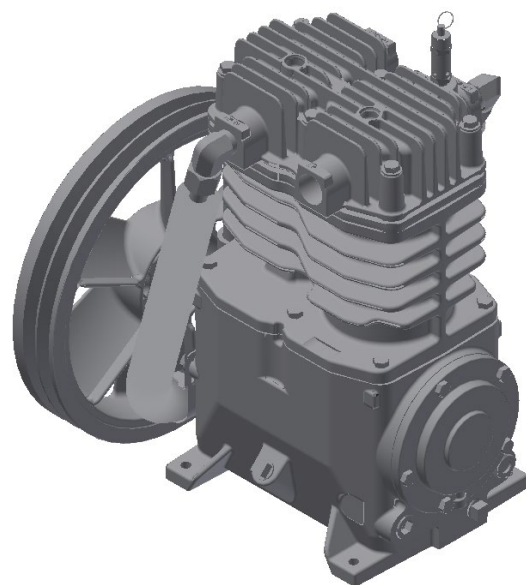
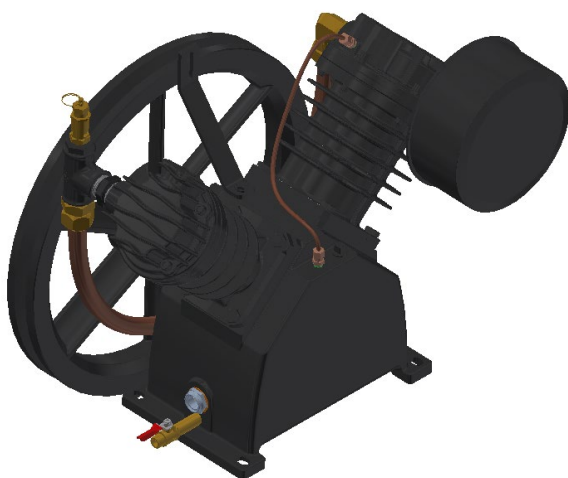


Atlas Copco

Industrial cast iron piston compressors



CR Range



Instruction book

Atlas Copco

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Industrial cast iron piston compressors

CR Range

Instruction book

Original instructions

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2019 - 02

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The Atlas Copco logo consists of the company name in a stylized, italicized serif font, positioned between two thick, solid black horizontal bars.

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1 Safety precautions

1.1 Safety icons

Explanation


	Danger for life
	Warning
	Important note

1.2 Safety precautions, general

General precautions

1. The operator must employ safe working practices and observe all related work safety requirements and regulations.
2. If any of the following statements does not comply with the applicable legislation, the stricter of the two shall apply.
3. Installation, operation, maintenance and repair work must only be performed by authorized, trained, specialized personnel.
4. The compressor is not considered capable of producing air of breathing quality. For air of breathing quality, the compressed air must be adequately purified according to the applicable legislation and standards.
5. Before any maintenance, repair work, adjustment or any other non-routine checks, stop the compressor, press the emergency stop button, switch off the voltage and depressurize the compressor. In addition, the power isolating switch must be opened and locked.
6. Never play with compressed air. Do not apply the air to your skin or direct an air stream at people. Never use the air to clean dirt from your clothes. When using the air to clean equipment, do so with extreme caution and wear eye protection.
7. The owner is responsible for maintaining the unit in safe operating condition. Parts and accessories shall be replaced if unsuitable for safe operation.
8. It is not allowed to walk or stand on the roof of the compressor canopy.

1.3 Safety precautions during installation

	All responsibility for any damage or injury resulting from neglecting these precautions, or non-observance of the normal caution and care required for installation, operation, maintenance and repair, even if not expressly stated, will be disclaimed by the manufacturer.
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Precautions during installation

1. The machine must only be lifted using suitable equipment in accordance with the applicable safety regulations. Loose or pivoting parts must be securely fastened before lifting. It is strictly forbidden to dwell or stay in the risk zone under a lifted load. Lifting acceleration and deceleration must be kept within safe limits. Wear a safety helmet when working in the area of overhead or lifting equipment.
2. Place the machine where the ambient air is as cool and clean as possible. If necessary, install a suction duct. Never obstruct the air inlet. Care must be taken to minimize the entry of moisture at the inlet air.
3. Any blanking flanges, plugs, caps and desiccant bags must be removed before connecting the pipes.
4. Air hoses must be of correct size and suitable for the working pressure. Never use frayed, damaged or worn hoses. Distribution pipes and connections must be of the correct size and suitable for the working pressure.
5. The aspirated air must be free of flammable fumes, vapors and particles, e.g. paint solvents, that can lead to internal fire or explosion.
6. Arrange the air intake so that loose clothing cannot be sucked in.
7. Ensure that the discharge pipe from the compressor to the aftercooler or air net is free to expand under heat and that it is not in contact with or close to flammable materials.
8. No external force may be exerted on the air outlet valve; the connected pipe must be free of strain.
9. If remote control is installed, the machine must bear a clear sign stating: DANGER: This machine is remotely controlled and may start without warning. The operator has to make sure that the machine is stopped and that the isolating switch is open and locked before any maintenance or repair. As a further safeguard, persons switching on remotely controlled machines shall take adequate precautions to ensure that there is no one checking or working on the machine. To this end, a suitable notice shall be affixed to the start equipment.
10. The machines must be installed in such a way that an adequate flow of cooling air is available and that the air from the exhaust does not recirculate to the compressor air inlet or cooling air inlet.
11. The electrical connections must correspond to the applicable codes. The machines must be earthed and protected against short circuits by fuses in all phases. A lockable power isolating switch must be installed near the compressor.
12. On machines with automatic start-stop system or if the automatic restart function after voltage failure is activated, a sign stating "This machine may start without warning" must be affixed near the instrument panel.
13. In multiple compressor systems, manual valves must be installed to isolate each compressor. Non-return valves (check valves) must not be relied upon for isolating pressure systems.
14. Never remove or tamper with the safety devices, guards or insulation fitted on the machine. Every pressure vessel or auxiliary installed outside the machine to contain air above atmospheric pressure must be protected by a pressure-relieving device or devices as required.
15. Pipework or other parts with a temperature in excess of 176°F and which may be accidentally touched by personnel in normal operation must be guarded or insulated. Other high-temperature pipework must be clearly marked.
16. If the ground is not level or can be subject to variable inclinations, consult the manufacturer.



Also consult following safety precautions: Safety precautions during operation and Safety precautions during maintenance.
 These precautions apply to machinery processing or consuming air or inert gas. Processing of any other gas requires additional safety precautions typical to the application which are not included herein.
 Some precautions are general and cover several machine types and equipment; hence some statements may not apply to your machine.

1.4 Safety precautions during operation



All responsibility for any damage or injury resulting from neglecting these precautions, or non-observance of the normal precautions and care required for installation, operation, maintenance and repair, even if not expressly stated, will be disclaimed by the manufacturer.

Precautions during operation

1. Use only the correct type and size of hose end fittings and connections. When blowing through a hose or air line, ensure that the open end is held securely. A free end will whip and may cause injury. Make sure that a hose is fully depressurized before disconnecting it.
2. Persons switching on remotely controlled machines shall take adequate precautions to ensure that there is no one checking or working on the machine. To this end, a suitable notice shall be affixed to the remote start equipment.
3. Never operate the machine when there is a possibility of taking in flammable or toxic fumes, vapors or particles.
4. Never operate the machine below or in excess of its limit ratings.
5. People staying in environments or rooms where the sound pressure level reaches or exceeds 90 dB(A) shall wear ear protectors.
6. Periodically check that:
 - All guards are in place and securely fastened
 - All hoses and/or pipes inside the machine are in good condition, secure and not rubbing
 - There are no leaks
 - All fasteners are tight
 - All electrical leads are secure and in good order
 - Pressure relief valves and other pressure-relief devices are not obstructed by dirt or paint
 - Air outlet valve and air net, i.e. pipes, couplings, manifolds, valves, hoses etc. are in good repair, free of wear or abuse
7. If warm cooling air from compressors is used in air heating systems, e.g. to warm up a workroom, take precautions against air pollution and possible contamination of the breathing air.
8. If available, do not remove any of, or tamper with, the sound-damping material.
9. Never remove or tamper with the safety devices, guards or insulations fitted on the machine. Every pressure vessel or auxiliary installed outside the machine to contain air above atmospheric pressure shall be protected by a pressure-relieving device or devices as required.



Also consult following safety precautions: Safety precautions during installation and Safety precautions during maintenance.
 These precautions apply to machinery processing or consuming air or inert gas. Processing of any other gas requires additional safety precautions typical to the application which are not included herein.
 Some precautions are general and cover several machine types and equipment; hence some statements may not apply to your machine.

1.5 Safety precautions during maintenance or repair



All responsibility for any damage or injury resulting from neglecting these precautions, or non-observance of the normal precautions and care required for installation, operation, maintenance and repair, even if not expressly stated, will be disclaimed by the manufacturer.

