. Control Cabinet Air Exhaust (only variable speed units)

Foundation - The rotary screw compressor requires no special foundation, but should be mounted on a smooth, solid surface. Whenever possible install the unit near level. However, installation conditions such as piping rigidity, angle of tilt, or danger of shifting from outside vibration or moving vehicles may require the use of mounting bolts and shims to provide uniform support for the base. Ensure that the unit is anchored to the floor using isolator pads. When anchoring the unit, ensure that there is approx. 1/4" (0.635 cm) between the nut and the compressor foot (as shown in Figure 6 below). Do not bolt down tightly. Belt alignment and tension should be checked after installation.

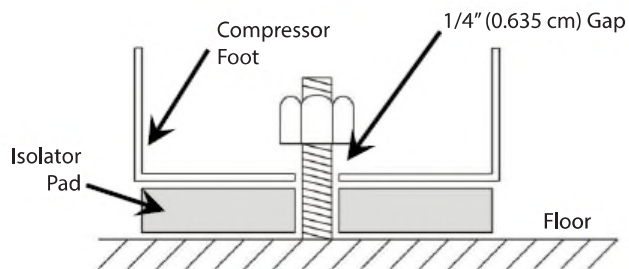



Figure 6

Oil Sump / Oil Cooler Drain – Sump oil and oil cooler oil are drained from a single plugged connection on the lower, left-hand side of the oil cooler core.

 CAUTION	
 	<p>Burn Hazard, Hot Surface</p> <ul style="list-style-type: none"> • Be careful of the hot surfaces of the Oil Sump and Oil Cooler when draining oil.

Enclosure - The compressor, electric motor, oil cooler and after cooler are mounted inside the enclosure.

 WARNING	
	<ul style="list-style-type: none"> • The enclosure doors and panels must be closed and latched while the compressor is operating. • Failure to close and latch the doors and panels will cause high temperature shutdowns.

Service panels are provided for maintenance access. Be sure to allow enough space around the unit for the panels to be removed. Any of the enclosure panels may be removed by opening the latch and lifting it up slightly.

Auxiliary Air Receiver – When using the base compressor package, an auxiliary air receiver is not required if the piping system is large and provides sufficient storage capacity to prevent rapid cycling. When used, an air receiver should be of adequate size, provided with a relief valve of proper setting, a pressure gauge and a means of draining condensate.

Optional Moisture Separator Trap - The unit can be provided with an optional combination moisture separator and trap that is field-installed immediately downstream of the aftercooler.

Control Piping - Control piping is not necessary since the rotary screw unit is factory wired and piped for the control system specified.



Inlet Line - The filter is close-coupled to the compressor intake flange thus no inlet line is used or recommended.



■ **Discharge Service Line**

For a base-mounted compressor unit, the discharge service line connection is provided at the outlet of the field installed moisture separator, which in turn is located at the lower right hand side of the aftercooler core.

For a tank-mounted compressor unit, the discharge service line connection is provided at the outlet of the receiver vessel.

A hand operated valve (air service valve) must be installed between the unit and the customer's air system. A separate (swing type) check valve may also be installed between the unit and the customer's air system. If a fast operating valve such as a ball valve is used, it must be closed slowly to give the intake valve time to shut and keep the discharge pressure from spiking.


 WARNING	
	<ul style="list-style-type: none"> • The controller has an automatic start/stop sequence built in. You do NOT need to close the air service valve. • Closing the air service valve on start-up or prior to shutdown will cause rapid cycling, and could cause a high pressure shutdown.




 DANGER	
	<p>Risk of injury</p> <ul style="list-style-type: none"> • Discharge air used for breathing will cause severe injury or death. • Consult filtration specialists for additional filtration and treatment equipment to meet health and safety standards.


When piping two or more rotary screw units on a common discharge line, each unit shall be isolated by the check valve in the unit discharge line.

If a rotary screw and a reciprocating compressor are piped to a common discharge line, an air receiver must be located between the two units.

■ Electrical Connection

⚠ DANGER	
	<p>Risk of strong damages and fire on the electric power components.</p> <ul style="list-style-type: none"> The power supply to the compressor side has to be fitted for industrial equipment and fulfilling the requirements of NFPA 79 and CSA C22.2 No.301. Any kind of operation outside of the stated limits of NFPA 79 and CSA C22.2 No.301 is inadmissible. The electrical connection should be made by a qualified electrician.

⚠ DANGER	
  	<p>High Voltage – Hazard of Electric shock, burns, or death</p> <p>Dangerous and deadly electrical voltage</p> <ul style="list-style-type: none"> Work on the electrical equipment may be performed only by specialized electrical technicians. Only units with Variable Frequency Drives, there is a risk of electric shocks due to charged capacitors! Isolate the compressor and wait 10 minutes before touching any electrical parts. Check the DC bus voltage.

⚠ WARNING	
	<ul style="list-style-type: none"> If local regulations are stricter than the values given below, observe the stricter regulations. If the electrical connection is made to a non-earthed three-phase system (IT network), please see the corresponding notes in the included frequency converter documentation. If a residual current device (RCD) is used to monitor the earthing connection in the system for earth faults, to prevent interruptions only Type B devices (adjustable trip setting and delay) may be used. Install all covers and panels before applying power to the unit. Failure to install proper fuse protection may void the unit warranty. This product must be connected to a grounded, metallic, permanent wiring system, or an equipment-grounding terminal or lead on the product.

NOTICE

Disturbances in the electrical supply grid

- Speed-controlled compressor system with variable speed drives can cause disturbances in low-voltage grids. For this reason, this drive system is not intended for use on the public low-voltage grid that feeds residential areas.

The compressor system is completely finished at the factory according to EN 60204 (Industrial Machinery).

- The power supply to the compressor must be suitable for industrial equipment and must meet all requirements of EN60204-1/IEC60204-1. If the installation conditions deviate from the conditions as described in EN 60204, contact **Ingersoll Rand**.
- Provide the electrical connection and protective measures according to local requirements. As a rule, additional regulations from the corresponding power company must also be complied with.
- A main switch must be fitted on-site upstream of the compressor (DIN EN 1012 - 1) insofar that such a switch has not already been fitted in the factory as a special accessory. The main disconnect switch must meet the requirements of the safety standard EN 60 204-1 (Electrical Equipment for Machinery) and EN 60947-2 (Low Voltage Equipment).
- The compressor must be protected by suitable line fuses according to EN 60269-1 (Low Voltage Directive).
- If other electrical circuits are run to the electronic controller afterward, such as lighting, heating, or the like, that are not disconnected by the main disconnect switch, then these excepted electrical circuits must be labeled and run separately per EN 60204. Warning labels must also be installed near the main disconnect switch and near these circuits.
- Should an electrical connection to an unearthed AC electrical circuit (IT network) be made, observe the instructions in the supplied documentation of the frequency converter (only VSD compressors).

Unit Electrical Connection - The following instructions are required when connecting power supply to unit:

- The electrician is to bring power to the Unit through the conduit hole located on the Left Panel. The electrical panel is accessible by means of opening the Front Door.
- Refer to the electrical schematic and engineering data sheet for help determining proper disconnect / breaker and wire size. Sizing of electrical systems should be conducted via the local Authority Having Jurisdiction (AHJ).
- Connect ground wire to Protective Earth terminal on the control panel plate for fixed speed units and inside the VSD for VSD units.
- For Fixed Speed units: Bring power to L1, L2, L3 of the K1 starter.
- For Variable Speed units: Bring power to L1, L2, L3 of the VSD.

6. For units with dryers only: Dryer uses attached cord with plug and appropriate mating receptacle (NEMA 5-20P).

Electrical Wiring - On standard units, the compressor package is factory wired for all connections from the starter to the motor, for the horsepower and voltage specified on the order. The standard unit is supplied with totally enclosed motors and a NEMA 4 (Fixed Speed), NEMA 1 (Variable Speed) starter and controls enclosure.

Overload protection is done through direct evaluation of winding temperature on the motor.

When the compressor unit is integrated into an Air System and the optional compressed air dryer is furnished, the latter shall be provided with a separate source of electrical power.


Perform all wiring in accordance with the National Electrical Code (NFPA-70) and/or an applicable local electrical codes. Wiring must be performed only by qualified electricians.

Electrical Wire Sizing - A certified electrician familiar with National Electric Codes and applicable local codes shall size the electrical power wires serving the compressor package. Refer to following table for NEC motor full load currents.

Package Power (HP)	Voltage	NEC FLC (Amps)
5.5/7.5/10/15 (4/5.5/7.5/11kW)	208	18/24/31/48
	230	15/22/28/42
	460	8/11/14/21
	575	6/9/11/17

Motor Full Load Current

Grounding - Ground wiring must meet applicable local codes.

⚠ DANGER	
	<ul style="list-style-type: none"> • Failure to properly ground the compressor package could result in injury or death. • Install ground wiring must meet applicable local codes.

Fixed Speed Tri-Voltage Conversion - The 208, 230 and 460V units utilize a tri-voltage motor and can be converted in the field by changing the wiring connections. Please refer to the electrical schematics for correct wiring changes. The unit voltage must be labeled on the electrical enclosure.

■ Controls and Instrumentation

General Description - The **Ingersoll Rand** rotary screw compressor is pre-wired with all controls, motor, and starter for the voltage and horsepower at the time of ordering. It is necessary only to connect the compressor unit to the correct power supply and to the shop airline. A standard package unit consists of the Correct IR76X/IR58X compressor, oil separation module, air/oil cooling and filtration system, TEAO electric main motor, Wye/Delta reduced voltage magnetic starter (variable speed drive option available) housed in an NEMA 1 (NEMA 12 optional upgrade), and control components as described below.

Electronic Controller and Starter Assembly Hardware - See the Wiring Diagrams supplied with unit for more details on the location of the referred hardware.

Controller - The compressor package features the controller, which integrates all the control functions under microprocessor control. Controller functions include safety and shutdown, compressor regulation, operator control and advisory/maintenance indicators. The keypad and display provides a logical and easily operated control of the compressor and indication of its condition. The controller is factory adjusted for the compressor package, but allows tuning for specific applications.

Emergency Stop Pushbutton - This is a maintained pushbutton, and removes power from the controller outputs regardless of controller status. It is located on the electrical panel door, below the controller keypad. This should be used for emergency purposes only, use the (O) key for normal controlled stopping.

Control Transformer - A control transformer is provided to supply 24 VDC control power supply on 575V machines.

Fuse Blocks - Fuse blocks provide input and output side protection for the control transformer.

Terminal Strip - This device provides an interconnection between the controller and the low voltage hardware such as sensors and switches within the enclosure.

■ Main Starter

For Fixed Speed Variant Models, Simplest DOL starter for 5-7.5HP machines, a Wye/Delta for 10-15HP Machines will reduce voltage starter provides control for the main drive motor. (Single phase option is available for 5.5HP, 7.5HP, 10HP machines)

For Variable Speed Variant Models, a variable speed drive provides the overload protection for the main drive motor as well as compressor speed modulation.

Field Conversion of Multi-Voltage Electrical System - For fixed speed tri-voltage models to convert the compressor package from its as-built voltage configuration to one of its optional ones, contact a **Ingersoll Rand** distributor for details.

GENERAL INFORMATION

The compressor is an electric motor driven, contact cooled screw compressor, complete with all necessary components piped, wired and baseplate mounted. It is a totally self contained air compressor package.

The standard compressor is designed to operate in the following ambient ranges:

- For RSa4-11i & RSa5.5-11n: 2 °C to 40 °C (35 °F to 104 °F)

The standard maximum temperature of 40 °C (104 °F) is applicable up to an elevation of 1000 m (3280 ft) above sea level. Above this altitude, significant reductions in ambient temperatures are required if a standard motor is to be used.

The compressor is managed by the onboard electronic controller. The controller and drive system operate together to vary the speed of the compressor to deliver compressed air at the target pressure.

For fixed speed (FS) models, the capacity is automatically controlled via 'ON-OFF LINE'. The compressor will operate to maintain a set discharge line pressure and is provided with an auto restart system for use in plants where air demand varies widely.

Panel instrumentation is provided to indicate the compressor operating conditions and general status.

The air/oil mixture discharges from the compressor into the separation system. This system removes all but a few ppm of the oil from the discharge air. The coolant is returned to the cooling system and the air passes to the after-cooler and out of the compressor through the moisture separator.

Air is pulled into the compressor by the cooling blower and through the coolant cooler and after-cooler.

By cooling the discharge air, much of the water vapor naturally contained in the air is condensed and is drained from the built-in (TAS)/Optional (NON-TAS) moisture separator and drain.

The coolant system consists of a sump, cooler, thermostatic valve and a filter. When the compressor is operating, coolant is forced by air pressure from the separator tank to the thermostatic element. The position of the element (a direct result of coolant temperature) will determine whether the coolant circulates through the cooler, bypasses the cooler, or mixes the two paths together to maintain an optimum compressor discharge temperature. This temperature is controlled to preclude the possibility of water vapor condensing. By injecting coolant at a sufficiently high temperature, the discharge air coolant mixture temperature will be kept above the dew point.

The compressor is provided with a temperature sensor which will shut the compressor down in case of excessive temperature. This setting is typically 116°C (240°F).

Effective coolant filtration is provided by the use of a screw on, coolant filter.

NOTICE

Fixed speed compressors should not be connected to variable speed drives. Please contact your local Ingersoll Rand representative before inverter duty conversion.

CAUTION

For fixed speed models, the compressor may not reach its normal operating temperature during periods of low demand. Sustained operation at low demand can result in the buildup of condensate in the coolant. If this situation occurs, the lubricating characteristics of the coolant can be impaired, which may lead to damage of the compressor.

The compressor should be allowed ample loading time.

■ Integrated Dryer Operation

In the default mode, the dryer is non-cycling (constant run mode). The stop button must be pressed to shut-off the dryer.

For RSa4-11i/n:

Dryer operation is independent with separate power supply (115V/ 12A) and it can be on/off from dryer panel.

NOTICE

If ISO Class 4 dew point standards are critical to your application, run the compressor in unload mode (fixed speed) or idle mode (variable speed) for one minute at startup to allow the dryer to reach the required dew point before the compressor begins providing compressed air.

■ Environmental Limits

The standard compressor package is designed for the following conditions:

- Indoors only.
- Area not considered to be a high dust area.
- For RSa4-11i/n, the ambient temperature range is from 2 to 40 °C (35 to 104 °F).

Ingersoll Rand offers the following options for fixed speed compressors that extend the environmental limits:

- Outdoor modification (RSa4-11i).
- Low ambient option (-10 to 40°C / 14 to 104°F) at sea level (RSa4-11i).
- High ambient option (2 to 46°C / 35.6 to 115°F) at sea level (RSa4-7.5i).
- High dust inlet air filter.

DESIGN AND FUNCTION

■ General Description

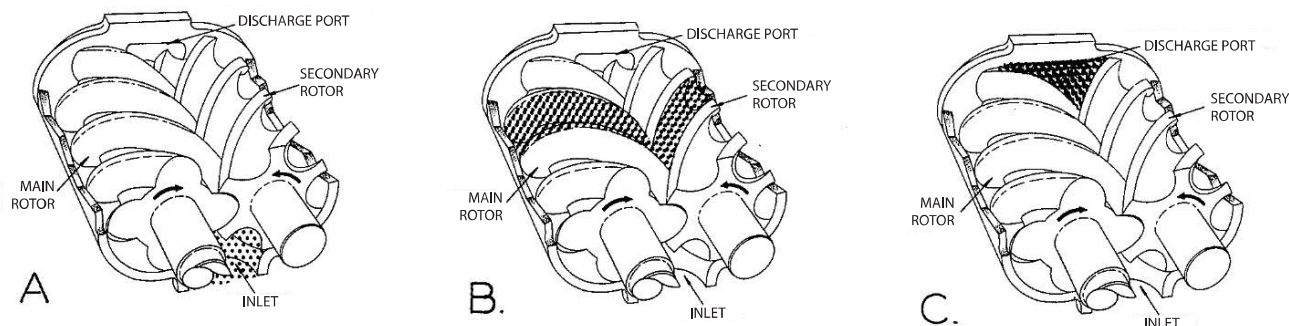


Figure 7: Compressor Cycle

Compressor - The rotary screw compressor is a single stage, positive displacement rotary machine using meshing helical rotors to effect compression. Both rotors are supported between high capacity anti-friction bearings located outside the compression chamber. Roller bearings are used at the inlet end of the rotors to carry part of the radial loads. Angular contact ball and roller bearings at the discharge end locate each rotor axially and carry all thrust loads and the remainder of the radial loads.

Compression Principle - (Figure 7) Compression is accomplished by the main and secondary rotors synchronously meshing in a one-piece cylinder. The main rotor has five (5) helical lobes 90° apart. The secondary rotor has six (6) matching helical grooves 72° apart to allow meshing with main rotor lobes.

The air inlet port is located on top of the compressor cylinder near the drive shaft end. The discharge port is near the bottom at the opposite end of the compressor cylinder. Figure 7 is an inverted view to show inlet and discharge ports. The compression cycle begins as the rotors unmesh at the inlet port and air is drawn into the cavity between the main rotor lobes and the secondary rotor grooves (A). When the rotors pass the inlet port cutoff, air is trapped in the interlobe cavity and flows axially with the meshing rotors (B). As meshing continues, more of the main rotor lobe enters the secondary rotor groove, normal volume is reduced and pressure increases.

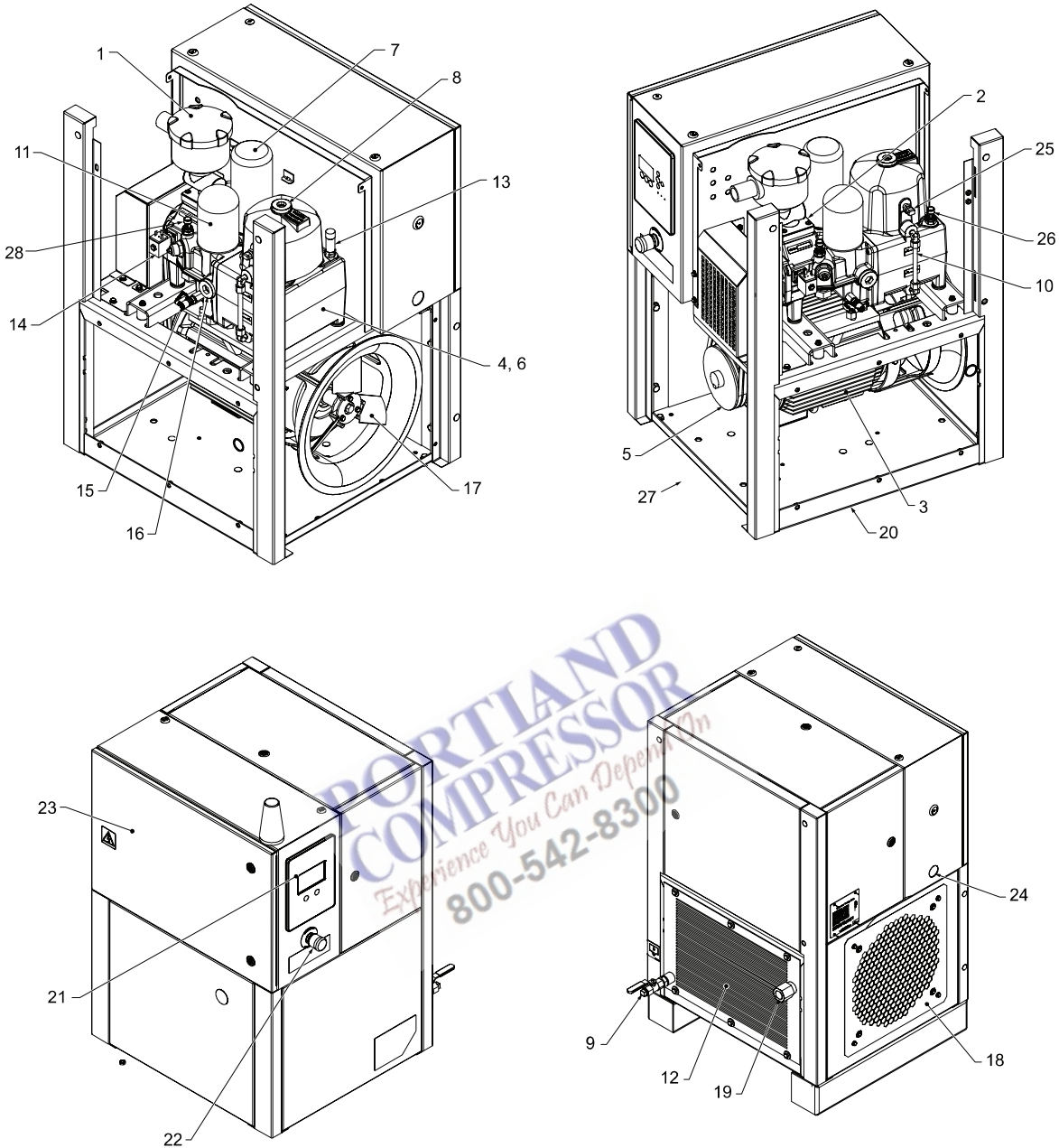
Oil is injected into the cylinder to remove the heat of compression and seal internal clearances. Volume reduction and pressure increase continues until the air/oil mixture trapped in the interlobe cavity by the rotors passes the discharge port and is released to the oil sump (C). Each rotor cavity follows the same "fill-compress-discharge" cycle in rapid succession to produce a discharge air flow that is continuous, smooth and shock free.

Air flow in the compressor system - Air enters the air filter and passes through the inlet valve and on into the compression chamber where oil is injected into the air. After compression, the air/oil mixture passes into the oil reservoir where most of the entrained oil is removed by velocity change and impingement and drops back into the reservoir. The air and remaining oil then passes through the air/oil separator. The air then passes through the minimum pressure/check valve, the after cooler and the optional moisture separator and into the plant air lines.

Lubrication, Cooling and Sealing - Oil is forced by air pressure from the oil reservoir through the oil cooler, thermostatic mixing valve, and oil filter and discharge into the compressor main oil gallery. A portion of the oil is directed through internal passages to the bearings and shaft oil seal. The balance of the oil is injected directly into the compression chamber to remove heat of compression, seal internal clearances and lubricate the rotors.

Electronic Controls - The main components of the electronic control system are the Touchscreen Display and panel mounted I/O Module. A detailed description of the controller operation can be found in the controller manual provided with the package.

■ Construction of the Compressor



- | | | |
|-------------------------|----------------------------------|-------------------------------|
| 1. Intake Air Filter | 11. Oil Filter | 20. Base Frame |
| 2. Inlet Valve | 12. Air/Oil Cooler | 21. Controller/User Display |
| 3. Electric Motor | 13. Pressure Relief Valve | 22. Emergency Stop Button |
| 4. Compressor | 14. Solenoid Valve | 23. Control Cabinet |
| 5. Belt Drive | 15. Oil Sampling Valve | 24. Feed Cable Entry |
| 6. Pressure Reservoir | 16. Thermal Control Valve | 25. Sump Temperature Sensor |
| 7. Air/Oil Separator | 17. Cooling Fan | 26. Sump Pressure Sensor |
| 8. Oil Fill Port | 18. Cooling Air Inlet Filter Mat | 27. Opening for Lifting Gear |
| 9. Oil Drain | 19. Compressed Air Outlet | 28. Discharge Pressure Sensor |
| 10. Oil Level Indicator | | |

Figure 8: Compressor Illustration, Base Mount Components

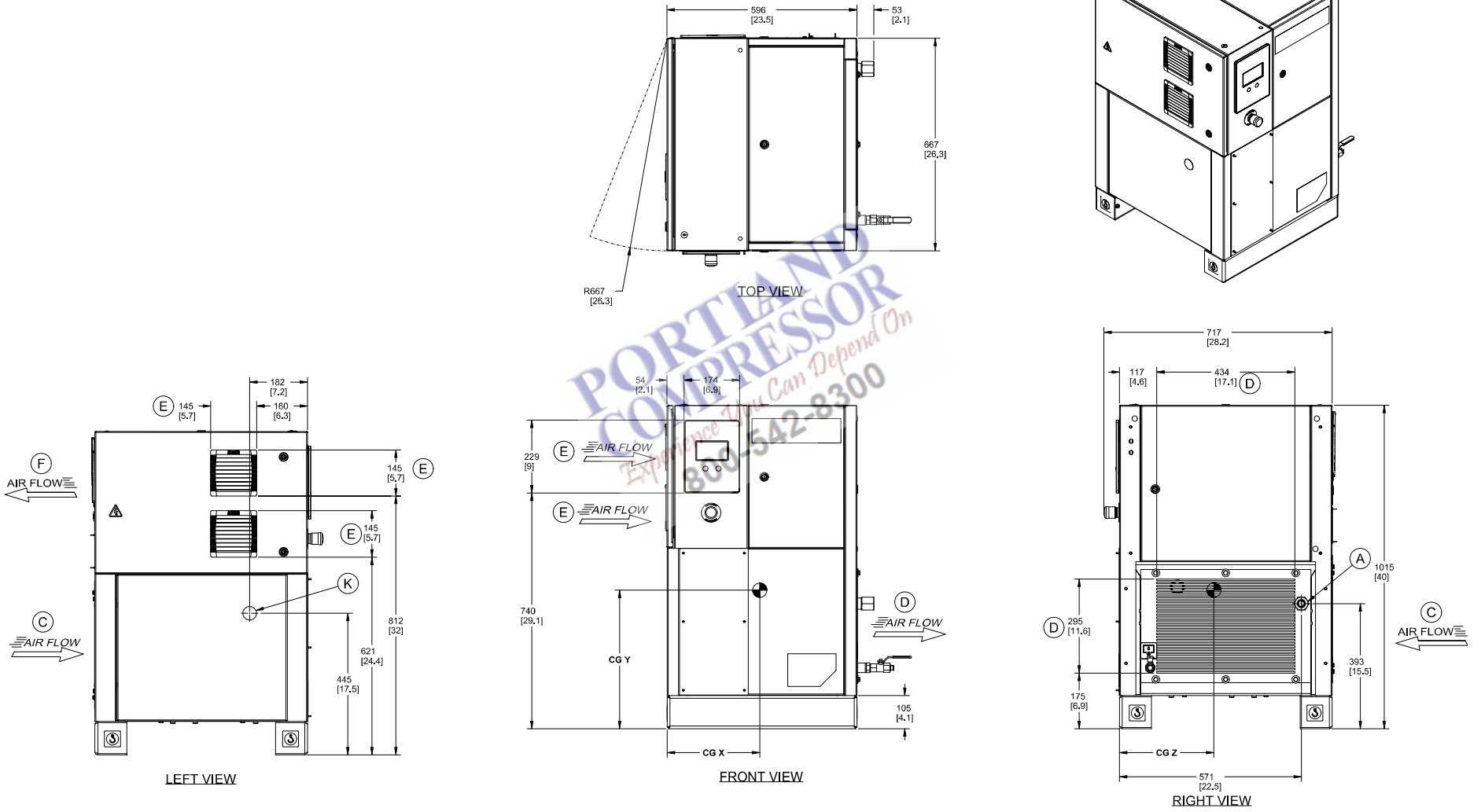
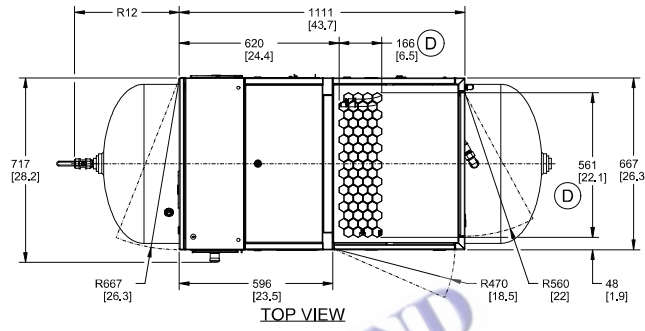
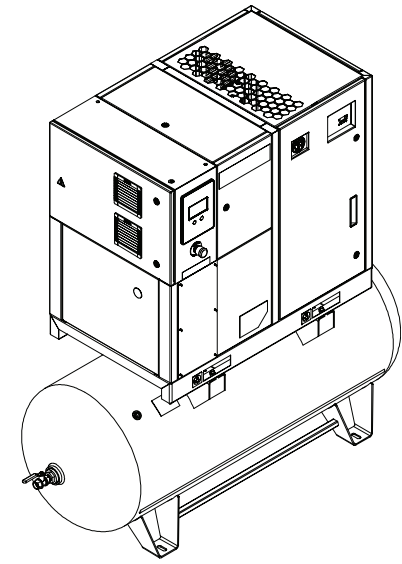
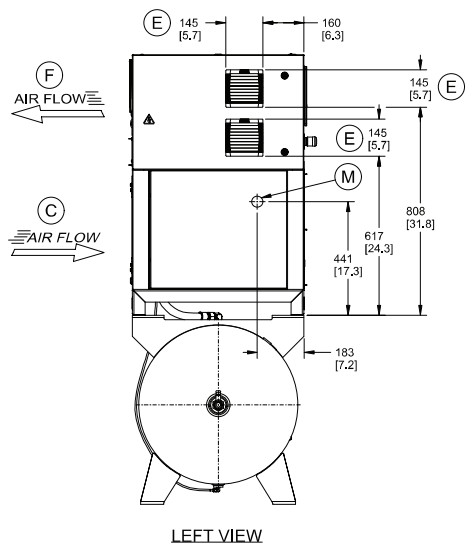


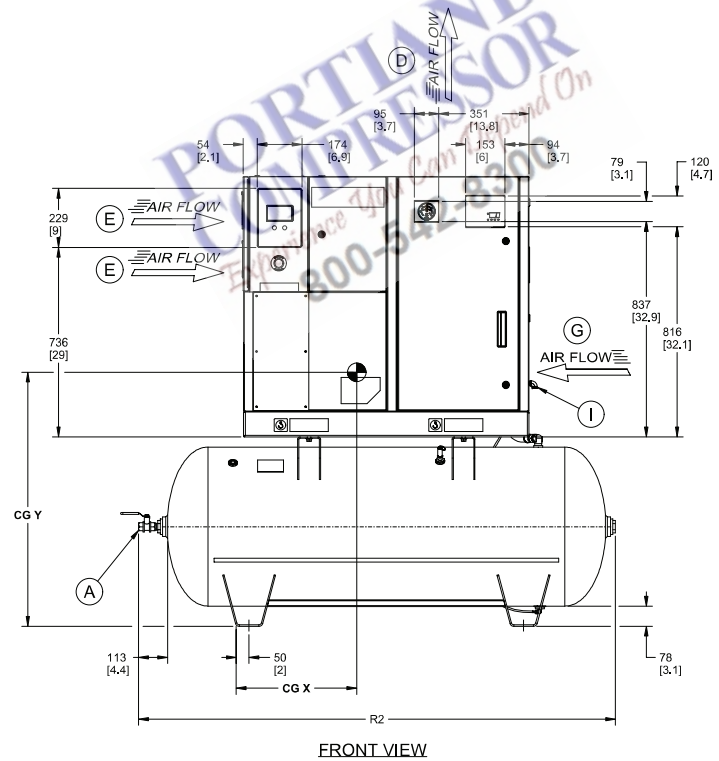
Figure 9: Compressor Illustration, Base Mount Unit