Precautions during maintenance or repair

1. Always wear safety glasses.
2. Use only the correct tools for maintenance and repair work.
3. Use only genuine spare parts.
4. All maintenance work shall only be undertaken when the machine has cooled down.
5. A warning sign stating “work in progress; do not start” shall be attached to the starting equipment.
6. Persons switching on remotely controlled machines shall take adequate precautions to ensure that there is no one checking or working on the machine. To this end, a suitable notice shall be affixed to the remote start equipment.
7. Close the compressor air outlet valve before connecting or disconnecting a pipe.
8. Before removing any pressurized component, effectively isolate the machine from all sources of pressure and relieve the entire system of pressure.
9. Never use flammable solvents or carbon tetrachloride for cleaning parts. Take safety precautions against toxic vapors of cleaning liquids.
10. Scrupulously observe cleanliness during maintenance and repair. Keep dirt away by covering the parts and exposed openings with a clean cloth, paper or tape.
11. Never weld or perform any operation involving heat near the oil system. Oil tanks must be completely purged, e.g. by steam-cleaning, before carrying out such operations. Never weld on, or in any way modify, pressure vessels.
12. Whenever there is an indication or any suspicion that an internal part of a machine is overheated, the machine shall be stopped but no inspection covers shall be opened before sufficient cooling time has elapsed; this to avoid the risk of spontaneous ignition of the oil vapor when air is admitted.
13. Never use a light source with open flame for inspecting the interior of a machine, pressure vessel etc.
14. Make sure that no tools, loose parts or rags are left in or on the machine.
15. All regulating and safety devices shall be maintained with due care to ensure that they function properly. They may not be put out of action.
16. Protect the motor, air filter, electrical and regulating components etc. to prevent moisture from entering them, e.g. when steam-cleaning.
17. Make sure that all sound-damping material and vibration dampers, e.g. damping material on the bodywork and in the air inlet and outlet systems of the compressor, are in good condition. If damaged, replace it by genuine material from the manufacturer to prevent the sound pressure level from increasing.
18. Never use caustic solvents which can damage materials of the air net, e.g. polycarbonate bowls.
19. **The following safety precautions are stressed when handling refrigerant:**
 - Never inhale refrigerant vapors. Check that the working area is adequately ventilated; if required, use breathing protection.
 - Always wear special gloves. In case of refrigerant contact with the skin, rinse the skin with water. If liquid refrigerant contacts the skin through clothing, never tear off or remove the latter; flush abundantly with fresh water over the clothing until all refrigerant is flushed away; then seek medical first aid.
20. Protect hands to avoid injury from hot machine parts, e.g. during draining of oil.



Also consult the following safety precautions: Safety precautions during installation and Safety precautions during operation.

These precautions apply to machinery processing or consuming air or inert gas. Processing of any other gas requires additional safety precautions typical to the application which are not included herein.

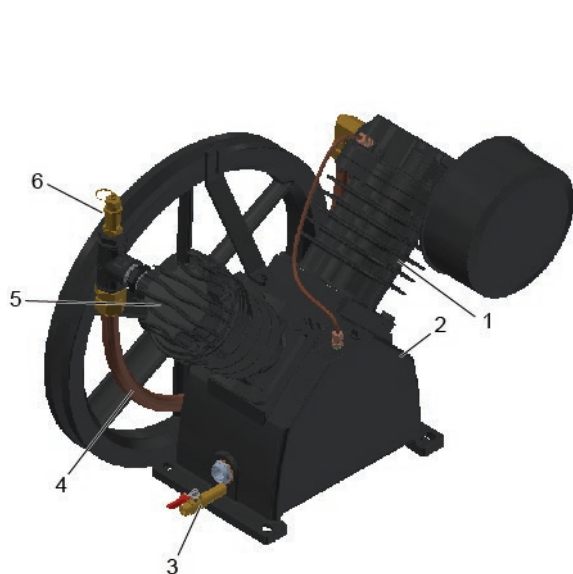
Some precautions are general and cover several machine types and equipment; hence some statements may not apply to your machine.

2 General description

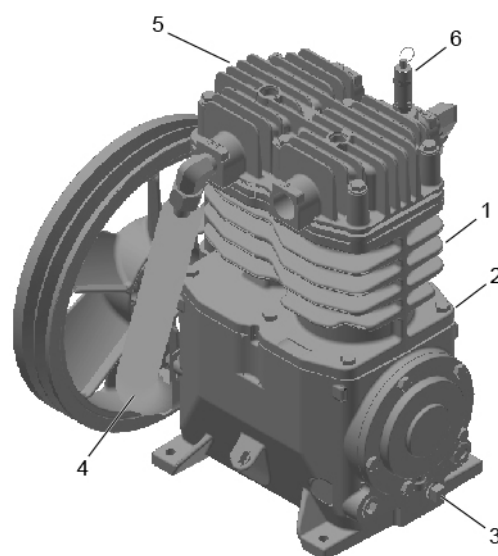
2.1 General description

Introduction

CR Range Compressors are air-cooled, two cylinder, single-stage and double-stage, lubricated piston compressors, built for effective working pressures up to 145-175 psi.

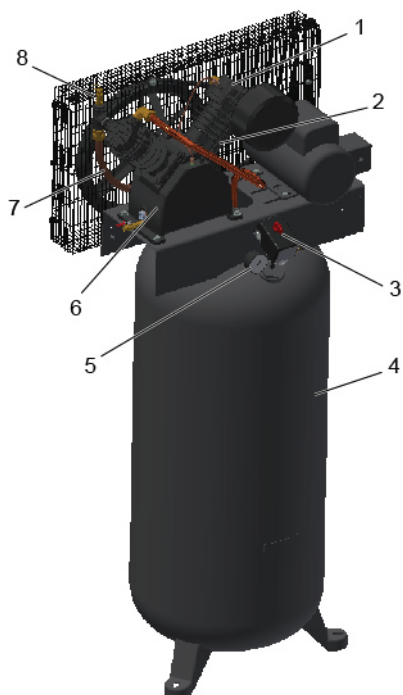
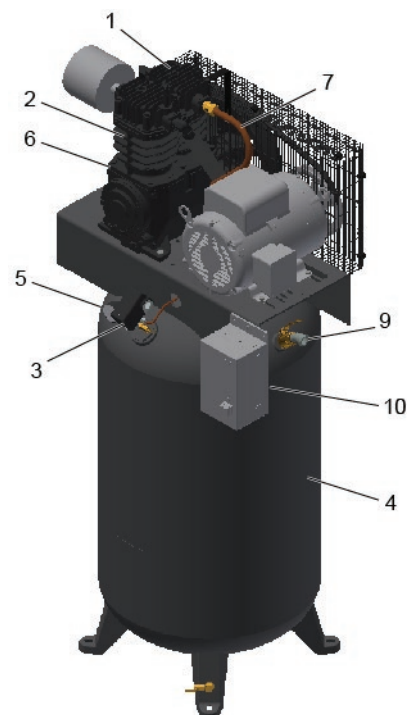


Compressor block

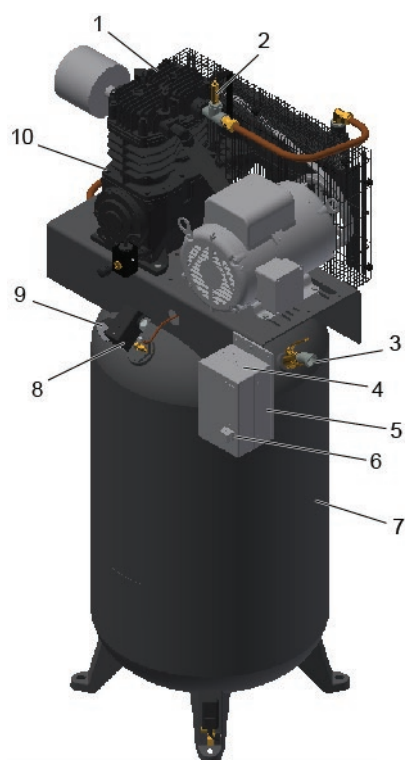


Compressor block

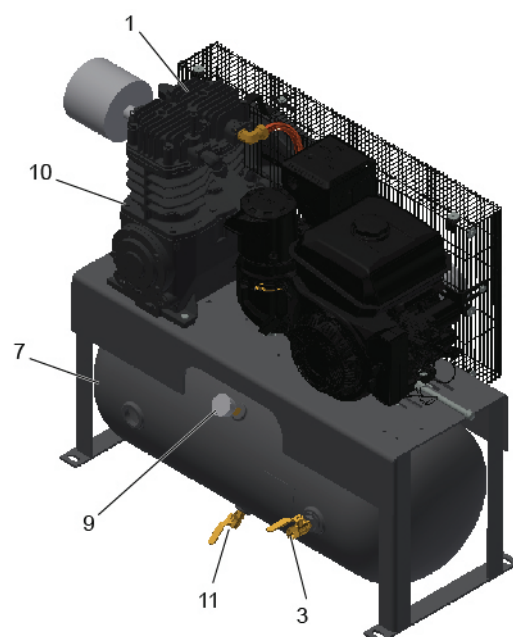
Reference	Description
1	Cylinder
2	Crankcase
3	Oil drain
4	Intercooler
5	Cylinder head
6	Pressure relief valve


Tank-mounted, vertical receiver

Tank-mounted, vertical receiver

Reference	Description
1	Compressor
2	Filter
3	Air pressure switch
4	Air receiver
5	Air pressure gauge
6	Crankcase
7	Intercooler
8	Pressure relief valve
9	Air outlet valve
10	Control panel



Tank-mounted, vertical receiver



Tank-mounted, horizontal receiver

Reference	Description
1	Compressor
2	Pressure relief valve
3	Air outlet valve
4	Hour meter (option)
5	Electric cabinet
6	On/off switch
7	Air receiver
8	Air pressure switch
9	Air pressure gauge
10	Compressor
11	Condensate drain valve

Compressor variants

The **compressor block** includes:

- Crankcase and cylinders
- Air cooler piping
- Check valve
- Pressure relief valve

The unit comprises:

- **Tank-mounted CR with electric motor:** The compressor on a horizontal or vertical air receiver with air outlet valve, pressure gauge, pressure relief valve, air pressure switch with an on/off button (MDR), and condensate drain valve.
- **Tank-mounted CR with gas engine:** The compressor on an air receiver with air outlet valve, pressure gauge, pressure relief valve, and condensate drain valve.
- **CR base-mounted unit** is a fully operational unit with air pressure switch and on/off switches mounted on a frame (no air receiver).
- **CR Contractor units** are mobile compressors. They are equipped with a gas engine. The compressors have two outlet connections:
 - A connection for compressed air at working pressure.
 - A connection for compressed air at reduced pressure via a pressure regulator.

2.2 Hour meter option

The hour meter is triggered by the motor's magnetic field, so the hours display actual operation. When the motor is on, the hours icon will blink on/off indicating the hour meter is active.

With solid-state technology the hour meter is built with a custom chip and with solid construction for maximum durability for harsh environments and rugged applications.



Hour meter

Features

- Large 5 segment LCD display
- Low cost and small size
- No external power required
- No shunt required
- Solid-state electronics
- Quartz crystal
- Wide operating temperature range
- High reliability
- Easy to install
- Made in the U.S.A.

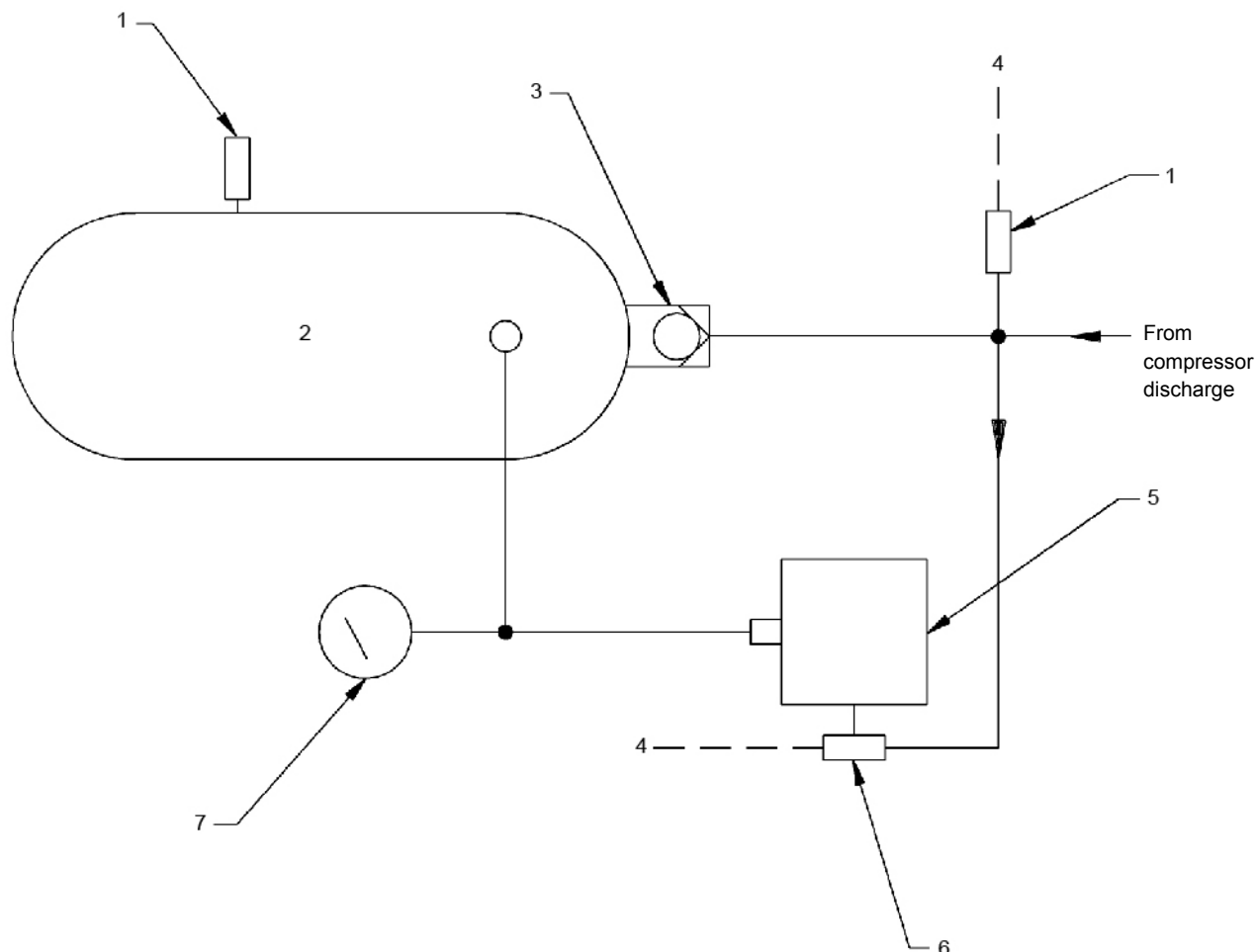
Specifications

Display Reading:	9999.9 Hour meter
Digit Height:	5-digits [8MM] LCD
Operating Voltage:	Internal lithium battery 15,000 hours continuous running
Temperature:	Standard -40°C to +85°C (-40°F to +185°F)
Vibration Resistance:	Withstands 10 to 75Hz @ 1 to 8 g's
Mounting Configuration:	Two hole base mount

2.3 Control piping

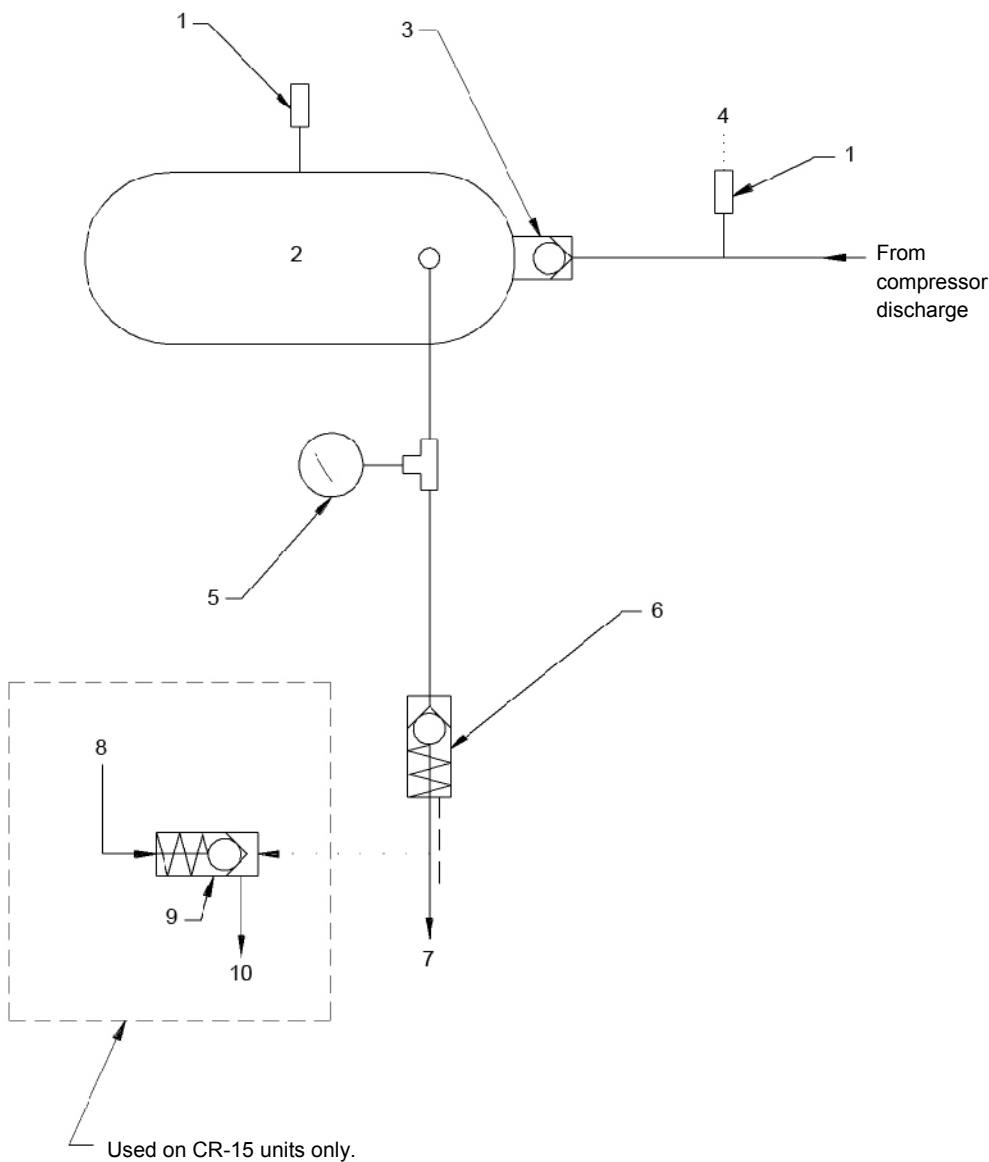
CR 2 to 15 hp

Air drawn through the air filter and inlet silencer into cylinders is compressed, then discharged through the cooler piping and “and check valve / unloader valve” into the air receiver.