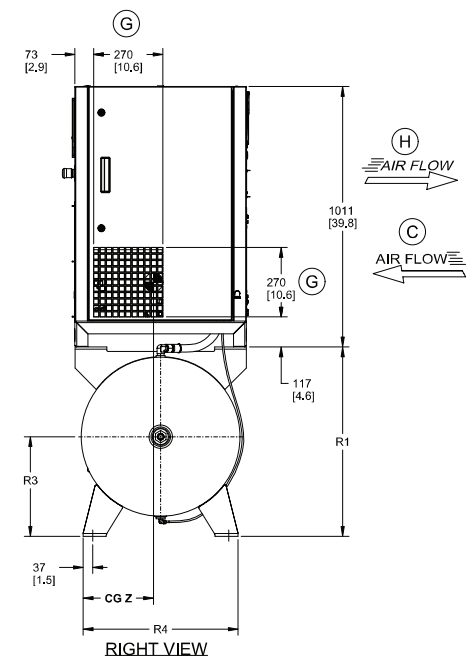
TOP VIEW



LEFT VIEW

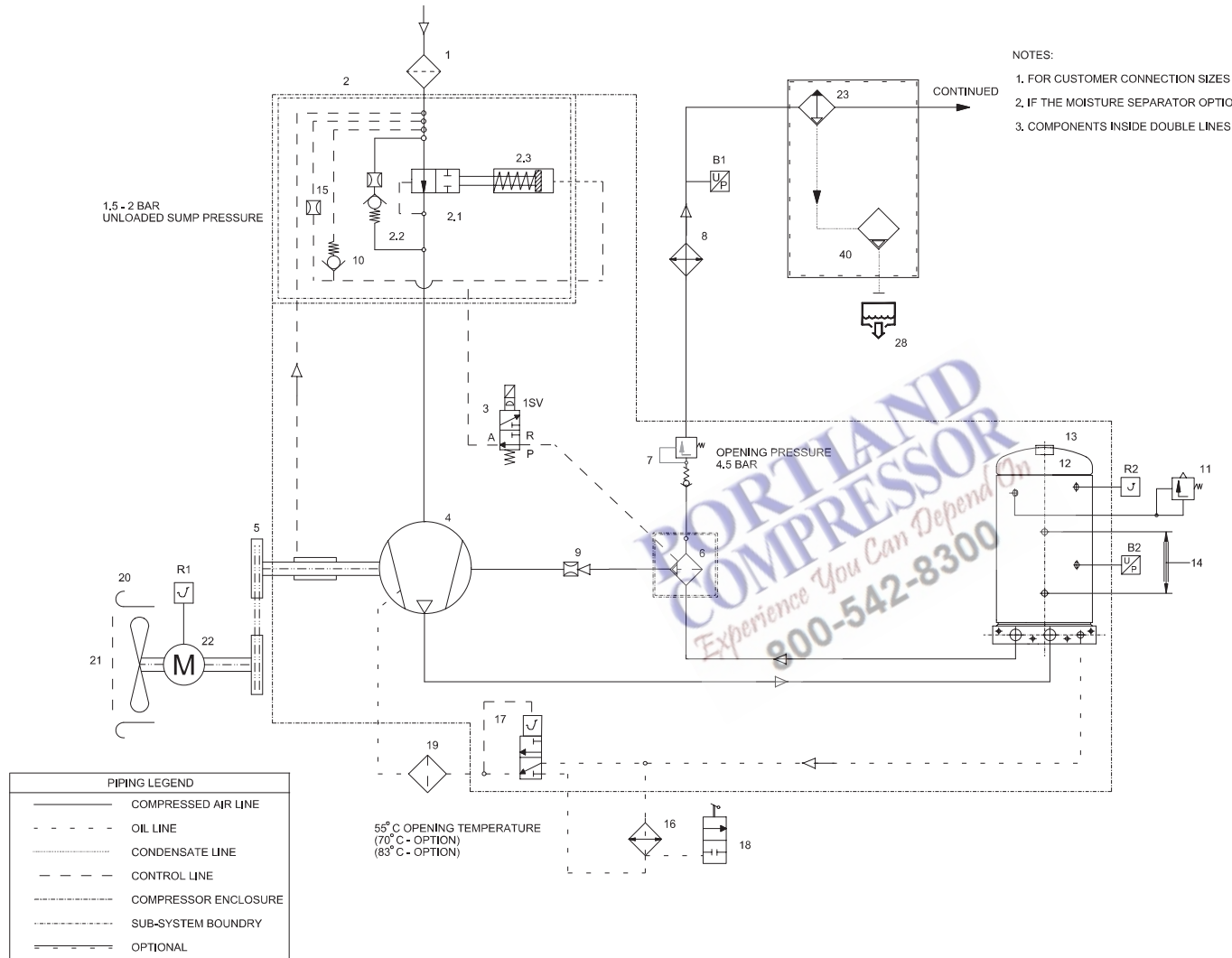


FRONT VIEW



RIGHT VIEW

Figure 10: Compressor Illustration, Tank Mounted With Dryer



NOTES:
 1. FOR CUSTOMER CONNECTION SIZES AND LOCATIONS SEE FOUNDATION PLAN OF UNIT.
 2. IF THE MOISTURE SEPARATOR OPTION IS NOT USED, THEN THE CONDENSATE DRAIN VALVE IS NOT REQUIRED
 3. COMPONENTS INSIDE DOUBLE LINES ARE OPTION MODULE.

B2	PRESSURE SENSOR
B1	SENSOR MAINS PRESSURE
R2	COMPRESSOR TEMPERATURE
R1	MOTOR TEMPERATURE
45	GAUGE, PRESSURE
44	MANUAL DRAIN VALVE
43	AUTO DRAIN VALVE
42	CHECK VALVE
41	MANIFOLD
40	AUTO DRAIN
39	CONDENSER
38	BALL VALVE WITH DEAERATING
37	REFRIGERANT COMPRESSOR - DRYER (1M1)
36	CAPILLARY TUBE
35	FILTER DRYER REFRIGERANT
34	GP FILTER
33	EVAPORATOR
32	RECUPERATOR
31	HF FILTER
30	CONDENSATE SEPARATOR
29	CONDENSATE DRAIN VALVE
28	CONDENSATE DISCHARGE
27	VALVE, ISOLATION (AIR RECEIVER)
26	CONDENSATE DRAIN VALVE - 9SV (AIR RECEIVER)
25	VALVE, SAFETY (AIR RECEIVER)
24	RECEIVER, AIR
23	MOISTURE SEPARATOR (NON - DRYER ONLY)
22	ELECTRIC MOTOR
21	COOLING AIR INLET FILTER
20	COOLING AIR FAN
19	OIL FILTER
18	OIL DRAIN
17	OIL TEMPERATURE REGULATOR
16	OIL COOLER
15	NON RETURN VALVE - OPENING PRESSURE 1 BAR
14	SIGHT GLASS, OIL LEVEL
13	OIL FILL PORT
12	PRIMARY SEPARATOR
11	PRESSURE RELIEF VALVE
10	NOZZLE 1,4 MM
9	SCAVENGE OIL - AIR SEPARATOR
8	AIR COOLER
7	MIN PRESSURE CHECK VALVE
6	SEPARATOR ELEMENT
5	BELT DRIVE
4	AIR END
3	VALVE, SOLENOID 1SV (LOAD)
2,3	ACTUATING CYLINDER
2,2	NON RETURN VALVE, NOZZLE 2,5MM
2,1	PRESSURE CONTROL VALVE
2	INLET VALVE
1	AIR INLET FILTER
DESCRIPTION	KEY TO COMPONENT

PIPING LEGEND	
—————	COMPRESSED AIR LINE
- - - - -	OIL LINE
.....	CONDENSATE LINE
- · - · -	CONTROL LINE
—————	COMPRESSOR ENCLOSURE
—————	SUB-SYSTEM BOUNDRY
—————	OPTIONAL

Figure 11a: Process & Instrumentation Diagram - Standard Configuration

47864438 Rev. A
 (Ref. Drawing)

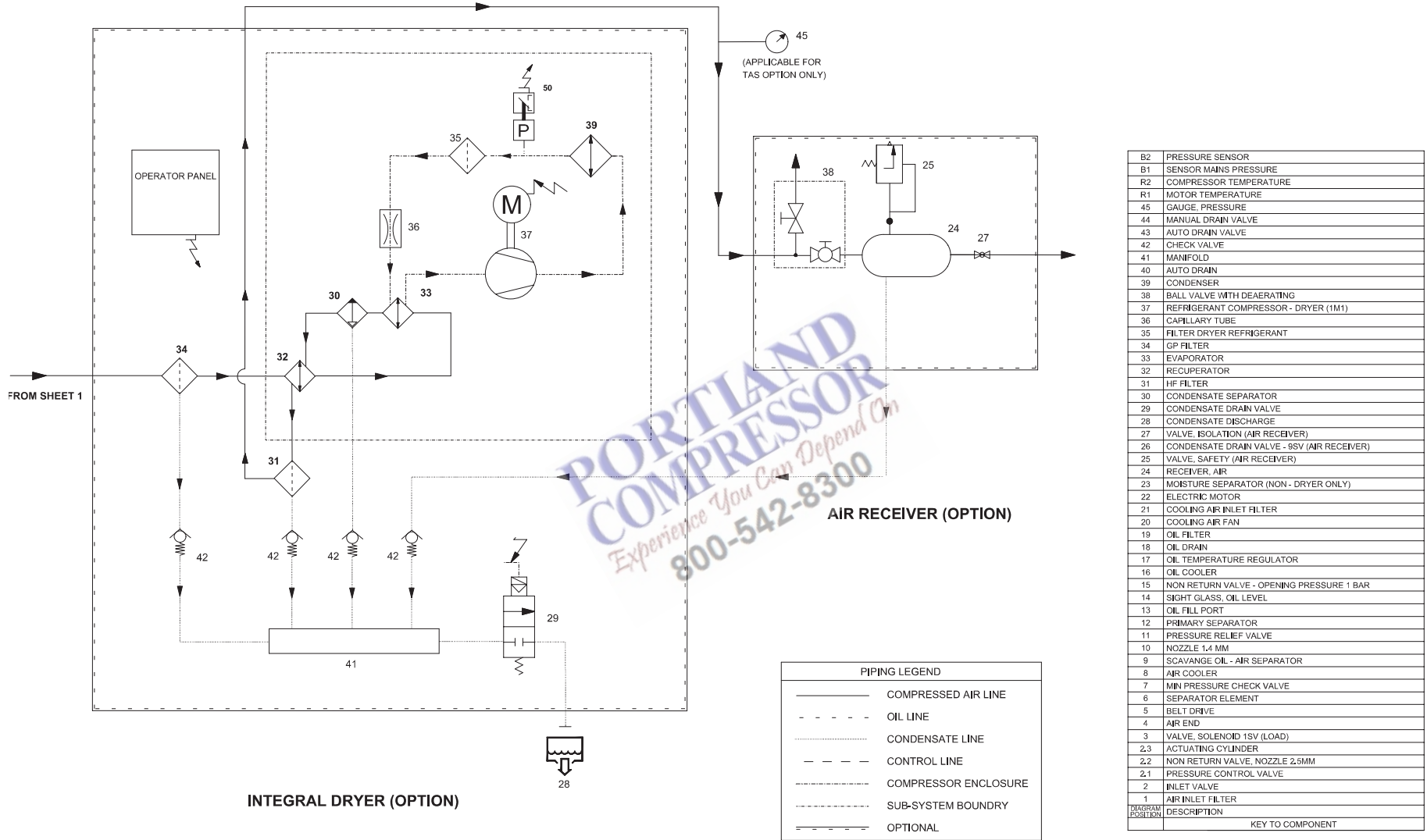
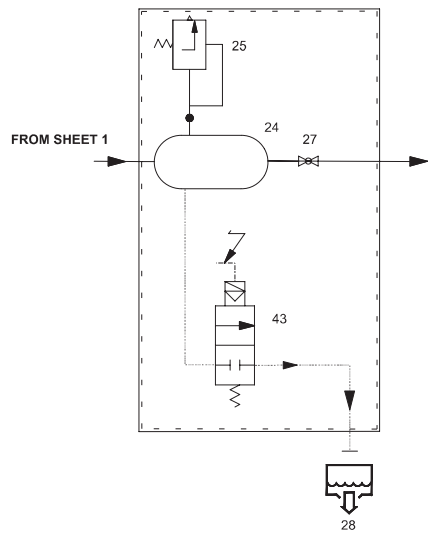


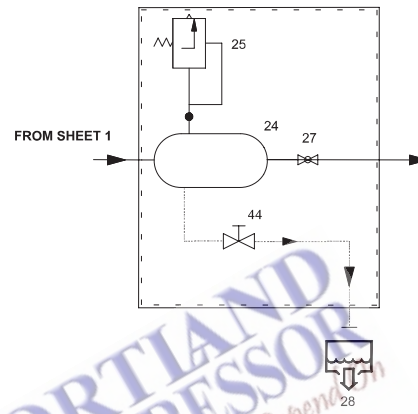
Figure 11b: Process & Instrumentation Diagram - Integral Dryer (Option)

47864438 Rev. A
(Ref. Drawing)



AIR RECEIVER WITH AUTOMATIC DRAIN (OPTION)

PIPING LEGEND	
—————	COMPRESSED AIR LINE
- - - - -	OIL LINE
.....	CONDENSATE LINE
— · — · —	CONTROL LINE
-----	COMPRESSOR ENCLOSURE
-----	SUB-SYSTEM BOUNDARY
-----	OPTIONAL



AIR RECEIVER WITH MANUAL DRAIN (OPTION)

PORTLAND
COMPRESSOR

Experience You Can Depend On

800-542-8300

B2	PRESSURE SENSOR
B1	SENSOR MAINS PRESSURE
R2	COMPRESSOR TEMPERATURE
R1	MOTOR TEMPERATURE
45	GAUGE, PRESSURE
44	MANUAL DRAIN VALVE
43	AUTO DRAIN VALVE
42	CHECK VALVE
41	MANIFOLD
40	AUTO DRAIN
39	CONDENSER
38	BALL VALVE WITH DEAERATING
37	REFRIGERANT COMPRESSOR - DRYER (1M1)
36	CAPILLARY TUBE
35	FILTER DRYER REFRIGERANT
34	GP FILTER
33	EVAPORATOR
32	RECUPERATOR
31	HF FILTER
30	CONDENSATE SEPARATOR
29	CONDENSATE DRAIN VALVE
28	CONDENSATE DISCHARGE
27	VALVE, ISOLATION (AIR RECEIVER)
26	CONDENSATE DRAIN VALVE - 9SV (AIR RECEIVER)
25	VALVE, SAFETY (AIR RECEIVER)
24	RECEIVER, AIR
23	MOISTURE SEPARATOR (NON - DRYER ONLY)
22	ELECTRIC MOTOR
21	COOLING AIR INLET FILTER
20	COOLING AIR FAN
19	OIL FILTER
18	OIL DRAIN
17	OIL TEMPERATURE REGULATOR
16	OIL COOLER
15	NON RETURN VALVE - OPENING PRESSURE 1 BAR
14	SIGHT GLASS, OIL LEVEL
13	OIL FILL PORT
12	PRIMARY SEPARATOR
11	PRESSURE RELIEF VALVE
10	NOZZLE 1,4 MM
9	SCAVANGE OIL - AIR SEPARATOR
8	AIR COOLER
7	MIN PRESSURE CHECK VALVE
6	SEPARATOR ELEMENT
5	BELT DRIVE
4	AIR END
3	VALVE, SOLENOID 1SV (LOAD)
2,3	ACTUATING CYLINDER
2,2	NON RETURN VALVE, NOZZLE 2,5MM
2,1	PRESSURE CONTROL VALVE
2	INLET VALVE
1	AIR INLET FILTER
DIAGRAM POSITION	DESCRIPTION
	KEY TO COMPONENT

Figure 11c: Process & Instrumentation Diagram - Air Receiver with Automatic & Manual Drain (Option)

47864438 Rev. A
(Ref. Drawing)

Miscellaneous Control Devices - Refer to Figure 11a, 11b & 11c for the Process & Instrumentation diagram of the control system.

Air Inlet Filter (1) - Captures solid impurities in the air stream entering compressor inlet. It also attenuates noise emitted by the compressor inlet.

Inlet Valve (2) - This device controls the intake of atmospheric air entering the compressor during the Load/Unload phases of operation.

- **During the Loaded State:** The Pressure Control Valve (2.2) remains open and allows atmospheric air to enter the compressor inlet.
- **During the Unloaded State:** The Y1 2-way Solenoid Valve feeds pressurized air underneath the Actuating Cylinder (2.1), forcing it and the Pressure Control Valve (2.2) upward and blocking-off the compressor intake. Excess gas is vented to atmosphere. A small purge line Non-Return Valve (2.3) allows a stream of air to reach the rotors and keep them from unstable, noisy operation and producing sufficient pressure to maintain cooling / lubricating oil flow.

Electric Motor (3) - Drives the Compressor (4) via a Belt Drive (5), and drives the package ventilation fan from a secondary rear shaft. It is energized by the Wye/Delta starter (variable frequency drive in variable speed models), which in turn is controlled by the controller.

Pressure Reservoir (6) - Separates by inertial effects the bulk of the compressed air and injection oil streams and serves as a sump for the latter.

Fine Air/Oil Separator (7) - Intercepts and coalesces the aerosol oil stream in the compressed air exiting the inertial separation process within the reservoir.

Oil Fill Cap (8) - Oil fill port on the reservoir.

Oil Drain (9) - Ball valve drains the oil from the reservoir and the oil trapped in the oil cooler and associated hoses.

Oil Level Indicator (10) - This gauge is located on the oil reservoir and indicates the oil level.

Oil Filter (11) - Captures solid impurities in the oil entering the compressor injection port.

Oil Cooler (12) - The air-cooled heat exchanger removes heat from the oil stream prior to injection.

Pressure Relief Valve (13) - This device protects the pressure containing components of the compressor package against high pressure exceeding 217 psig (15 barg).

Minimum Discharge Pressure/Check Valve (14) - This device maintains minimum pressure 65 psig (4.48 barg) within the air/oil sump, thus ensuring adequate lubricating oil injection flow to the compressor even when no air delivery into the system is taking place. It also functions as a check valve to prevent reversed air flow from the system line during compressor stoppage.

Air Cooler (15) - The air-cooled heat exchanger removes heat from the air stream prior to exit from the package.

Oil Fine Separator Extractor (16) - This annular orifice, built into the air/oil separator element adaptor pipe, controls the amount of oil and compressed air that is returned from the air/oil separator back into the compressor.

Y1 Solenoid Valve - This 2-way Normally Open (NO) solenoid valve controls the position of the inlet valve in response to signals from the Controller.

Pressure Sensor - Sump Dry Side (B1) - This device is connected after the minimum pressure valve. It converts the pressure in the plant air system into an electrical signal for use by the controller for monitoring and control load/unload operation.

Pressure Sensor - Sump Wet Side (B2) - This device is connected to the oil sump. It converts the pressure in the oil sump into an electrical signal for use by the controller for monitoring and control. Its signal, when compared to that of sensor (B1), indicates the pressure loss across the air/oil separator element and it can also trigger a shutdown event in case an exceedingly high pressure is detected.

Temperature Sensor - Sump Wet Side (R2) - This device is connected to the oil sump. It converts the temperature in the oil sump into an electrical signal for use by the controller for monitoring and control. Its signal is used to monitor compressor temperature and also trigger a shutdown event in case an exceedingly high is detected.

The following items additional are provided with the Total Air System (TAS) variant:

Receiver - Provides storage of compressed air and serves as a support for the compressor unit and optional dryer.

Refrigerated Dryer - The [optional] electric refrigerated dryer cools and lowers the dewpoint of the compressed air stream delivered by the compressor unit by removing the condensed water vapor entrained.

Condensate Drain Valve - This device provides drainage from the receiver. It, along with the receiver, replaces the water separator shipped loose with the basic package.

Pressure Relief Valve - This device protects the pressure containing components included with the receiver against high pressure exceeding 200 psig (14 barg).

■ Lubrication, Oil Cooler, Oil Filter & Separator

⚠ DANGER



Air/Oil Under Pressure

- Air/oil under pressure will cause severe personal injury or death.
- Shut down compressor, relieve system of all pressure, disconnect, lockout and tagout power supply to the starter before servicing the unit.

⚠ CAUTION

- Compressor, air/oil reservoir, separator chamber and all piping and tubing may be at high temperature during and after operation.
- Use of improper lubricants will cause damage to equipment. Do not mix different types of lubricants or use inferior lubricants.
- Improper equipment maintenance with use of synthetic lubricants will damage equipment. Oil filter and oil separator change intervals remain the same as for **Ingersoll Rand** genuine lubricants.
- High temperature operation can cause damage to equipment or personal injury. Do not repeatedly restart the unit after high temperature stops operation. Find and correct the malfunction before resuming operation.
- Read the oil level when the unit is shut off for an accurate measurement.
- All materials used in **Ingersoll Rand** compressor units are compatible with our synthetic rotary screw lubricants. Use caution when selecting downstream components such as air line lubricating bowls, gaskets and valve trim.

Compressor Oil System – Lubricating oil is employed to absorb the heat of compression, lubricate moving parts and seal internal clearances between the rotor and the air cylinder. Pressure differential between the air/oil sump and the final injection point into the compressor is used to move the oil mass through the various oil system components.

Oil exits the air/oil sump and is delivered to the heat exchange and thermal mixing valve, where cold (oil cooler branch) and hot (oil bypass branch) are mixed to the desired compressor injection temperature. The tempered oil is cleansed via the oil filter before injection into the compressor casing.

Recommended oil – **Ingersoll Rand** compressors are factory filled with one of several lubricants. These lubricants are formulated to the highest quality standards and are factory authorized, tested and approved for use in rotary screw compressors. Lubricants are available through your authorized **Ingersoll Rand** compressor distributor.

Oil Specifications – This machine has a standard factory fill with 4000-hour lubricant. Food Grade Oil is also available for factory fill.

Oil Level Gauge indicates the amount of oil in the oil reservoir. Read oil level when unit is shut off and the foam has settled out. In operation the oil level will fluctuate as the compressor loads and unloads. Adequate oil level falls between the MAX and MIN limits of the sight glass.

- approximate oil system total capacity is 5.5hp-7.5hp: 2.46L (0.65gal) & 10hp-15hp: 5.0L (1.3gal)

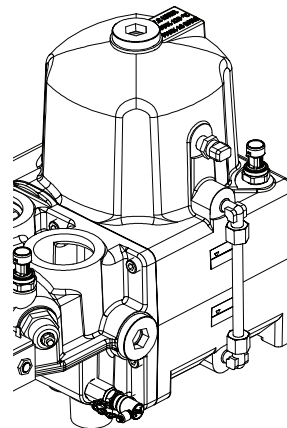


Figure 12: Oil Level Gauge

Before draining, adding, or changing the lubricant oil in the compressor, be aware of the following hazards associated with these tasks:

Safety Data Sheets (SDS) are available for all lubricants upon request.

■ Moisture in the System

During periods of low ambient temperatures, light duty cycles, high humidity, or in the event of thermal mixing valve malfunction, the oil charge residing in the sump may not reach a high enough temperature to keep water vapor from condensing as liquid water, a condition that contaminates the oil charge, may cause excessive oil carryover, or result in compressor failure.

To help the end user determine if the compressor package is operating under potential water condensing conditions, the charts in Figures 13 and 14 have been provided. To use, find the prevailing ambient temperature along the horizontal scale of the chart, move vertically from this point until intercepting the slanted line corresponding to the operating discharge pressure; and finally, move horizontally from this point to read the corresponding water vapor dew point on the vertical scale. The compressor discharge temperature must be maintained at a minimum of 5.5°C (10°F) above this dewpoint temperature to prevent condensation accumulation in the lubricant reservoir. Note that the charts conservatively assume 100% relative humidity for the ambient air.

The presence of water in the oil may be identified by one of the following means:

- Oil drawn from the oil sampling valve attached to the sump.
- Oil volume drained during an oil exchange.
- Periodic (e.g., every 2000 hours) oil sample analyzed by a reputable laboratory.

If water is found in the oil, drain sufficient volume of oil until no visible water is found, the heavier water will collect at the low elevations of the oil system, thus it will likely be expelled first. If this condition persists, consider the following solutions to avoid water condensation in the compressor oil:

- Make sure that the correct setting for the thermostatic mixing valve element is used, value is stamped on valve body.
- If the standard thermal control valve element 55°C (131°F) does not prevent water condensation, consult your application with **Ingersoll Rand**. The standard thermal control valve element may be replaced with a high temperature one 70°C (158°F). Depending on the prevailing ambient temperature, the controller setting for the high discharge temperature shutdown may have to be reset to 115°C (240°F) also.

Thermostatic Control Valve (TCV) - This device, housed within the compressor body, mixes hot and cooled oil and delivers a tempered mixture to the oil filter and finally the compressor injection port, see Figure 8 for its location.

Its thermostatic element expands with heat, and it will stroke from just opening to fully open state within a 15°C (27°F) temperature change. Within these two temperature limits the valve gradually mixes hot separator oil with cooled heat exchanger oil to maintain a nearly constant oil injection temperature. Above this range of oil temperature, the valve blocks all hot oil and only cooled oil is delivered.

The valve's nominal setting is stamped on the valve body. It may be verified by immersing the valve assembly into an open container with lubricating oil, raising its temperature to its nominal setting and checking that the element strokes fully from closed to open.

RSa7.5-11i/n Models

- Fixed Speed standard valve opening temp = 55°C (131°F), fully open temp = 70°C (158°F)
- Variable speed standard valve opening temp = 70°C (158°F), fully open temp = 85°C (185°F)

RSa4-5.5i/n Model

- Fixed speed standard valve opening temp = 70°C (158°F), fully open temp = 85°C (185°F)
- Variable speed standard valve opening temp = 83°C (181°F), fully open temp = 98°C (208°F)

Oil Sump (Reservoir) - This device provides the inertial separation of air and oil streams discharged by the compressor, the bulk (98%) of the air/oil separation is done at this step. It also serves as a holding and degassing volume for the major portion of the oil charge. It provides limited air storage for control and gauge actuation.

Air/Oil Separator - This device provides the final (2%) of the air/oil separation, typically 3.5 ppm oil content at the final discharge of the compressor package. It is housed in a removable spin-on cartridge.

Its high level of performance may be affected by the following conditions:

- Compromised media (e.g., ruptured).
- Contaminated media (e.g., vanish, moisture, inadequate oil type).
- High oil level in oil sump.
- Blockage of oil return orifice.
- Abnormally frequent or fast depressurization cycles.

Oil separator element life cannot be predicted; it will vary greatly depending on the conditions of operation, the quality of the oil used and the maintenance of the oil and air filters. The condition of the separator can be determined by pressure differential or by inspection.

Separator Pressure Differential - The pressure drop across the separator is equivalent to the difference between the two (2) pressure sensors in use. Use the measured pressure difference to forewarn of a potentially contaminated air-oil separator element:

- The pressure differential value may be calculated by subtracting the system pressure value from the compressor discharge pressure value.
- A pressure differential of 8 psi (.55 bar) may indicate a moderately dirty element.

A pressure differential of 15 psi (1 bar) may indicate a severely dirty element, replace as soon as possible.

The Air/oil separator element to be replaced by the preset life hours.

CAUTION

- Using an oil separator element at excessive pressure differential can cause damage to equipment.
- Replace the separator when the pressure differential has reached 15 psi (1 bar).

The following charts are easily used by reading the ambient temperature along the bottom axis of the chart and then reading the appropriate pressure curve to determine the corresponding dew-point temperature on the left axis of the chart. The compressor discharge temperature must be maintained at a minimum of -12°C (10°F) above this dewpoint temperature to prevent condensation accumulation in the lubricant reservoir. These charts assume 100% relative humidity.

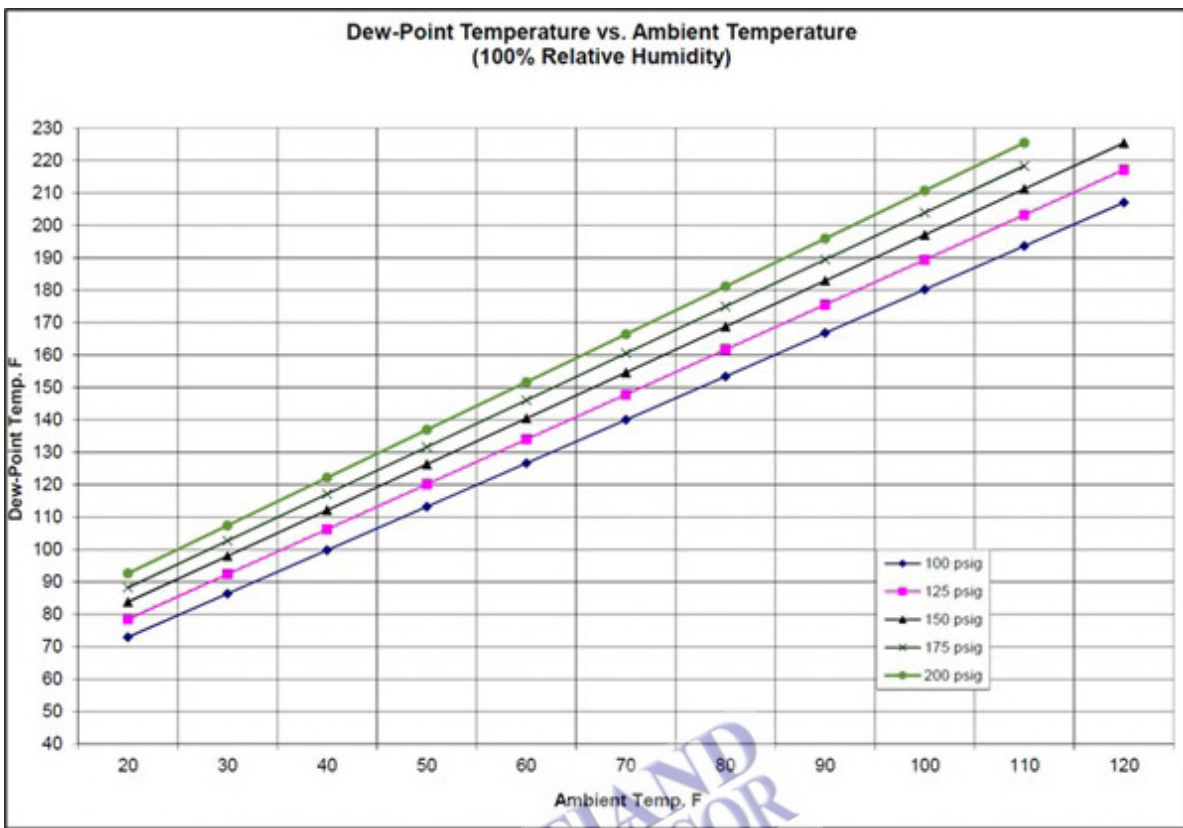


Figure 13: Dew Point Chart °F (7-11kW)