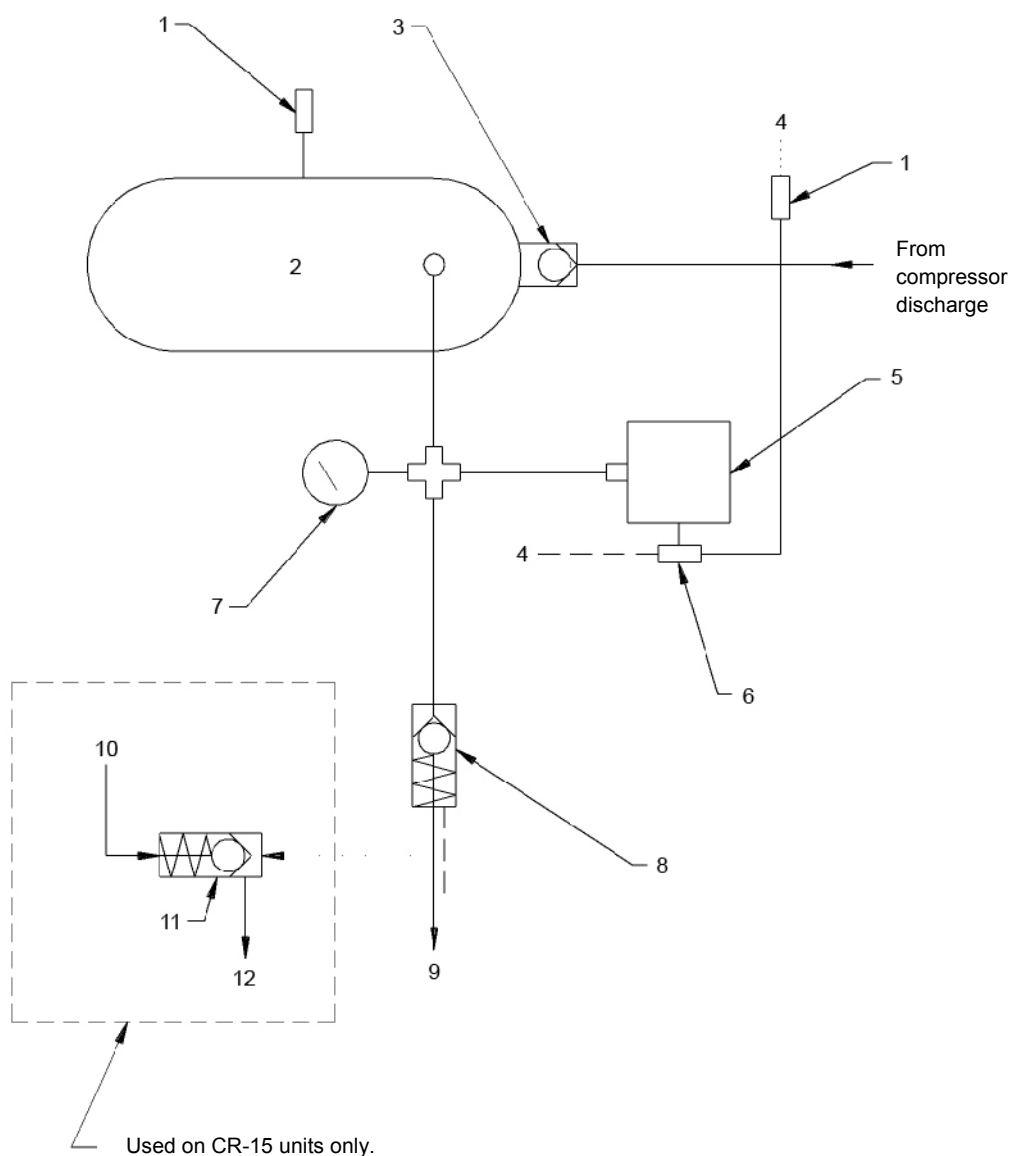
Control piping and regulating system with automatic start/stop

Reference	Description
1	Pressure relief valve
2	Air receiver
3	Discharge line check valve
4	Vent
5	Pressure switch
6	Pressure release valve on pressure switch
7	Pressure gauge



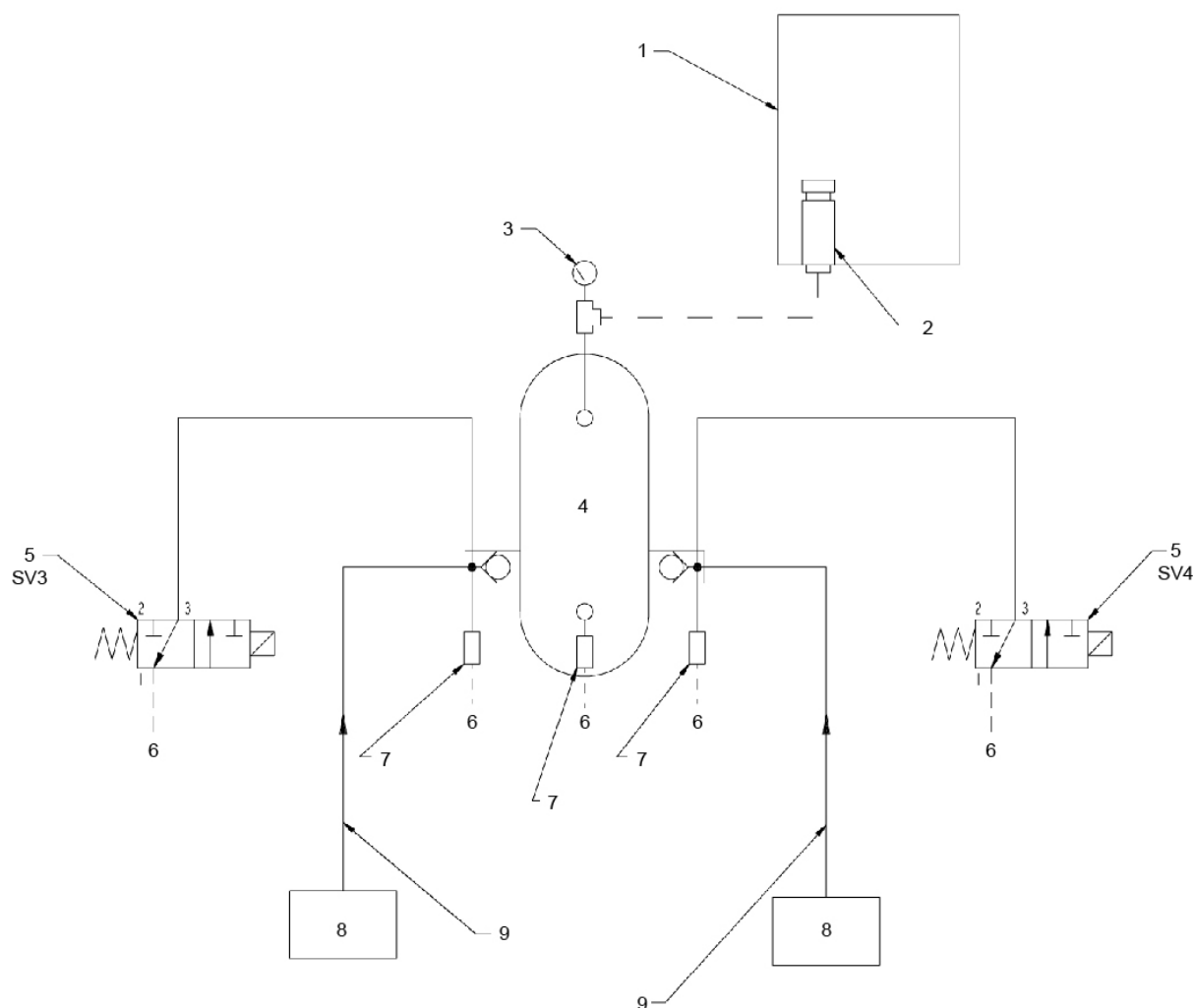
Control piping and regulating system with load/unload

Reference	Description
1	Pressure relief valve
2	Air receiver
3	Discharge line check valve
4	Vent
5	Pressure gauge
6	Pilot valve
7	Flow to head unloaders
8	Flow from compressor interstage
9	Electronic drain
10	Vent to atmosphere



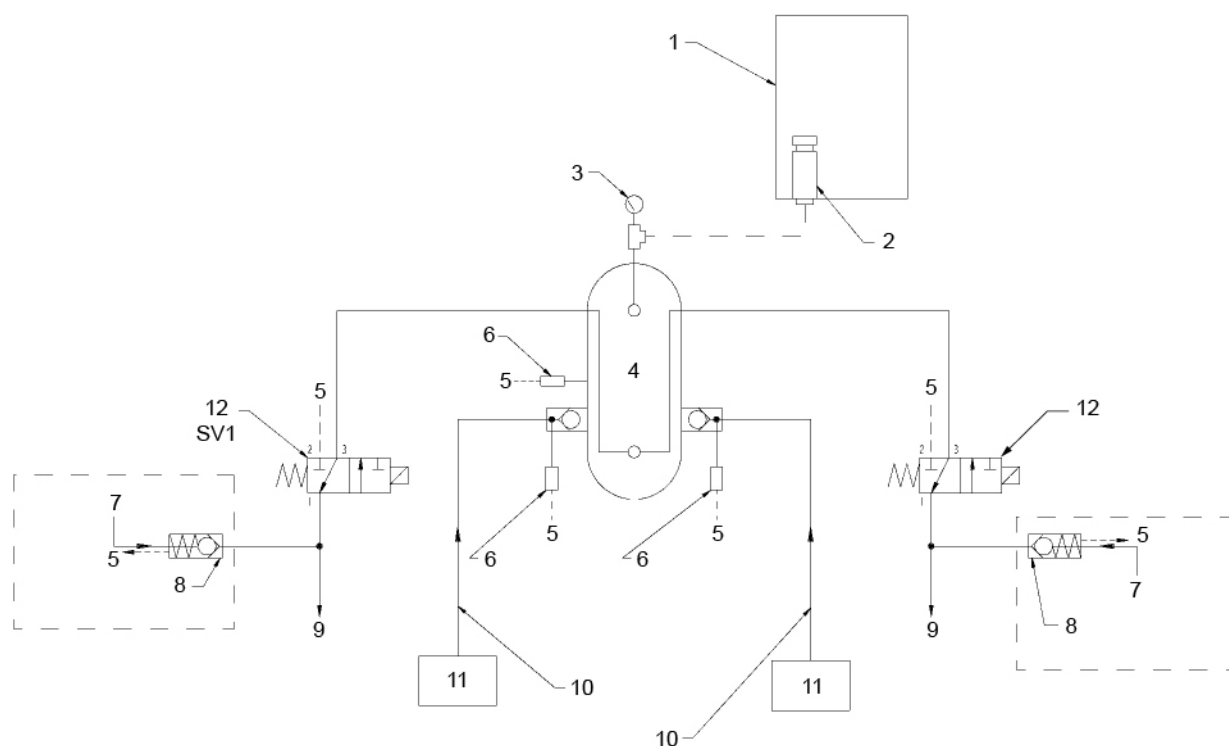
Control piping and regulating system with dual control and pilot