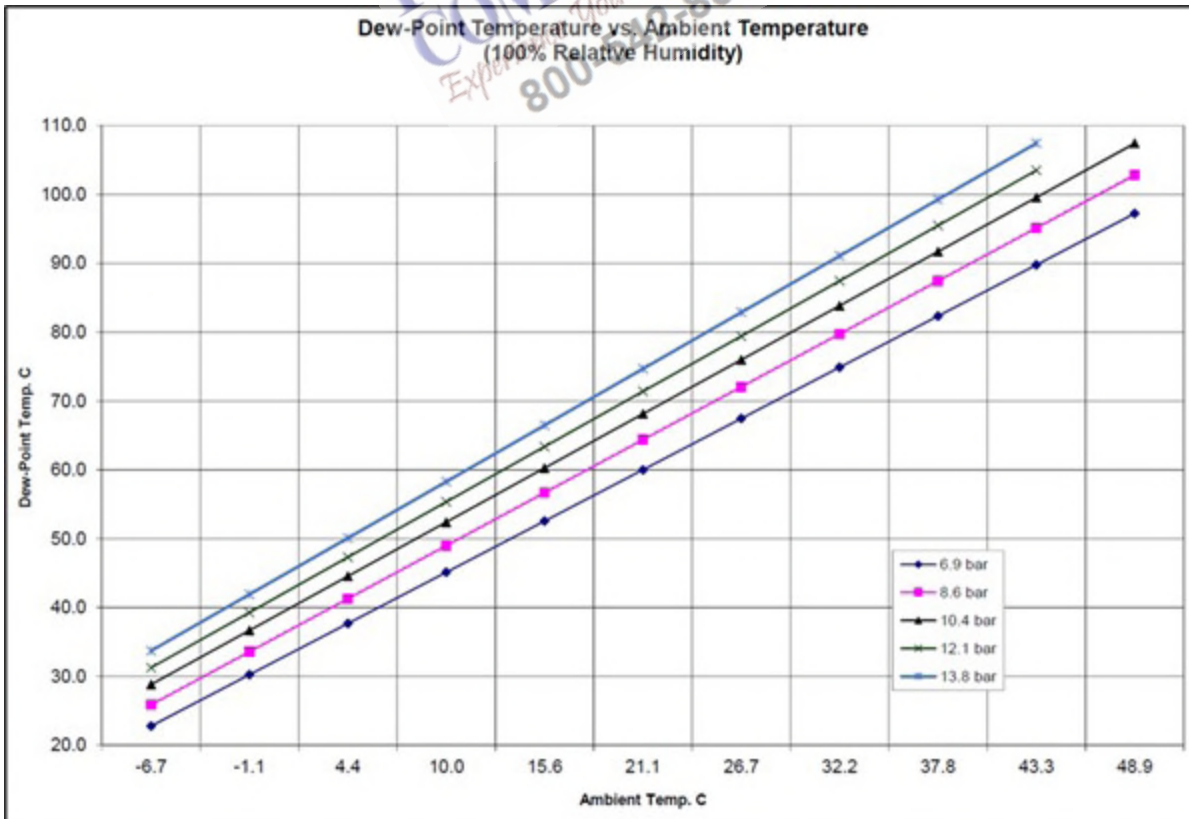


Figure 14: Dew Point Chart °C (7-11kW)

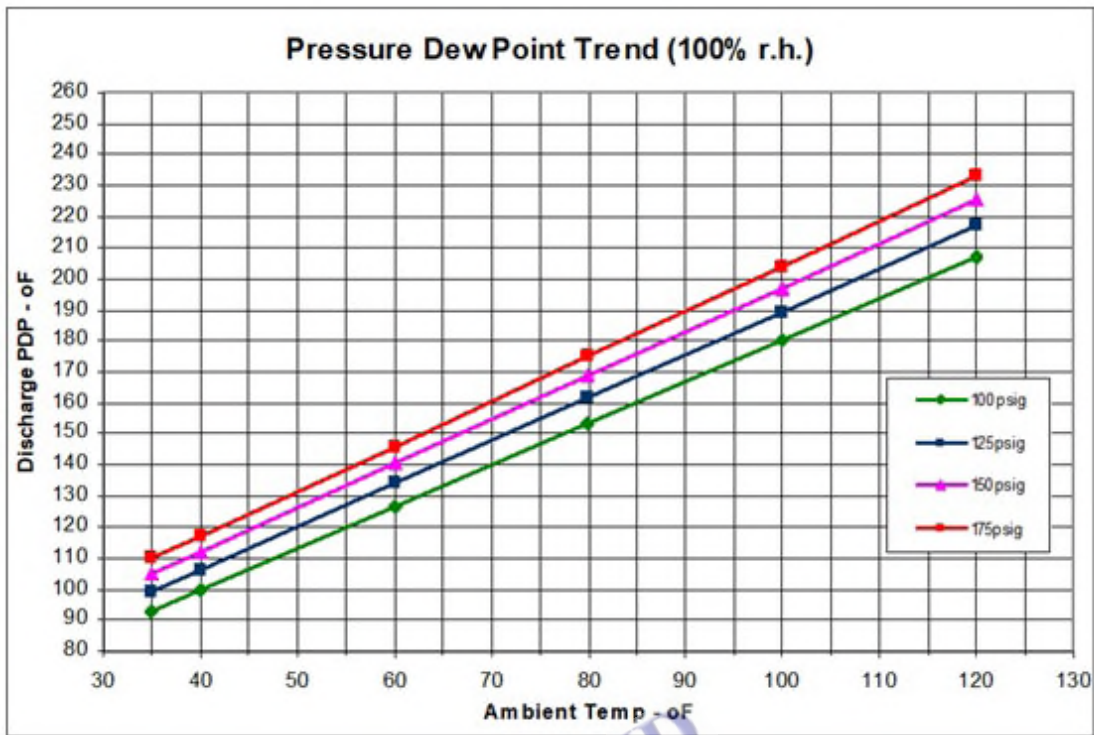


Figure 15: Dew Point Chart °F (4-5kW)

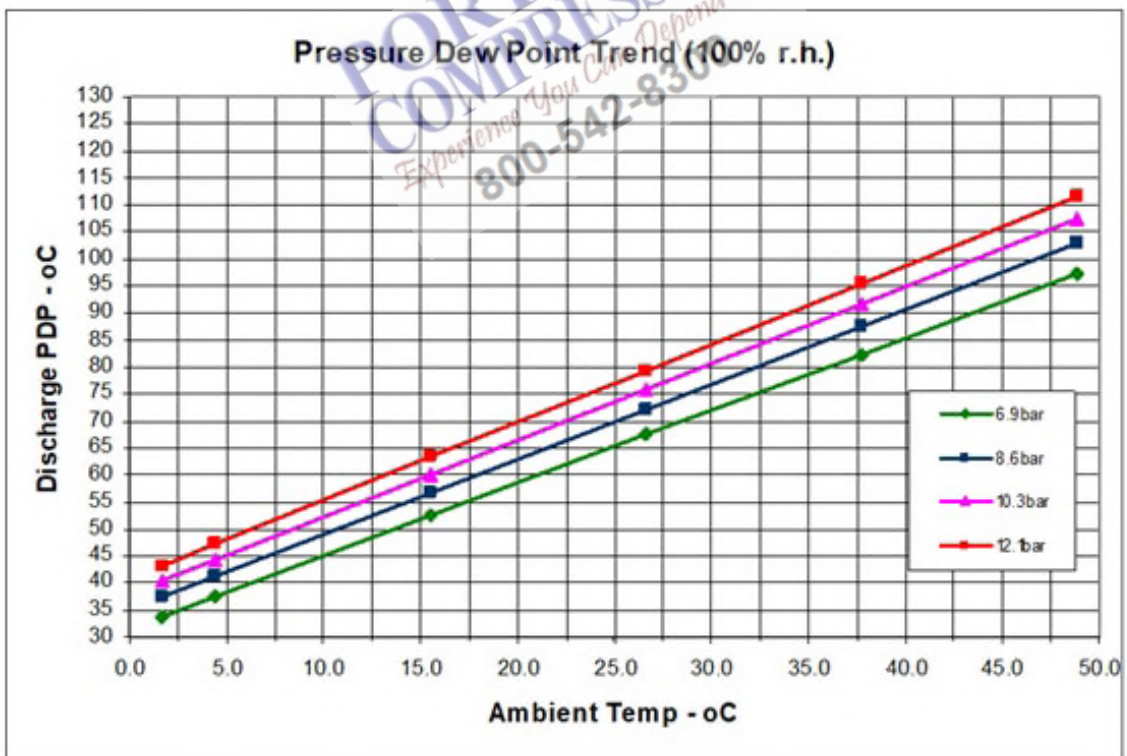


Figure 16: Dew Point Chart °C (4-5kW)

■ **Air / Oil Heat Exchangers**

CAUTION

- The ventilation system for the air-cooled package relies on positive back pressure to cool the heat exchanger.
- Make sure that the enclosure panels that surround the heat exchanger area are closed during compressor operation, or the compressor discharge temperature will reach shutdown levels quickly.

Air / Oil Heat Exchangers – The heat of compression absorbed by the oil injected into the compressors (for cooling and lubrication) is ultimately rejected in a convenient medium such as air, for these air-cooled cooler fins. The compressor’s main motor utilizes a shaft mounted fan to provide the cooling air for the heat exchanger.

Ventilation Configuration – Air-cooled cooler fins (radiator-type) are provided as standard feature. One (1) axial fan, located behind the fresh air inlet grill, delivers an air stream to: a) cool the exterior of the main electric motor and b) meet the cooling demands of the air/oil combination heat exchanger on its way out the package. The fan is mounted on a rear shaft of the main motor. In addition, an open-weave, non-metallic mesh media is held in place over the fresh air inlet grill to pre clean the cooling air stream.

Refer to Figure 17 for estimates of ventilation requirements. Please note that the air-cooled package requires the combined total of the heat exchanger plus the enclosure ventilation flow rates (which include motor ventilation and compressor intake). Furthermore, when package location makes it necessary to duct fresh cooling air in/out, these ducts must be sized with a maximum (total) pressure loss of 0.1-inch water gauge to avoid impacting the heat exchanger cooling air system. An external ventilation fan may be required to properly evacuate hot air from the compressor room.

Minimum Cooling Air Flow Requirements	
RSa4-11i	1368cfm (38.74 m3/min)
RSa5.5-11n	1436 cfm (40.67 m3/min)

Figure 17: Air Flow Chart

■ **Air Filters**

CAUTION

- Do not oil this element. Do not wash in inflammable cleaning fluids. Do not use solvents other than water. Improper cleaning may damage the element.
- Never operate the unit without the element. Never use elements that are damaged, ruptured or wet. Never use gaskets that won't seal. Keep spare elements and gaskets on hand to reduce downtime. Store elements in a protected area free from damage, dirt and moisture. Handle all parts with care.

NOTICE

Use only genuine **Ingersoll Rand** air filter elements on **Ingersoll Rand** compressor units. Genuine parts are available through your authorized **Ingersoll Rand** distributor.

Compressor Air Filter - This device cleans the air stream entering the compressor inlet and is furnished as standard equipment on the compressor package. It is a single stage, high efficiency, cellulose media element housed in a non-corrosive housing.

Efficient compressor package operation depends on the unrestricted, clean supply of fresh air delivered by the air filter. In turn, the longevity of the filter element depends on the cleanliness of the local environment.

■ **Belt Drive System**

NOTICE

Shipping Cleat installed for shipping purposes only. Remove Shipping Cleat prior to operating.

The motor power is transmitted to the compressor with a system comprised of heavy-duty v-belts, sheaves, and bushings. Belt tension is provided by the motor weight with the help of a free-pivoting bracket, see Figure 18 for details.

■ **Unpacking the V-Belt System**

To protect the belts from shock and strain during transportation, the free-swinging side of the motor frame is locked in place by means of a shipping cleat assembly. Proceed to prepare the belt system for operation as follows, refer to Figure 19 for component description:

1. Unlatch and remove the door panel opposite to the main cooling fan panel to gain access to the V-belt system.
2. Lift motor by loosening jam-nut (6) and turning adjusting bolt (2) clockwise via access hole.
3. Loosen and remove fastening screws (3) and (4) as well as shipping cleat (1). Keep this hardware for future use, such as relocating compressor package.
4. Check alignment of the sheave set and make sure that V-belts are properly seated in sheave grooves.
5. Screw out adjusting bolt (2) and secure with jam-nut (6) to allow motor weight to rest on V-belts.
6. Keep 1/4 inch clearance between the jacking bolt and the jack-bolt bracket.

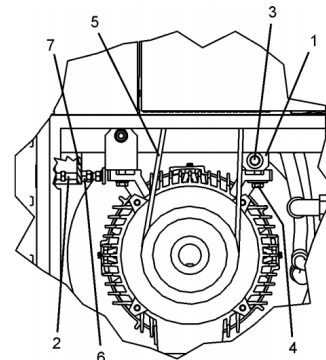


Figure 18: Motor Jacking Assembly

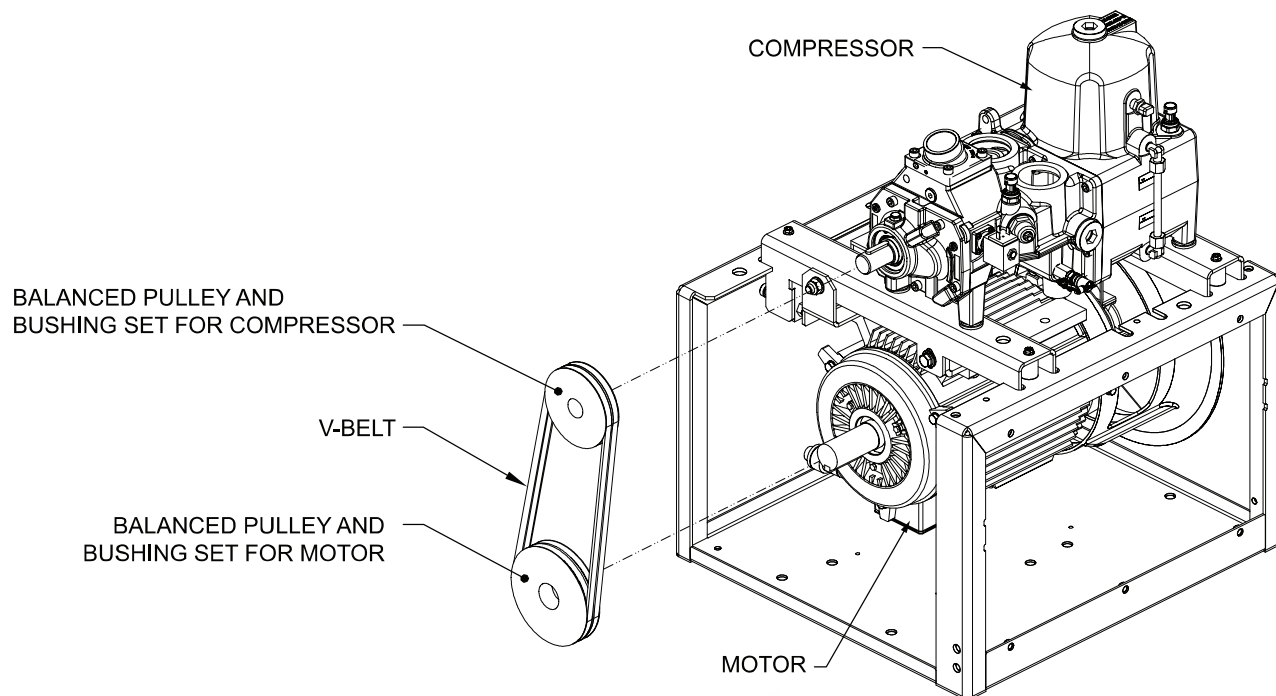


Figure 19: V-Belt Drive Components

■ Sheave Set Alignment

⚠ CAUTION

- Check sheave misalignment prior to start compressor operation.
- Failure to do so may shorten the operational life of the belts.

1. Use a straight edge for alignment checks.
2. Check parallel alignment. It should be simple to control by moving one of the sheave/bushing pairs along the shaft to match the other.
3. Check angular alignment. The misalignment $A = \text{ArcTan} * ((X2-X1)/D)$, where calculated A is in degrees and measured $X1$, $X2$ and D are in inches or mm.
4. The allowable total misalignment is 0.5 degrees for best belt longevity. As reference, 0.5 degrees represents a gap (e.g., $X1-X2$) of 0.05" (1.33mm) over a 6" diameter sheave.

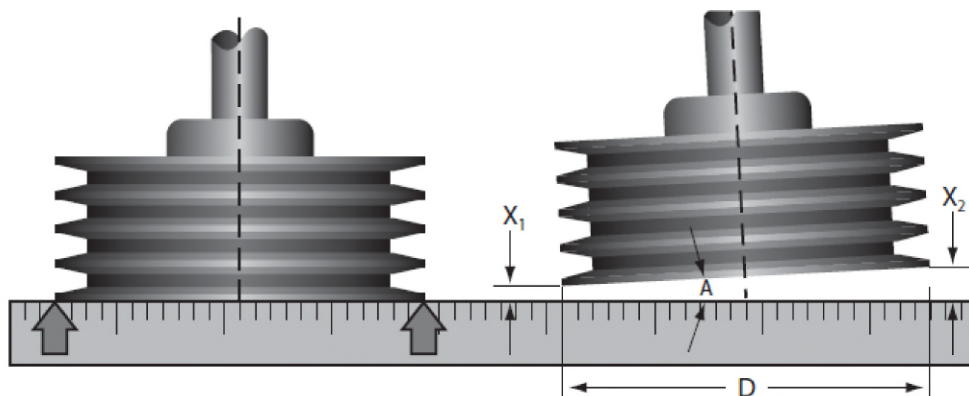



Figure 20: Measuring Angular Misalignment

■ Tank Mounted Compressor – Total Air Station

! WARNING	
	<ul style="list-style-type: none"> Do not stop the Unit using the Emergency Stop Button unless there is a danger to the product or of personnel injury. Using the Emergency Stop Button, disconnect, or breaker to stop the Unit will not all the Unit to go through an unloading sequence, and could result in damage to the Motor, Starter, or other electrical components. Damage caused in this manner is not covered by the manufacturer's Warranty.

Description - The basic compressor can be furnished mounted on an optional 80 gallon or 120 gallon compressed air receiver.

- Refer to dimensioned outline drawing.
- Refer to the description of the main components that comprise the Total Air Station.

Dryer models corresponding to compressor package models:

Compressor Model	INTEGRATED DRYER MODEL
RSa4-11i	47845564001
RSa5.5-11n	

■ Storage

■ Storing Compressors

NOTICE
<p>Damage to property</p> <p>Damage to property due to exceeding the permissible temperature range</p> <ul style="list-style-type: none"> Where there is a risk that the permissible temperature limits of +2°C (36°F) to +65°C (149°F) could be exceed or underrun, contact Ingersoll Rand.

The compressor should be stored in a dry area, heated if possible. This applies especially to the winter months.

■ Corrosion Protection

All compressors are protected at the factory against corrosion for shipping and short-term storage prior to commissioning. If compressors are stored for longer than 6 months, additional preventive measures must be taken.

Compressors that will be out of service for an extended period of time must also be protected against corrosion.

PORTLAND
COMPRESSOR

Experience You Can Depend On
800-542-8300

OPERATING INSTRUCTIONS FOR INTEGRATED DRYER (APPLICABLE TO RSa4-11i/n)

■ Introduction

This manual is an integral part of the dryer you bought, and must remain with the machine even if this will be resold.

It is highly recommended that the qualified* personnel for installation maintenance and/or control will fully comply with the contents of this manual and the prevention and safety rules in force in the country where the system will be used. In this way, not only the usage of the machine will be rational, but also the service will result cost effective.

In case your dryer will present any kind of problem, Contact your local authorized **Ingersoll Rand** distributor.

Note that, when necessary, the use of original spare parts will ensure efficiency and long duration to your dryer.

Due to the continuous technological evolution, **Ingersoll Rand** reserves the right to modify the specifications contained in this manual without giving previous notice.

■ Symbols and Labels Used in the Manual and on the Dryer

Table 2 : Symbols and Labels

	Pay particular attention to the indications preceded by these symbols.
	Air inlet / outlet
	Air inlet / outlet
	Air inlet / outlet
	Air inlet / outlet
	Air outlet
	Air inlet.
	Read the Operators manual before attempt to start up the machine and to perform any service operation on the dryer.
	Installation, maintenance, and/or control operations preceded by these symbols must be performed exclusively by qualified personnel*.
	Pay particular attention to the risk of moving parts
	Pay particular attention to components or systems under pressure.
	Pay particular attention to hot surfaces.

	Condensate drain point.
	Condensate drain point.
	Pay particular attention to the risk of electric shock.
	Rotation direction of the fan.
	Attention: Before performing any maintenance operation on this machine, do not forget to disconnect the electric supply, to completely discharge air pressure, and to refer to the Operators manual.

* Qualified personnel must be trained and certified in accordance with local laws and regulations.

■ General Information

■ Functional Description

Ingersoll Rand refrigerated air dryers remove moisture from compressed air. Moisture is detrimental to pneumatically operated appliances, controls, instruments, machinery and tools.



Compressed air enters the patented aluminum heat exchanger where it is cooled down to the dew point temperature in two different stages: In the first air/air sector compressed inlet air is cooled thanks to the colder compressed air coming out counterflow from the condensate separator. In the second refrigerant / air sector, compressed air temperature is further lowered to the dew point temperature. During this two stages almost all the oil and water vapours contained in compressed air are condensed to liquid and successively be separated from the compressed air in the condensate separator and drained out by the automatic drain. At this point the obtained cold air re-enters counterflow the initial air/air exchanger and it is reheated by the inlet hot air with the consequence of energy recovering and also reduction of the relative humidity contained in the outflowing air.

This dryer can be easily installed into various pneumatic systems in which dry air is required or desired. Refer to Principles of Operation for complete operating details.

The dryer comes provided with all the control, safety and adjustment devices, therefore no auxiliary devices are needed.

A system overload not exceeding the maximum operative limits can worsen the operational performance of the dryer (high dew point), but it will not affect its safety.






The electric diagram (attachment B) shows the minimum protection degree IP 42.

 	<p>Improper grounding can result in electrical shock and can cause severe injury or death.</p> <p>This product must be connected to a grounded, metallic, permanent wiring system or an equipment-grounding terminal or lead on the product.</p> <p>All grounding must be performed by a qualified electrician and comply with national and local electrical codes.</p> <p>In the event of an electrical short circuit, grounding reduces the risk of electric shock by providing an escape wire for the electric current.</p> <p>Ground must be established with a bare grounding wire sized according to the voltage and minimum branch circuit requirements.</p> <p>Ensure good bare metal contact at all grounding connection points, and ensure all connections are clean and tight.</p> <p>Check grounding connections after initial installation and periodically thereafter to ensure good contact and continuity has been maintained.</p> <p>Check with a qualified electrician or service technician if the grounding instructions are not completely understood, or if in doubt as to whether the product is properly grounded.</p>
--	--

■ Use of the Machine in Safe Conditions

This system has been designed and manufactured in compliance with the European safety directive in force, therefore any installation, use and maintenance operations must be performed respecting the instructions contained in this manual.

Because an air dryer is pressurized and contains rotating parts, the same precautions should be observed as with any piece of machinery of this type where carelessness in operation or maintenance could be hazardous to personnel. In addition to obvious safety rules that should be followed with this type of machinery, safety precautions as listed below must be observed.

    	<ol style="list-style-type: none"> 1. Only qualified personnel shall be permitted to adjust, perform maintenance or repair this air dryer. 2. Read all instructions completely before operating unit. 3. Pull main electrical disconnect switch and disconnect any separate control lines, if used, before attempting to work or perform maintenance on the unit. 4. Do not attempt to service any part while machine is in an operational mode. 5. Do not attempt to remove any parts without first relieving the entire air system of pressure. 6. Do not attempt to remove any part of the refrigeration system without removing and containing refrigerant in accordance with the EPA and local regulations. 7. Do not operate the dryer at pressures in excess of its rating. 8. Do not operate the dryer without guards, shields and screen in place. 9. Inspect unit daily to observe and correct any unsafe operating conditions.
---	---

■ Start Up

Switch on the main electrical isolation switch (if present). The control panel will show the message OFF, indicating that the line and control voltages are available.

• Start sequence

The dryer will start closing the contact remote ON / OFF. The fan motor will start 30 seconds after the compressor.

• Stop sequence

The dryer can be stopped locally from the control panel or opening the remote ON/OFF contact. After having pressed the ON/OFF switch for 1 second, the compressor and the fan motor keep on running for further 10 seconds in order to re-balance the internal pressures. The dryer can be also stopped due to an alarm or energy saving condition (ESA or ES2). Any alarm will de-energize the compressor, fan motor can still running, it depends on the type of alarm (see Display indications chapter). If the shutdown is due to an alarm, a message will blink on display indicating the reason for the shutdown. Energy saving condition (ESA or ES2) occurs when the dew point stands below the set value for a long time in order to save energy and avoid heat exchanger freezing. This situation can happen when ambient temperature is low and there is no compressed air load.

• **Variable speed fan control**

A patented microprocessor allows to adjust dryer’s cooling capacity by changing the fan motor speed. If the dew point is greater than the set value, the fan speed is increased, if the dew point is smaller than the set value, the fan velocity is decreased. The range can be from 0 to 100% and the higher is the fan speed, the faster the fan LED blinks, you can read the exact value by pressing the UP button.

If the velocity is 100% you will read FL (Full Load). Under load standard condition the fan speed is usually at 100%, if there is no load the fan velocity can oscillate between 0 and 20%.

■ **Control Panel**

The dryers are provided with an electronic control system. All adjustments and resets can be performed by means of the digital panel located on the front of the dryer. The control panel is composed of 5 keys (ON/OFF, TEST, SET, DOWN and UP) and a 3 digit display, with three signalling LED s indicated by icons (Figure 21).

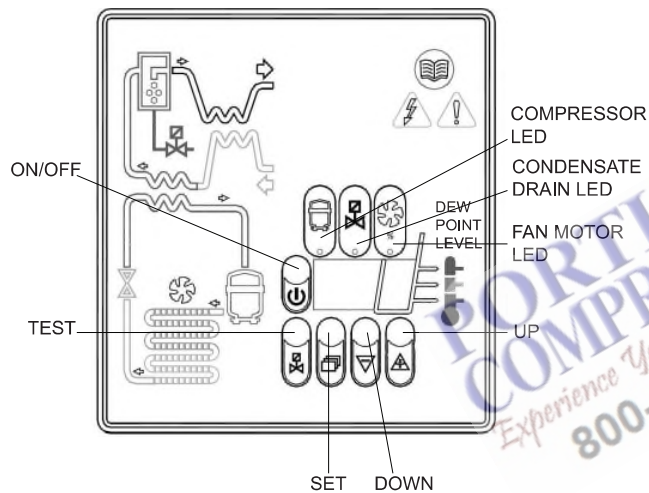


Figure 21 : Display Visualization and Signalling LEDs

Table 3 : Display Icons

Display	Description
	the unit is ON with low load
	the unit is ON with normal load
	the unit is ON with normal-high load
	the unit is ON with high load

Table 4 : LED Display Icons

LED	Status	Description
	ON	Compressor energized
	Blinking	Programming mode activated
	ON	Condensate drain energized*
	Blinking	
	ON	Speed of the fan = 100%
	Blinking	Speed of the fan < 100%
	OFF	Fan not running

• **Keys Function**

TEST: When pushed for 3 sec. during normal operation, it activates the condensate drain. (Not used on No loss condensate drain)

SET: When pushed and released during normal operation, it displays the parameter C1. When pushed for 10 seconds, it allows to enter the C8 and C9 condensate drain parameters programming menu (see relevant table). When pushed after having set new configuration values, it stores the applied modifications.

DOWN: When pushed while setting the drain set point, it decreases the displayed value of one unit per second, during the first 10 seconds, than of one unit every 0,1 sec. When pushed for 10 seconds during normal operation, it starts an automatic test cycle of the controller.

UP: When pushed while setting the drain set point, it increases the displayed value of one unit per second, during the first 10 seconds, than of one unit every 0,1 sec.

ON / OFF: Pressed, it activates or deactivates the dryer. When the dryer is deactivated, the display shows OFF.

NOTE:

When the controller is in the OFF position, some parts of the dryer may still be energized. Therefore, for safety purposes, disconnect the electrical power before performing any operation on the machine.

• **Condensate Discharge Parameters Programming**




Push the SET key for 10 seconds to enter the parameters configuration menu: the display will show in sequence the set point value, the code of the first modifiable parameter (C8) and its value).

Only if strictly necessary, use the UP and/or DOWN keys to change the displayed parameter value.

Press the SET key to store the previously changed parameter value or to browse the parameters without changing them.

15 seconds after the last performed operation, the controller will return automatically to the normal operation mode.

Table 5

  	Parameter	Description	Range	Default Set Value
	C8	Delay between condensate discharges	1 ÷ 999 (min)	1
C9	Time required for condensate discharge	1 ÷ 999 (sec)	10	

NOTE

Changes entered for timing values will be effective only after exiting the programming, while changes to other variables will be immediately effective.

Remember that eventual changes to the configuration parameters of the machine could negatively affect its efficiency. Thus, changes have to be performed by a person familiar with the operation of the dryer.

WARNING

It's forbidden to attempt to modify the other configuration parameters of the electronic controller without authorization from Ingersoll Rand's authorized distributor.

- Display Indications**

The controller is capable of recognizing certain types of anomalies in the drying circuit. In such cases, a message will blink on the display, alternated to the current dew point value.

Table 6: Display Indications

MESSAGE (BLINKING)	CAUSE	OUTPUTS	ACTIONS
HtA	High dew point value (delayed alarm)	Alarm output ON Refrig. Compressor output OFF	Resettable by switching off the dryer.
Ht2	Very high dew point value (immediate alarm)	Fan output ON Drain cycle standard	If problem persists call your local Ingersoll Rand distributor.
PF1	Interruption or short circuit on the PTC probe input line	Alarm output ON Refrig. Compressor output OFF Fan output OFF Drain cycle standard	Resettable by switching off the dryer. May require replacing the faulty probe. If problem persists call your local Ingersoll Rand distributor.
ESA	The automatic Energy saving mode activated due to low load	Alarm output OFF Refrig. Compressor output OFF	No action necessary. Automatic Reset
ES2		Fan output OFF Drain cycle standard	
ASt	Activated after repeated alarms	Alarm output ON Refrig. Compressor output OFF Fan output ON Drain cycle standard	Call your local Ingersoll Rand distributor.

NOTE: PF1 has priority on all other messages.

• Remote Signaling System



The dryer control board is equipped with a dry contact for a remote alarm signal. This is normally open contact: when an alarm is detected, this contact is closed.

Proceed as follows to activate a remote alarm output:

1. The User must review the diagram below.
2. Disconnect the dryer from electrical power supply, remove cover and left side panel.
3. Connect the alarm circuit to the terminal blocks (See Figure 22).
4. Replace cover, left side panel and reconnect power.

Alarm Output electric features:

12V DC - 40mA on alarm,
0V on normal conditions.

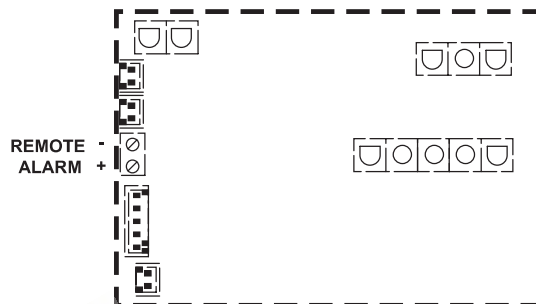


Figure 22

The activation of the above function is at the User's discretion. The User will purchase all necessary installation material. Any operation which needs access to the dryer must be carried out by qualified personnel.