Reference	Description
1	Pressure relief valve
2	Air receiver
3	Discharge line check valve
4	Vent
5	Pressure switch
6	Pressure release valve on pressure switch
7	Pressure gauge
8	Pilot valve
9	Flow to head unloaders
10	Flow from compressor interstage
11	Electronic drain
12	Vent to atmosphere



Control piping and regulating system, duplex tank mount with automatic start/stop

Reference	Description
1	Control panel
2	Pressure transducer
3	Pressure gauge
4	Air receiver
5	3-way normally-open solenoid valve
6	Vent
7	Pressure relief valve
8	Compressor
9	Discharge line



Control piping and regulating system, duplex tank mount with dual control and solenoid valve

Reference	Description
1	Control panel
2	Pressure transducer
3	Pressure gauge
4	Air receiver
5	Vent
6	Pressure relief valve
7	Flow from interstage
8	Interstage dump valve (Used on CR-15 units only.)
9	Flow to compressor head unloaders
10	Discharge line
11	Compressor
12	3-way normally-open solenoid valve

2.4 Regulating system

Automatic Start/Stop

The regulating system includes:

- Check valve
- Air pressure switch (MDR) with pressure release valve and on/off button (S1).

Operation

The air pressure switch opens and closes its contacts at pre-set pressures. During loaded operation, the contacts are closed: the motor is running.

When the pressure in the air receiver reaches the pre-set maximum pressure, the contacts as well as pressure release valve are opened. The motor stops, the air at the delivery side of the compressor is vented to atmosphere and the check valve closes to prevent venting of the receiver.

When the pressure in the air receiver decreases to the pre-set minimum pressure, the contacts of the air pressure switch close and the pressure release valve closes. The motor restarts and compressed air is supplied to the receiver again.

CR Contractor

The regulating system includes:

- Pilot valve
- Unloader with integrated check valve

Operation

The pilot valve opens and closes at pre-set pressures. During loaded operation, the pilot valve is closed, preventing the compressed air from flowing to the unloader.

When the pressure in the pulsation dampers reaches the pre-set maximum pressure, the pilot valve will open. Compressed air from the pulsation dampers will flow to the plunger which causes the unloading valve to open. The air at the delivery side of the compressor is blown through the silencer to the atmosphere and the check valve closes to prevent venting of the pulsation dampers. The compressor runs unloaded.

When the pressure in the pulsation dampers decreases to the pre-set minimum pressure, the pilot valve closes. Control air from the unloader plunger chamber is vented to the atmosphere. The unloading valve closes and compressed air is supplied to the pulsation dampers again.

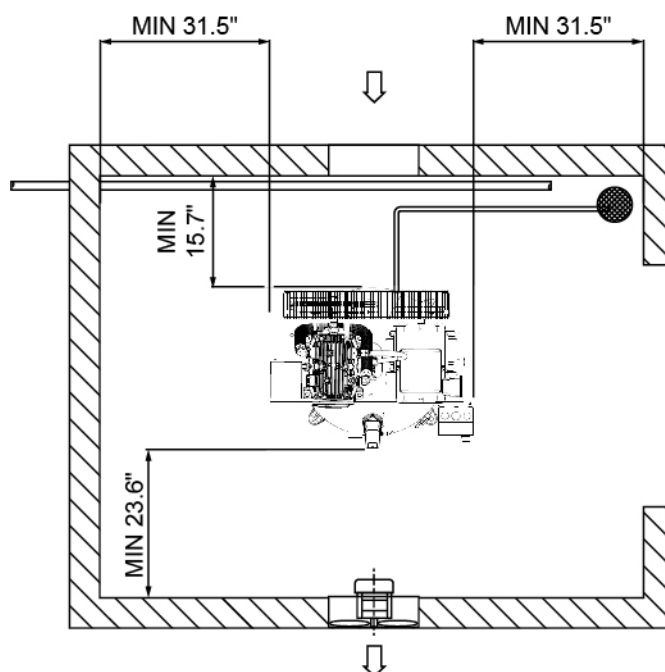
3 Installation

3.1 Installation instruction

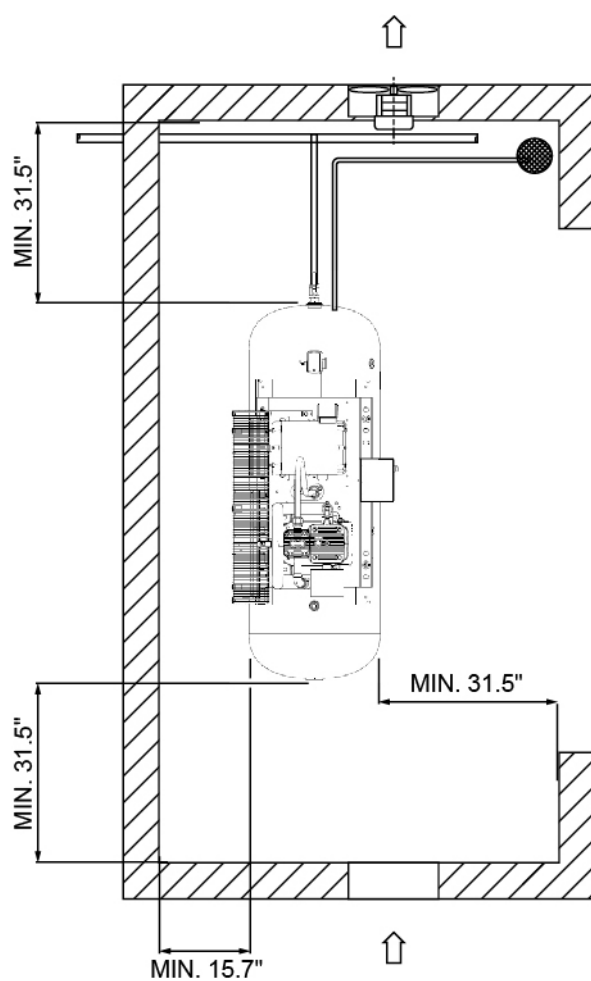
Install the unit in an area where the noise levels do not cause inconvenience and adequate ventilation is available for cooling purposes.



Before commencing installation, check that the electrical data on the compressor specification plate/s are compatible with the local power supply. Before connecting the electricity, ensure that the power supply is off and correctly isolated. The electrical power supplied to the compressor unit must be connected by a qualified electrician in accordance with the wiring diagram supplied with the plant. All wiring must be in accordance with UL regulations. Cable sizes given in section. Electric data are recommendations only.



Installation proposal for CR with vertical receiver



Installation proposal for CR with horizontal receiver

CR

Install the compressor horizontally, in a cool but frost-free and well-ventilated room. Place the compressor as level as possible; however, CR can be operated with a maximum inclination of 40% (22.5 degrees) in any direction. The air should be clean.

It is recommended to install an automatic condensate drain (available as an option) on the air receiver to ensure continuous condensate removal.

CR Contractor

The compressors are equipped with a lifting eye or yoke. When running, the compressor must be installed as level as possible; however, it can be operated temporarily in an inclined plane of maximum 25% (or 20 degrees). Keep the compressor in a frost-free and well-ventilated place.

3.2 Electrical connections

Warning



The electrical connection must be carried out by an electrician and must correspond to the local codes. The indications on the motor data plate must correspond to the power supply voltage and frequency. The installation must include an isolating switch in the power line near the unit and be protected against short-circuits by fuses for each phase. Refer to Fuses and wire sizes.

The power supply and grounding lines must be of suitable size. Refer to Fuses and wire sizes in Section 3.3.

For Automatic Start/Stop, connect the power supply cables as shown in the electrical diagrams. Check the setting of the overload relay.