■ Before Start Up



Before starting the machine, make sure that all operating parameters correspond to the nominal data.

The dryer is supplied already tested and preset for normal operation, and it doesn't require any calibration.



Nevertheless, it's necessary to check the operating performances during the first working hours.

■ Start Up

The operations specified below must be performed after the first start up and at each start up after a prolonged inactive period of time due to maintenance operations, or any other reason.

1. Make sure that all instructions contained in chapters INSTALLATION SITE and INSTALLATION have been observed.
2. Ensure dryer by-pass is open and air inlet/outlet valves closed. (if existing).
3. Activate power supply and close the remote ON/OFF contact.
4. Wait 5 to 10 minutes until machine has achieved its standard operating parameters.
5. Slowly open the air outlet valve and successively open the air inlet valve.
6. If existent, close the air by-pass valve.
7. Check if the condensate drain is working properly.
8. Check if all connecting pipes are properly tightened and fixed.



Before disconnecting the dryer from electrical power supply, use ON/OFF button on controller to stop the dryer. Otherwise wait 10 minutes before switching the dryer on again, in order to allow freon pressure to rebalance.

PREPARING FOR COMMISSIONING

■ Piping

Remove all blank flanges, stoppers, caps, and desiccant bags before installing the piping.

Discharge piping and pipe connections must be the correct size and designed for the operating temperatures and pressures.

Label the compressed air and water lines according to local requirements.

Support all piping appropriately. Pipes must not bear any loads.

If compressed air hoses are used, they must be of the correct size and must be suitable for the operating pressure and temperature. Do not use worn, damaged, or substandard hoses.

A shutoff valve should be installed in the supply line, so that the compressor can be isolated for maintenance purposes.

The drain line running away from the condensate connection must be pitched at no greater than 5mm (16.4 ft.).

An air tank of sufficient volume should be installed (as a buffer) between the compressor and the compressed air network. As a guideline for the tank capacity, select a size that is 10% of the supply volume. For example, a compressor with a supply volume of 10m³/min (353 ft³/min) requires a tank with a volume of 1m³ (35 ft³).

■ Compressed Air Connection

⚠ WARNING



Risk of injury

- A defective connection to the compressed-air system may jeopardize safe operation of the compressed-air system.
- When connecting the compressor outlet to the customer's existing compressed-air system, check that the necessary operating temperatures, operating pressures as well as the necessary connecting flange or connecting thread are appropriate and in perfect working order.
- For connections with hoses, take steps so that if an end breaks free it won't "whip" around dangerously.

NOTICE

After-coolers, separators, collecting reservoirs and the compressed-air lines must be equipped with drain facilities at their lowest points to drain collected liquids. These facilities have to be fitted to allow the observance of the draining of such liquids. Hand-operated drain facilities have to be actuated in accordance with the operating instructions.

Automatic drain facilities have to be checked for proper function at regular intervals. When draining condensate into a collecting line, which also collects the condensate from other machines, make sure that the collecting line is free from back pressure at all lines. When draining condensate, observe the corresponding regulations for waste water disposal.

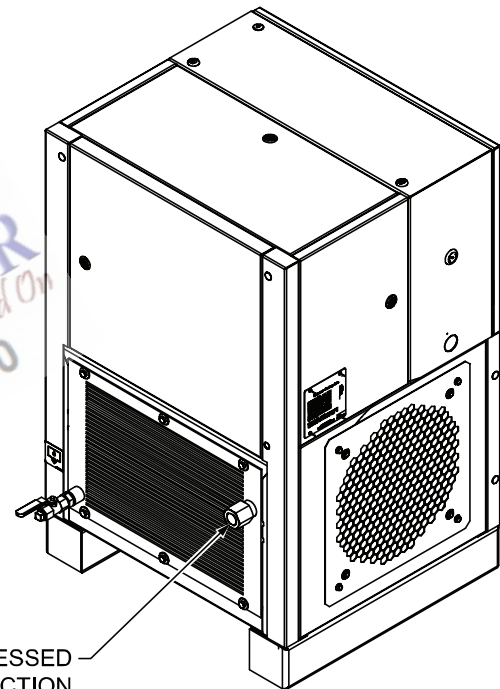


Figure 23: Compressed Air Connection

The compressor is fully assembled at the factory. The connection to the compressed air network should be made with a flexible line, that is, a compressed air hose or compensator.

Connection size: 3/4" NPT

COMMISSIONING AND OPERATION

■ First Commissioning

DANGER



High Voltage – Hazard of Electric shock, burns, or death

- Electrical shock can cause injury or death. Open main disconnect switch, lockout and tagout before working on control box.



DANGER



High Discharge Air Pressure

- Operation at excessive discharge air pressure can cause personal injury or damage to equipment. Do not adjust the operating discharge air pressure above the maximum stamped on the unit nameplate.



DANGER



Risk of injury

The direction of rotation of the drive motor can only be checked with the enclosure open.

- Before switching on, ensure that there is no one in the hazard zone.
- Keep a safe distance away from rotating parts of the machine.
- Wear hearing protection.
- Operate the compressor only when the enclosure is closed, except for test runs.

DANGER



Release Air Pressure

- Always stop the unit and release air pressure before removing oil filler plug.
- Failure to release pressure may result in personal injury or death.



DANGER



- The compressor starts and stops automatically. Automatic restarting can cause injury or death.
- Shut down compressor, relieve system of all pressure, disconnect, lockout and tagout power supply to the starter before servicing the unit.

WARNING



Risk of injury

- The enclosure doors must be closed and latched to keep the compressor package from overheating when the compressor is running.
- After an emergency stop, be sure that the pressure in the air/oil reservoir is less than 5 psig (.34 barg). Wait one minute or more before restarting.
- The controller has an automatic start/stop sequence built in. You do **NOT** need to close the air service valve.
- Closing the air service valve on start-up or prior to shutdown will cause rapid cycling, and could cause a high pressure shutdown.

CAUTION

- Operation with incorrect motor rotation can damage equipment and cause oil eruption from the compressor inlet.
- When checking motor rotation, induce minimum rotation (less than one revolution if possible).
- Never allow motor to reach full speed.
- The compressor unit's direction of rotation must be checked every time the compressor package or its main motor is reconnected to the power supply.

CAUTION

- The motor jacking hardware must be re-configured, the main motor carrier bracket removed, and belts engaged and the belt sheaves alignment checked prior to compressor operation. Failure to do so will prevent compressor operation and/or component damage.

CAUTION

- Failure to properly ground the compressor package could result in controller malfunction.

NOTICE

- Regular maintenance and replacement at required intervals of the oil filter, air filter and air/oil separator is necessary to achieve maximum service and extended drain intervals of **Ingersoll Rand** genuine lubricants. Use only genuine **Ingersoll Rand** filters designed and specified for this compressor.

NOTICE

Although every compressor has already undergone a test run at the factory, and has been checked thoroughly again prior to shipping, the possibility of transport damage cannot be eliminated.

- Check the compressor again for damage before commissioning and observe it during the first few hours of operation.
- When the compressor system is connected to a power source for the first time, always check the drive direction of the drive motor. The compressor controller provides a jogging function under the diagnostics menu. See the controller manual for additional instruction. Incorrect rotation of the compressor may cause serious damage, even during short periods of operation.

NOTICE

Shipping Cleat installed for shipping purposes only. Remove Shipping Cleat prior to operating.

■ Preparations

Check all electrical and electronic components and devices for water that may have penetrated or condensed. If any is found, contact **Ingersoll Rand**.

If the compressor has been stored for an extended period of time (up to 2 years), then switch on the main disconnect switch at least one hour prior to starting. This ensures that the capacitors are functional and prevents them from being damaged.

If the compressor has been stored for longer than 2 years, contact **Ingersoll Rand**.

Perform Initial Commissioning as follows:

- Remove transport guards and shipping cleat.
- Check the compressor oil level. Do not mix different type oils. Standard Unit is shipped filled with **Ingersoll Rand ULTRA COOLANT** lubricant which is suitable for the first 4000 hours under normal operating conditions. Other lubricants are available. Check the decal on the reservoir to be sure which lubricant is in the machine.
- Check the oil level in the pressure reservoir.
- Inspect the Air Filter to be sure it is clean and tightly assembled.
- Inspect the Pre-Filter to be sure it is clean.
- Check the wiring diagrams furnished with the unit to be sure it is properly wired.
- Check unit to make sure it is properly grounded.
- Check the alignment of the V-Belt system.
- Check for damaged panels or doors on enclosure. Check all screws and latches for tightness. Be sure doors are closed and latched prior to operation.
- Check and re-tighten all connecting terminals of the electrical control.
- Open isolator valves between the screw compressor, reservoir and pipe.
- Turn on the main power supply switch.
- After the power supply was switched on, the compressor controller will boot to the home screen. The fault shown on the display [power supply fault] must be acknowledged in the alarm screen prior to starting the unit.
- After the acknowledgement, the message [READY TO START] appears on the display, unless another fault is present.
- The factory settings of the Load, Target and Unload set points are saved in the compressor controller and depend on the pressure variant of the compressor (see nameplate Figure 1, stage pressures = maximum operating pressure). These settings can be checked or changed in the Settings -> Control menu (further information can be found in the compressor controller operating manual).
- Temporarily remove the panel in order to check the direction of rotation. Check the direction of rotation of the drive motor of the geared or direct drive compressor. Check the direction of rotation of the fan, see direction of rotation arrow on the fan.
- Use the jog motor function in the diagnostics menu to jog and check direction of rotation of the main and fan motor.
- With a wrong direction of rotation, de-energize/lockout and correct the direction of rotation.

■ Check the Direction of Rotation of the Drive Motor

NOTICE

For switching the compressor off “normally”, use only the stop push-button (-3- Figure 25), but not the EMERGENCY STOP push-button (-4- Figure 25). After having been switched off, the compressor is after-cooled for 30 seconds (soft stop).

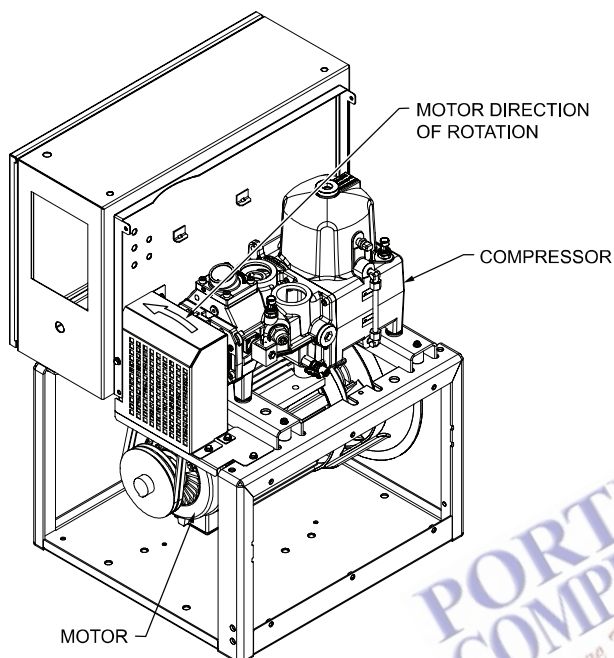


Figure 24: Drive motor direction of rotation

■ Temperature Start-up Protection

The screw compressor unit will not start up if the ambient temperature is lower than 5°C (41°F).

■ Normal Operation

NOTICE

Only for units with Variable Frequency Drives: If the compressor has been in storage for a substantial period of time (up to 2 years), switch the main power supply switch on (ON) at least one (1) hour prior to commissioning. This ensures the operability of the capacitors and prevents any damage from occurring.

If the compressor has been in storage for longer than 2 years, please contact an authorized **Ingersoll Rand** Distributor prior to start-up.

Before commissioning the compressor, all the electrical and electronic components and units should be checked for the ingress of water or condensation.

If the electronic control system was removed during shut down, it must be re-installed.

Then proceed as described in “First Commissioning” section.

■ Display of the Compressor Controller

WARNING



The compressor can be automatically started at any time when it is in enabled mode.

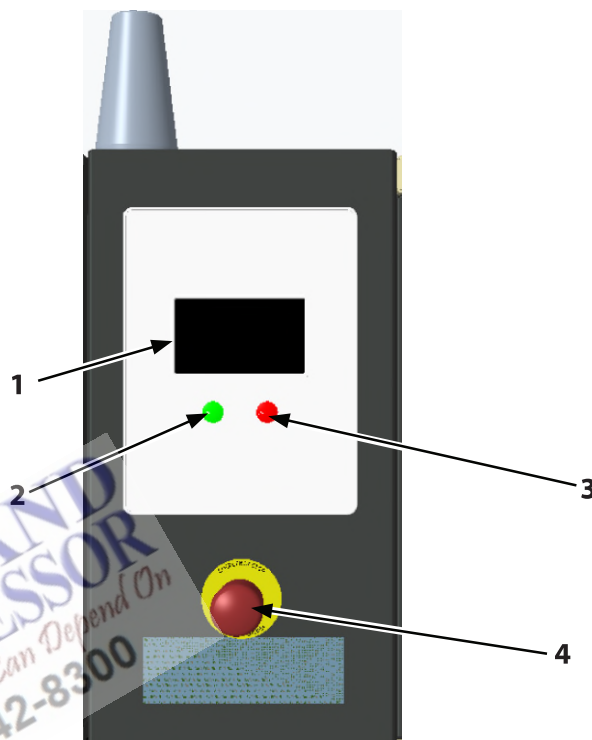


Figure 25: Controller Display

1. Touchscreen Display
2. Start button [I]
3. Stop button [O]
4. Emergency stop

■ Switching on

Press start button < I > (-2- Figure 25) on the control panel.

- The compressor switches on.
- The compressor runs automatically (automatic mode).

■ Operating states

During automatic mode, the compressor can be in one of the following operating states:

- Ready to start (Standby) [Ready to start]
- Loaded operation [On-Load]
- Partial load operation (on-load operation at reduced speed only VSD compressors) [On-Load]
- Unloaded Operation [Off-Load].

■ Observations during operations

During operation the compressor must be regularly checked to ensure leak-tightness of the oil circuit.

■ Switching Off

NOTICE

The unit may only be shut down using the emergency stop button in real emergencies. When shutting down normally, please use the O (STOP) key.

Press stop button < O > (-3- Figure 25) on the control panel, not the Emergency Stop button (-4- Figure 25).

- After shutdown, the compressor has a run on time of 30-50 seconds (soft stop).

■ Emergency Stop

⚠ WARNING



- Do not stop the Unit using the Emergency Stop Button unless there is a danger to the product or of personnel injury.
- Using the Emergency Stop Button, disconnect, or breaker to stop the Unit will not allow the Unit to go through an unloading sequence, and could result in damage to the Motor, Starter, or other electrical components. Damage caused in this manner is not covered by the manufacturer's Warranty.

The emergency stop button (-4- Figure 25) is located next to the compressor controller. It is used to immediately shut down the unit. Only use the Emergency Stop button to shut down the unit in emergencies.

■ Using the Emergency Stop

1. Press the <E-stop> button. The compressor is brought to a safe condition.
2. Correct the fault that was the reason for the emergency stop. See the "fault correction" chapter.
3. Unlock the <E-stop> button.
4. Start up the compressor. See the paragraph "Commissioning after a fault".

■ Routine Commissioning

⚠ WARNING



- Rotating parts inside the unit may lead to injuries, e.g., cutting of finger or hand.
- Before commissioning make sure that no one is located in the danger zone of the motor/screw compressor!
 - After doing work: Check that all safety equipment is reinstalled and that all tools have been taken out!
 - Only operate the screw compressor with the coverings closed!

Routine commissioning includes commissioning after maintenance:

- Check the oil level in the pressure reservoir.
- Open shut-off valves between the screw compressor, reservoir and pipe.
- Turn on the main power supply switch.
- After the power supply was switched on, the compressor controller will boot to the home screen. The fault shown on the display [power supply fault] must be acknowledged in the alarm screen prior to starting the unit.
- After the acknowledgement, the message [READY TO START] appears on the display, unless another fault is present.
- Press START button [I] (-2- Figure 25).
- To switch off the compressor in the usual way use the STOP button (-3- Figure 25) and not the emergency STOP button (-4- Figure 25). After shutdown the compressor has a run on time of 30-50 seconds (soft-stop). The time remaining is counted down on the display.

■ Temperature start-up protection

The screw compressor unit will not start up if the ambient temperature is lower than 5°C (41°F).

■ Commissioning after Extended Downtime

For commissioning after an extended idle period, contact your Ingersoll Rand distributor.

■ Commissioning after a fault

NOTICE

Property damage

Avoid switching on the compressor multiple times without clearing the fault, as this can lead to significant machine damage.

- Switch on the compressor only after the fault has been cleared.

■ Recommissioning after a fault (automatic shutoff)

Faults are shown in the "Fault memory" display memory.

1. Switch off the main disconnect switch and secure it against switching on again.
2. Clear the fault. See the "fault correction" chapter.
3. Switch on the main disconnect switch.
4. Acknowledge the fault in the Fault memory menu.
5. After acknowledgement, the message [Ready to start] appears on the display, as long as no other fault is present.
6. Press the start button < I > on the control panel.
 - The compressor switches on.
 - The compressor runs in automatic mode.

APPENDIX

Decommissioning

Routine Decommissioning

Routine decommissioning includes, for example, decommissioning for maintenance work.

1. Lockout and Tagout.
2. Close the shutoff valves between the compressor and the compressed air network.
3. Relieve the pressure in the aftercooler by carefully opening the pressure relief valve.

Decommissioning for an Extended Period of Time.

For decommissioning for more than six months, contact **Ingersoll Rand** distributor.

Final Decommissioning

In order to prevent renewed commissioning of the compressor or misuse by unknown persons, the compressor must be rendered unusable.

The compressor is made unusable by removing the electronic controller.

Consumables and Auxiliary Materials

The compressor contains approximately 4-5kW: 2.46L (0.65 gal), 7-11kW: 5L(1.3 gal) of oil.

Safety Data Sheets

When handling consumables and auxiliary materials, the associated Safety Data Sheets must be adhered to.

NOTICE

The following aspects must be taken into account for storage of storing compressors:

The compressor should be stored in a dry building which should be heated if possible. This is particularly true during the months of winter.

The coolant is to be completely drained where there is a risk of frost ($t < 1^{\circ}\text{C}$ (34°F)) (compressor stage, coolers, system containers, water filters, storage containers, lines, and valves).

If there is a risk that the temperature will fall or rise above the limits of -10°C (14°F) to 65°C (149°F), the electrical controller must be removed and stored in ambient temperatures of 5°C (41°F) to 30°C (86°F).

Disassembly

WARNING



Damage to health

Risk of damage to health from consumables and auxiliary materials

Consumables and auxiliary materials can cause irreparable damage to health, induce allergies, or irritate mucous membranes.

- Follow the locally applicable operating instructions and hazardous material Safety Data Sheets when handling consumables and auxiliary materials.
- Avoid direct contact with consumables and auxiliary materials. Wear personal protective equipment.
- In case of injuries associated with consumables and auxiliary materials, consult a physician and indicate the material involved.
- Keep the Safety Data Sheet for the causative material available.

CAUTION





Slip hazard

Slip hazard due to spilled consumables

- Clean up escaped consumable materials immediately.
- Avoid direct contact with consumables. Wear personal protective equipment.

■ Prerequisites

- The compressor is shut down.
- The compressor is electrically disconnected.
- The main disconnect switch is switched to OFF and secured against restarting.
- The compressor is not pressurized.
- Liquids and greases are removed to the greatest extent possible.

 DANGER	
	<p>Electric shock</p> <p>Deadly electrical voltage</p> <ul style="list-style-type: none"> • Work on the electrical equipment may be performed only by authorized electrical technicians.

1. Disconnect the feed cables. See wiring diagram.
2. Remove the feed cables.
3. Apply seal plugs to the feed line openings.

■ Removing the Pipework

1. Disconnect the compressed air connection.
2. Disconnect the condensate drain lines.
3. Allow the condensate to drain out completely.
4. Clean up any escaped condensate immediately.

■ Draining the Lubricating Oil

1. Open the enclosure, create access.
2. Place a suitable container below the oil drain.
3. Open the drain valve and allow oil to drain out completely. Dispose of the lubricating oil.
4. Close the drain valve.
5. Close the enclosure.

■ Remove the Oil Filter

Remove all oil filters in the lubrication system. Dispose of the filters.

- Oil filter
- Oil fine separator

■ Remove the Air Filter

Remove all filter elements and filter mats. Dispose of filter elements and filter mats.

- Air filter cartridge
- Filter mat
- Switch cabinet cooling air inlet filter
- Control air filter

■ Disposal

■ General

The compressor must be dismantled and removed by technicians. The applicable local safety and environmental protection regulations must be complied with.

When disposing of materials that are hazardous to health, the instructions on the corresponding Safety Data Sheets must be followed.

Packaging materials, cleaning agents, and used or residual consumables must be fed to recycling in accordance with the regulations applicable at the installation site.

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■ Warning Event List

Table 7: Warning Event List

Event	Alarm Code	Description
Invalid Calibration	P.372	Shall Occur when the controller fails to calibrate the Pressure sensor due to invalid conditions.
High Discharge Pressure	P.201	Shall Occur when Package Discharge Pressure sensor reads a value greater than a defined threshold for High Discharge pressure Warning.
High Sump Pressure	P.204	Shall Occur when Sump Pressure sensor reads a value greater than a defined threshold for High sump pressure Warning.
High Airend Discharge Temperature	A1.6	Shall Occur when Airend Discharge Temperature sensor reads a value greater than a defined threshold for High Airend discharge Temperature Warning.
100 Hours to Service	P.414	Shall Occur when there are 100 Hours remaining for the maintenance timer to exhaust.
Service Required	P.412	Shall Occur when the maintenance timer has exhausted.
Service Alarm	P.413	Shall Occur when it has been 100 Hours after the maintenance timer has exhausted.
Load Cycle High Duty	P.398	Shall Occur when the compressor is experiencing Load Cycles higher than a defined threshold for High Duty.
Load Cycle Severe Duty	P.399	Shall Occur when the compressor is experiencing Load Cycles higher than a defined threshold for Severe Duty.
VSD Warning Code :<#>:<Description> (Variable Speed Only)	V1.1<#>	Shall Occur when the controller receives any Warning fault Code from the drive.
Power Failure Occurred	P.0	Shall Occur when the controller boots up after a power Cycle. With Power Outage Restart feature ON or Severity Set to Warning.
Low Airend Discharge Temperature	A1.5	Shall Occur when Airend Discharge Temperature sensor reads a value Smaller than a defined threshold for Low Airend discharge Temperature Warning.
Elevated Airend Discharge Temperature	P.368	Shall Occur when Airend Discharge Temperature sensor reads a value greater than a defined Threshold for a defined prolonged period of time.
Load Or Stop Unit	P.424	Shall Occur when Machine runs Unloaded Forced State continuously for more than 10 Mins.
Heatsink Temp Limiter (Variable Speed Only)	P.12	
Control Box Temp Limiter (Variable Speed Only)	P.8	
Current & Elevation Limiter (Variable Speed Only)	P.11	
Bus Voltage Limiter (Variable Speed Only)	P.10	
HMI Capacity Limiter (Variable Speed Only)	P.14	
Main Motor Start Counter Warning	S.48	Shall occur when the Number of Motor Starts recorded is greater than the warning Threshold of Max Main Motor Starts in Counters.
Load Cycle Counter warning	S.40	Shall occur when the Number of Load Starts recorded is greater than the warning threshold of Max Load Cycles in Counters.
Software update failed	I.0	Shall Occur when the Software update action fails.
Power Outage Restart Recorded	I.1	Shall Occur when the controller records a Power Outage Restart.

■ Trips Event List

Table 8: Trips Event List

Event	Alarm Code	Description
AI_DISCHARGE_PRESSURE_SHORT_FAULT	P.202	Shall Occur when Package Discharge Pressure Sensor Wiring Shorted.
AI_DISCHARGE_PRESSURE_OPEN_FAULT	P.203	Shall Occur when Package Discharge Pressure Sensor Wiring broken.
AI_SUMP_PRESSURE_SHORT_FAULT	P.205	Shall Occur when Sump Pressure Sensor Wiring Shorted.
AI_SUMP_PRESSURE_OPEN_FAULT	P.206	Shall Occur when Sump Pressure Sensor Wiring broken.
AI_DISCHARGE_TEMPERATURE_SHORT_FAULT	A1.8	Shall Occur when Airend Discharge Temperature Sensor Wiring Shorted.
AI_DISCHARGE_TEMPERATURE_OPEN_FAULT	A1.9	Shall Occur when Airend Discharge Temperature Sensor Wiring broken.
Emergency Stop	P.1	Shall Occur when E-Stop is Engaged.
Main Motor Overload	M1.1	Shall Occur when Motor Overload Digital Input is reads OFF.
Drive Fault Overload Trip (1Ph-Variable Speed Only)	V1.108	Shall Occur when 1PH Drive Overload Digital Input is reads OFF.
Check Motor Rotation	M1.31	Shall Occur when Sump Pressure failes to rise by 1 psi during starting sequence.
Low Sump Pressure	P.3	Shall Occur when Sump Pressure sensor reads a value less than a defined threshold for Low sump pressure trip.
High Sump Pressure	P.204	Shall Occur when Sump Pressure sensor reads a value greater than a defined threshold for High sump pressure trip.
High Airend Discharge Temperature	A1.6	Shall Occur when Airend Discharge Temperature sensor reads a value greater than a defined threshold for High Airend discharge Temperature Trip.
Over Pressure	P.201	Shall Occur when Package Discharge Pressure sensor reads a value greater than a defined threshold for Over pressure trip.
Remote Stop Failure	P.397	Shall Occur when a Start Command is received while the machine is being stopped through Remote Stop Signal.
Remote Start Failure	P.396	Shall Occur when the Remote Start Command remains active for a defined period even after starting the machine.
VSD Init Fault (Variable Speed Only)	V1.201	Shall Occur when the controller fails to initialize the drive.
VSD Fault Code <#> : < Fault Description> (Variable Speed Only)	V1.1<#>	Shall Occur when the controller receives any Fault Code from the drive.
VSD Comm Failure (Variable Speed Only)	C.96	Shall Occur when the controller loses communication with the drive.
Controller Error	C.200	Shall Occur when the controller detects any internal Error.
Heavy Startup Fault	P.6	Shall Occur when the controller detects Sump Pressure rise too fast during starting sequence greater than a defined threshold.
Low Airend Discharge Temperature	A1.5	Shall Occur when Airend Discharge Temperature sensor reads a value Smaller than a defined threshold for Low Airend discharge Temperature Trip.
Excessive Unloaded Trip	P.425	Shall Occur when Machine runs Unloaded Forced State continuously for more than 30 Mins.
Extended Start Inhibit Trip	P.461	Shall Occur when Machine in start inhibit state for 30 Secs.
Unsafe Rate of Change	A1.7	Shall Occur when the controller detects the rate of change of Temperature readings is greater than a defined threshold.
Power Failure Occurred	P.0	Shall Occur when the controller boots up after a power Cycle.
IO Main Board HW/FW Trip	C.201	Shall Occur when the controller detects a Hardware or Firmware fault.

■ Start Inhibit List
Table 9: Start Inhibit List

Event	Alarm Code	Description
Inhibit:Airend Temp > 213.75 degF	SI.13	Shall Occur when Airend Discharge Temperature sensor reads a value greater than a defined Threshold When a Start is attempted.
Inhibit:Airend Temp < 35.6 degF	SI.18	Shall Occur when Airend Discharge Temperature sensor reads a value Smaller than a defined Threshold When a Start is attempted.
Inhibit:Wait for Blowdown	SI.10	Shall Occur when Sump Pressure sensor reads a value greater than a defined Threshold When a Start is attempted.
Inhibit:Wait for VSD Communication (Variable Speed Only)	SI.15	Shall Occur when the controller fails to establish communication with the drive when a Start is attempted.
Inhibit:Wait for Motor Stop (Variable Speed Only)	SI.16	Shall Occur when the controller detects the Motor Speed read from Drive is NOT 0 when a Start is attempted.
Inhibit:Pressure Too High to Start	SI.17	Shall Occur when the controller detects the Package Discharge Pressure sensor reads a value greater than a defined threshold when a Start is Attempted.

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NOTICES AND DISCLAIMERS

Machine models represented in this manual may be used in various locations worldwide. Machines sold and shipped into European community countries shall display the CE Mark and conform to various directives. In such cases, the design specification of this compressor has been certified as complying with EC directives. Any modification to any part is absolutely prohibited and would result in the CE certification and marking being rendered invalid.

The contents of this manual are considered to be proprietary and confidential to **Ingersoll Rand** and should not be reproduced without the prior written permission of **Ingersoll Rand**.

Nothing contained in this document is intended to extend any promise, warranty or representation, expressed or implied, regarding the **Ingersoll Rand** products described herein. Any such warranties or other terms and conditions of sale of products shall be in accordance with the standard terms and conditions of sale for such products, which are available upon request.

Ingersoll Rand reserves the right to make changes and improvements to products without notice and without incurring any obligation to make such changes or add such improvements to products sold previously.

Details of approved equipment are available from **Ingersoll Rand** Service departments.

The company accepts no responsibility for errors in translation of this manual from the original English version.

The design of this Compressor package and certain features within it are covered by patents held by Ingersoll Rand and patents pending.

⚠ WARNING

Cancer and reproductive harm - www.p65warnings.ca.gov

WARRANTY

The Company warrants that the equipment manufactured by it and delivered hereunder will be free of defects in material and workmanship for a period of twelve months from the date of placing the Equipment in operation or eighteen months from the date of shipment from the factory, whichever shall first occur. The Purchaser shall be obligated to promptly report any failure to conform to this warranty, in writing to the Company in said period, whereupon the Company shall, at its option, correct such nonconformity, by suitable repair to such equipment or, furnish a replacement part F.O.B. point of shipment, provided the Purchaser has stored, installed, maintained and operated such Equipment in accordance with good industry practices and has complied with specific recommendations of the Company. Accessories or equipment furnished by the Company, but manufactured by others, shall carry whatever warranty the manufacturers have conveyed to the Company and which can be passed on to the Purchaser. The Company shall not be liable for any repairs, replacements, or adjustments to the Equipment or any costs of labor performed by the Purchaser or others without Company's prior written approval.

The effects of corrosion, erosion and normal wear and tear are specifically excluded. Performance warranties are limited to those specifically stated within the Company's proposal. Unless responsibility for meeting such performance warranties are limited to specified tests, the Company's obligation shall be to correct in the manner and for the period of time provided above.

THE COMPANY MAKES NO OTHER WARRANTY OR REPRESENTATION OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED.

Correction by the Company of non-conformities whether patent or latent, in the manner and for the period of time provided above, shall constitute fulfillment of all liabilities of the Company for such non conformities whether based on contract, warranty negligence, indemnity, strict liability or otherwise with respect to or arising out of such Equipment.

The purchaser shall not operate Equipment which is considered to be defective, without first notifying the Company in writing of its intention to do so. Any such use of Equipment will be at Purchaser's sole risk and liability.

Note that this is **Ingersoll Rand** standard warranty. Any warranty in force at the time of purchase of the compressor or negotiated as part of the purchase order may take precedence over this warranty.



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A series of horizontal lines for writing, spanning the width of the page.

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