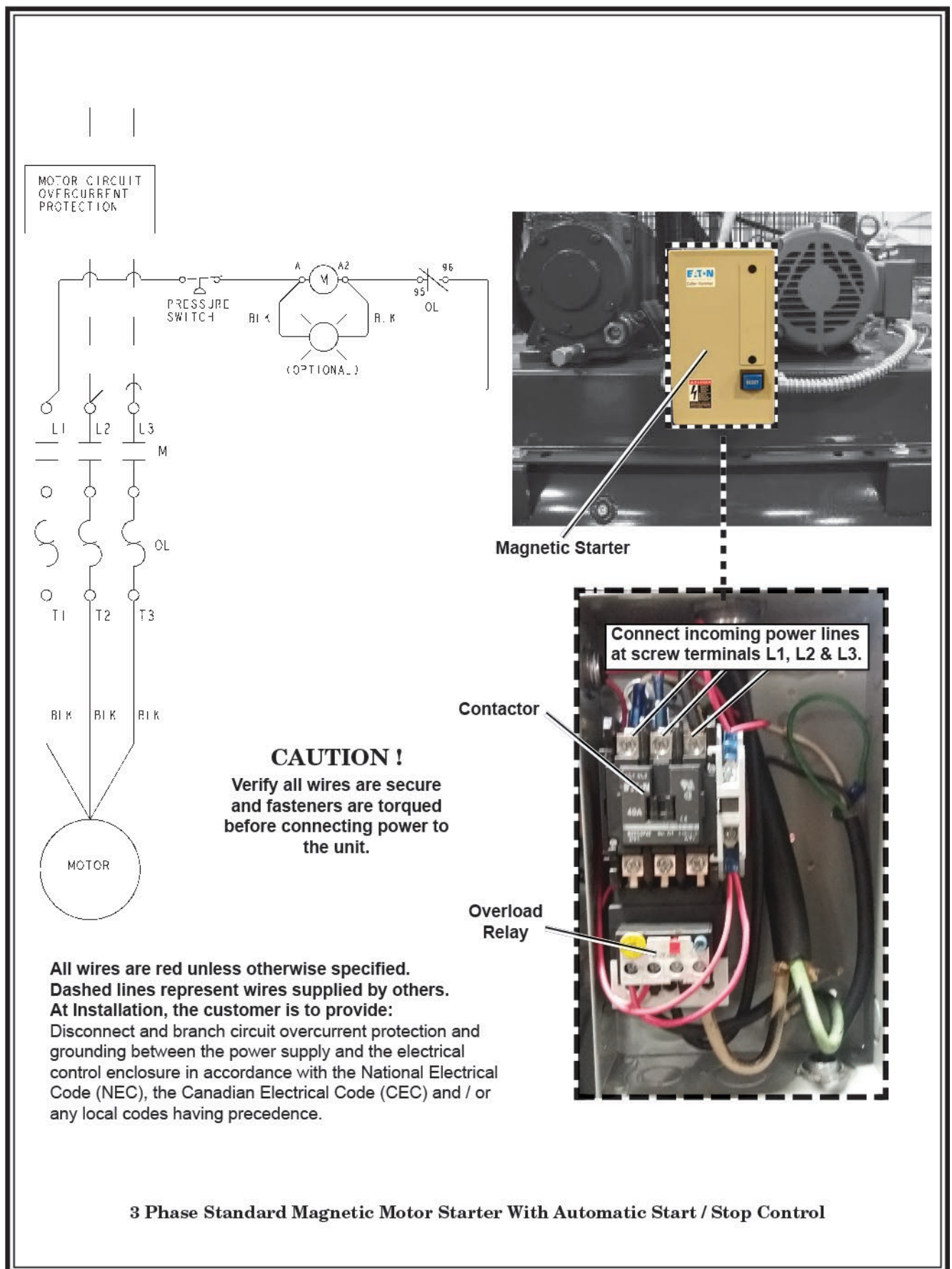
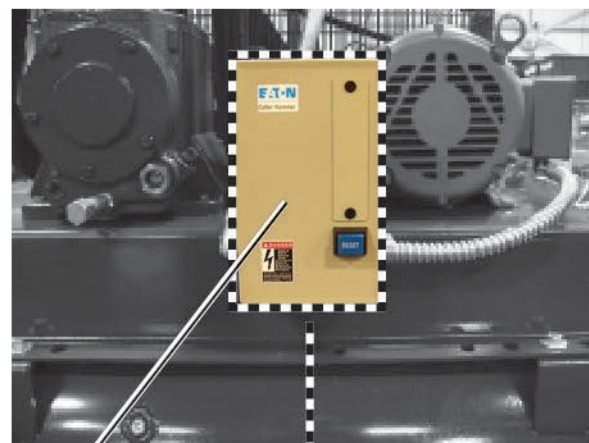
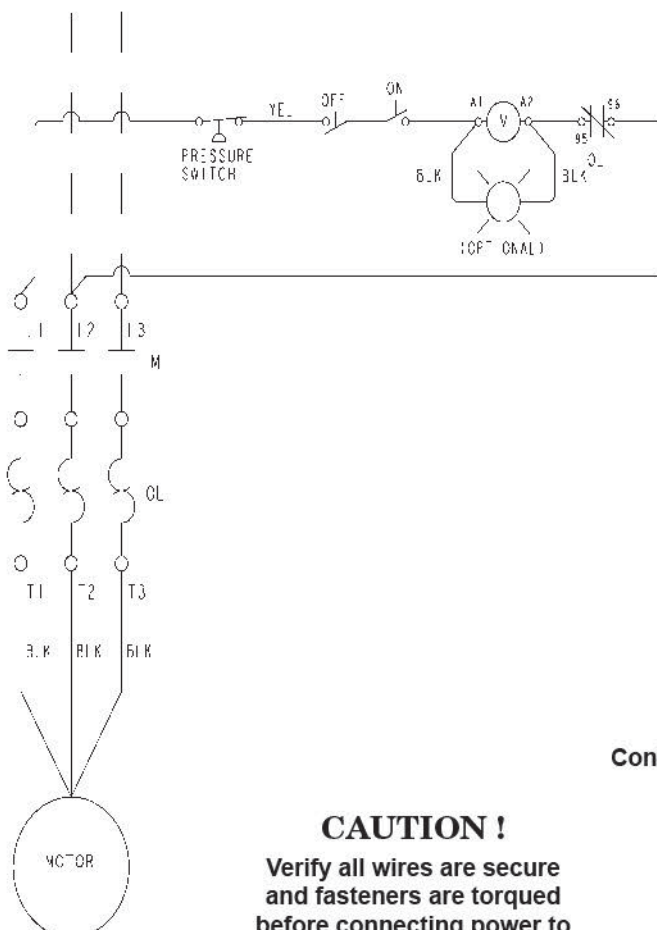


Fig. 3-1

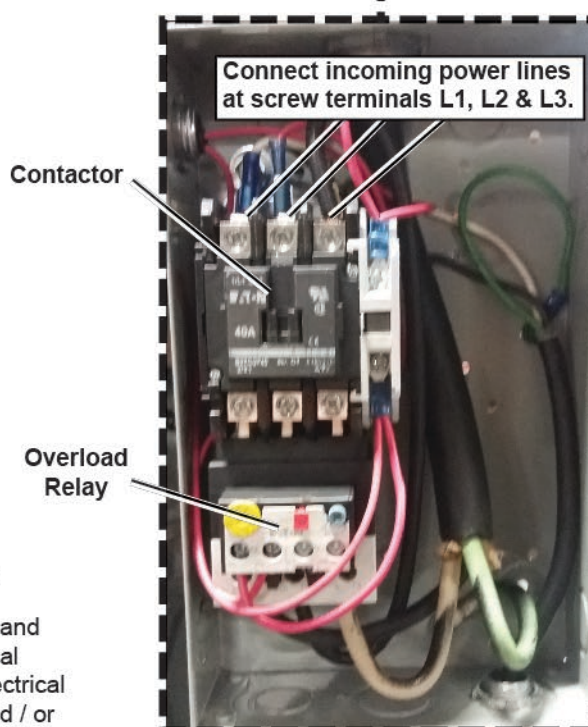
MOTOR CIRCUIT
OVERCURRENT
PROTECTION



Magnetic Starter

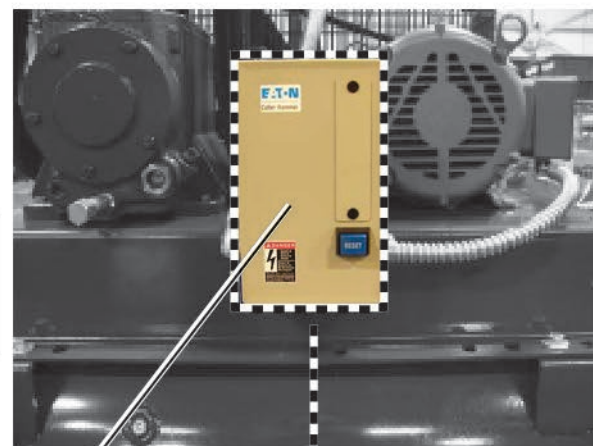
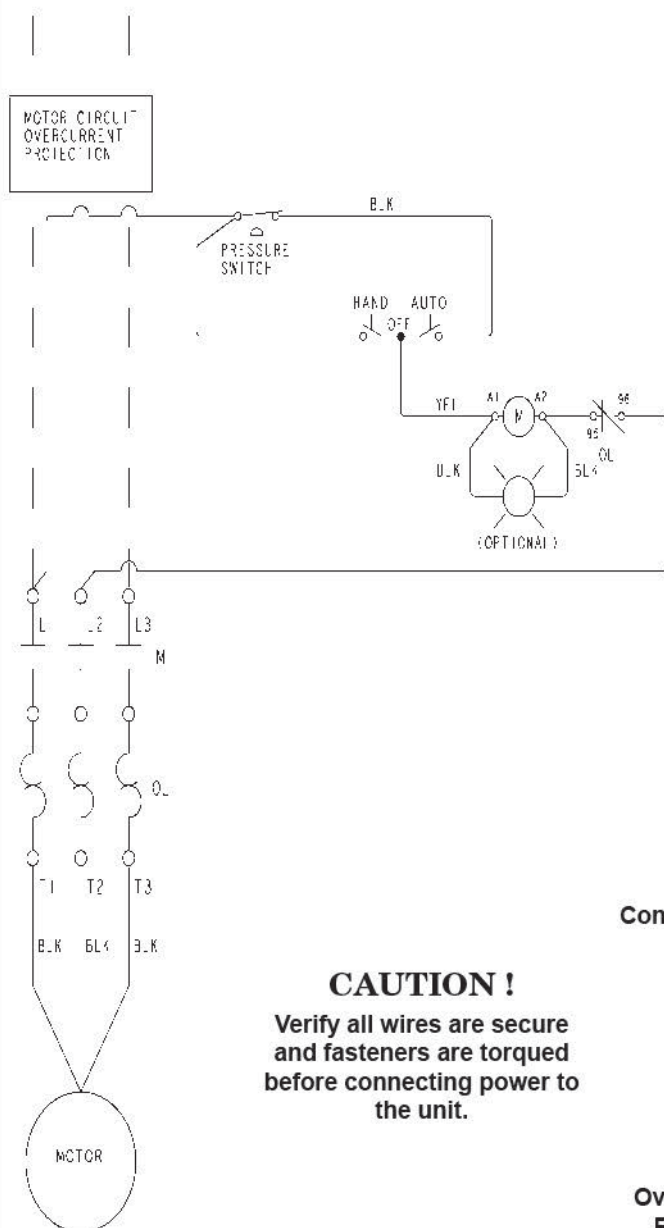
CAUTION !
Verify all wires are secure
and fasteners are torqued
before connecting power to
the unit.

All wires are red unless otherwise specified.
Dashed lines represent wires supplied by others.
At Installation, the customer is to provide:
Disconnect and branch circuit overcurrent protection and
grounding between the power supply and the electrical
control enclosure in accordance with the National Electrical
Code (NEC), the Canadian Electrical Code (CEC) and / or
any local codes having precedence.

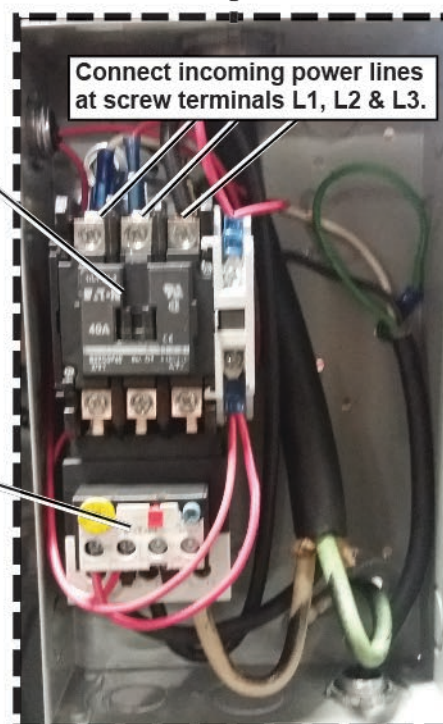


3 Phase Magnetic Motor Starter With ON-OFF Switch and Automatic Start / Stop Control

Fig. 3-2



Magnetic Starter



CAUTION !
Verify all wires are secure
and fasteners are torqued
before connecting power to
the unit.

All wires are red unless otherwise specified.
Dashed lines represent wires supplied by others.
At Installation, the customer is to provide:
Disconnect and branch circuit overcurrent protection and
grounding between the power supply and the electrical
control enclosure in accordance with the National Electrical
Code (NEC), the Canadian Electrical Code (CEC) and / or
any local codes having precedence.

3 Phase Magnetic Motor Starter With HAND-OFF-AUTO Switch and Automatic Start / Stop Control

Fig. 3-3

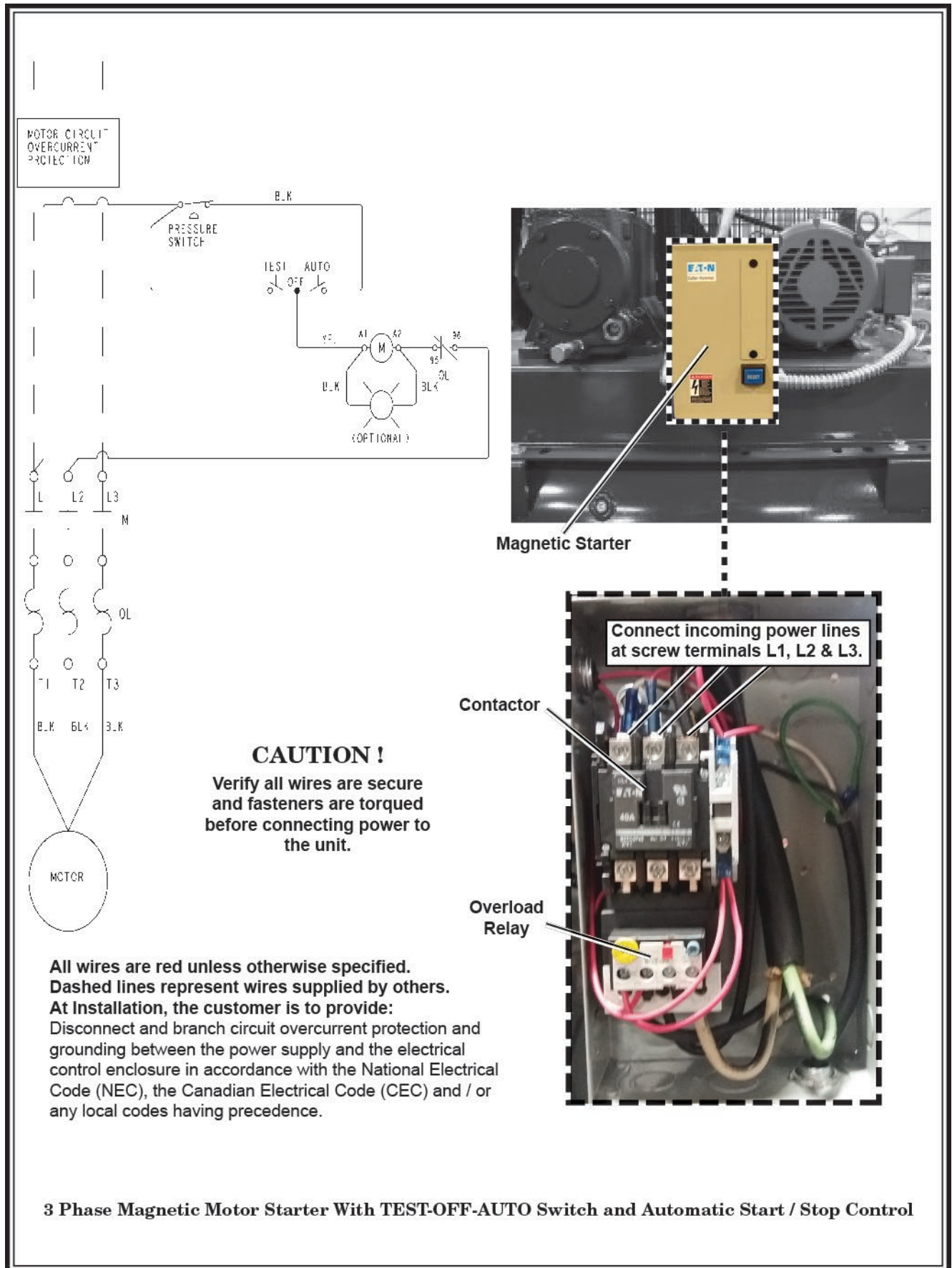


Fig. 3-4

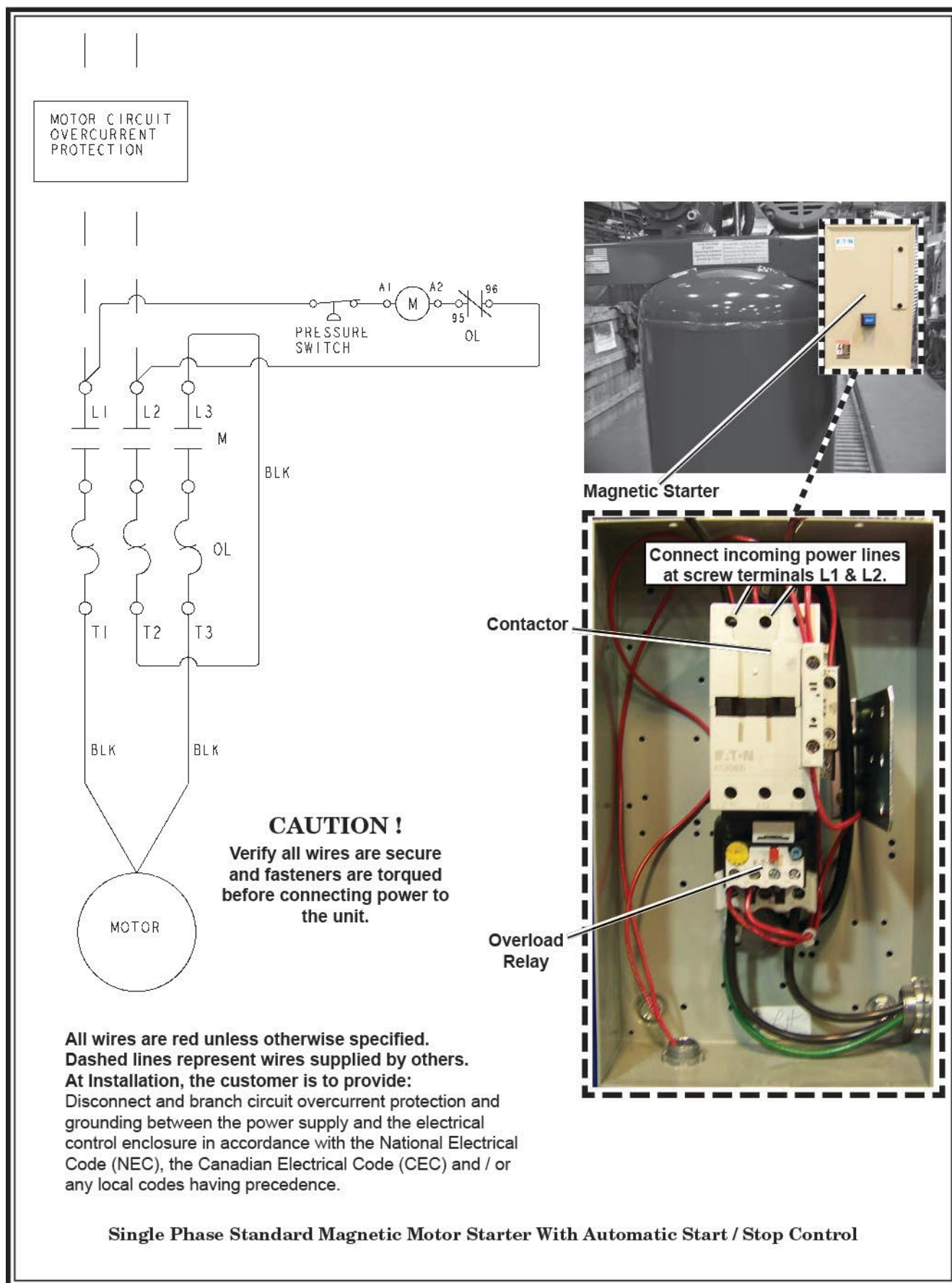
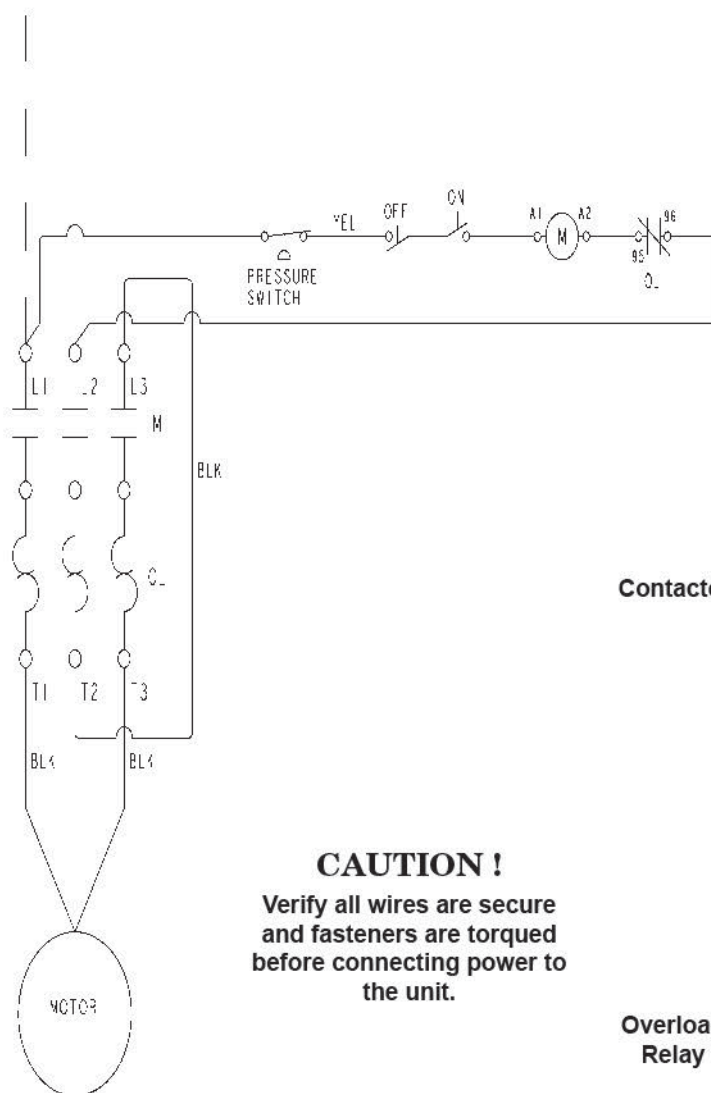


Fig. 3-5

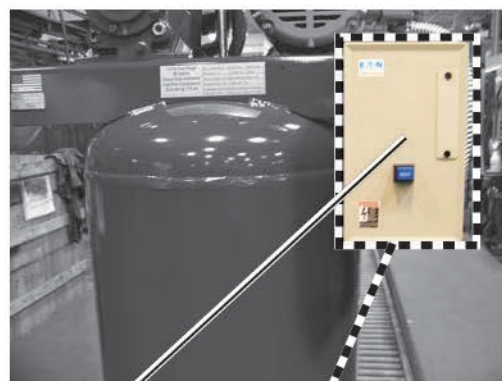
MOTOR CIRCUIT
OVERCURRENT
PROTECTION



CAUTION !
Verify all wires are secure
and fasteners are torqued
before connecting power to
the unit.

All wires are red unless otherwise specified.
Dashed lines represent wires supplied by others.
At Installation, the customer is to provide:
Disconnect and branch circuit overcurrent protection and
grounding between the power supply and the electrical
control enclosure in accordance with the National Electrical
Code (NEC), the Canadian Electrical Code (CEC) and / or
any local codes having precedence.

Single Phase Magnetic Motor Starter With ON-OFF Switch and Automatic Start / Stop Control



Magnetic Starter

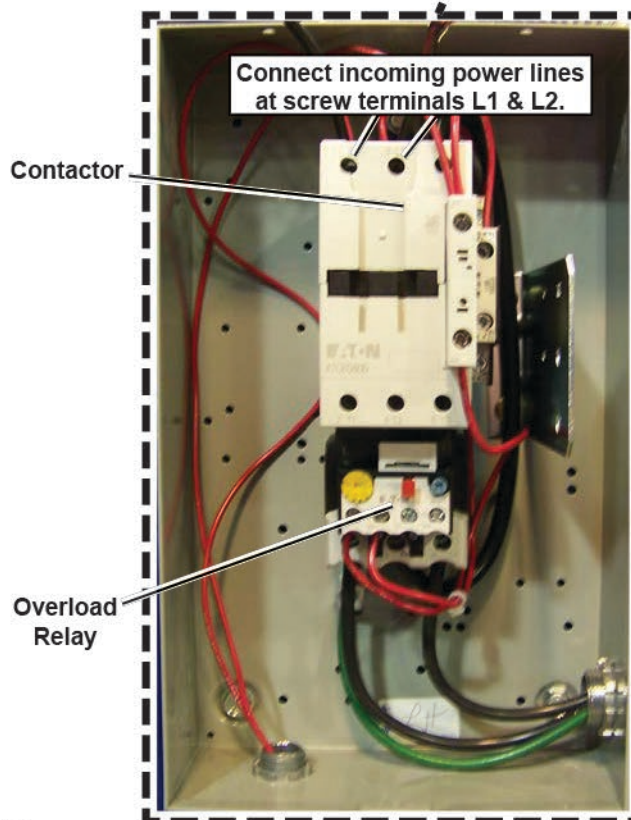


Fig. 3-6

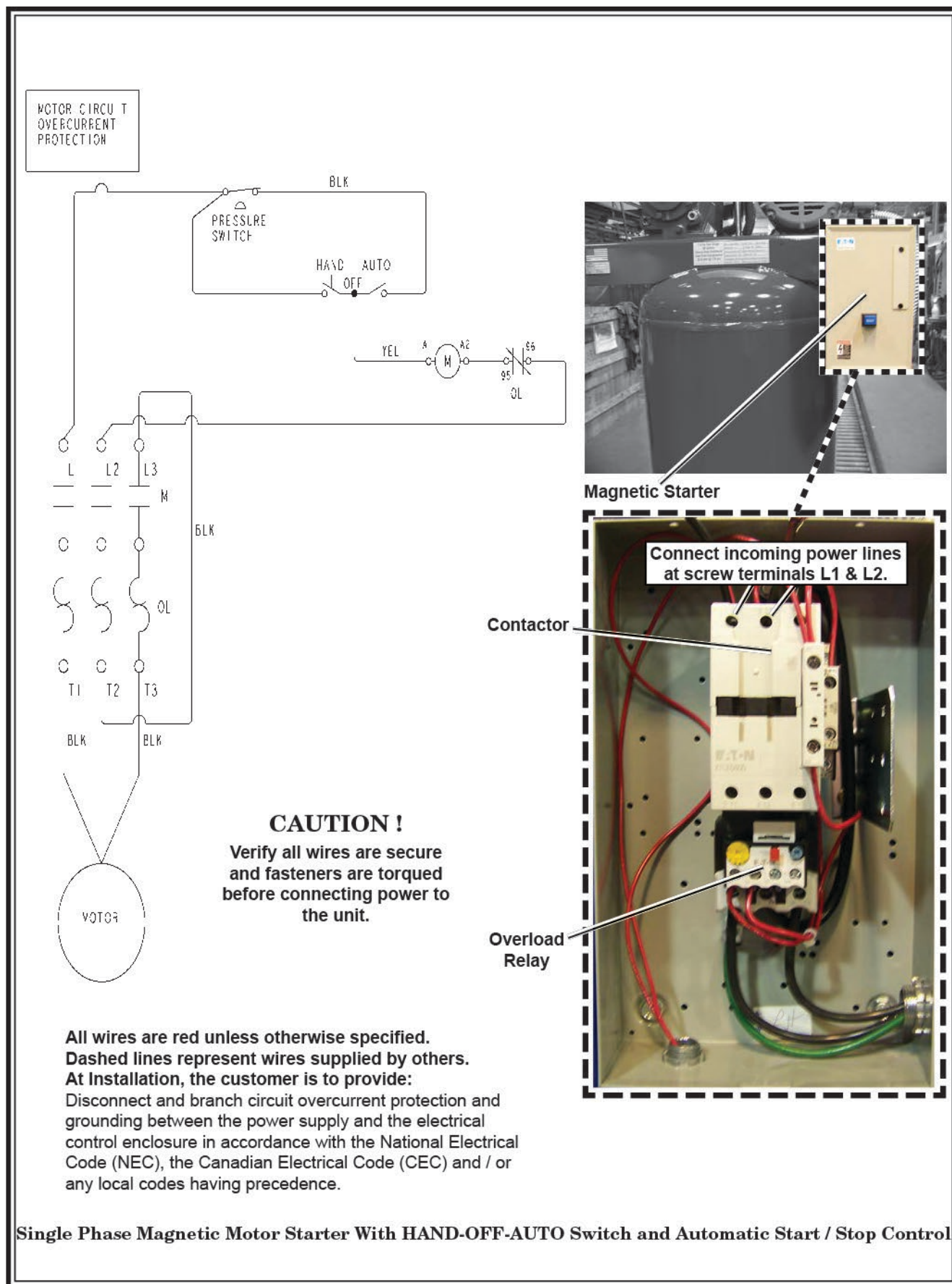


Fig. 3-7

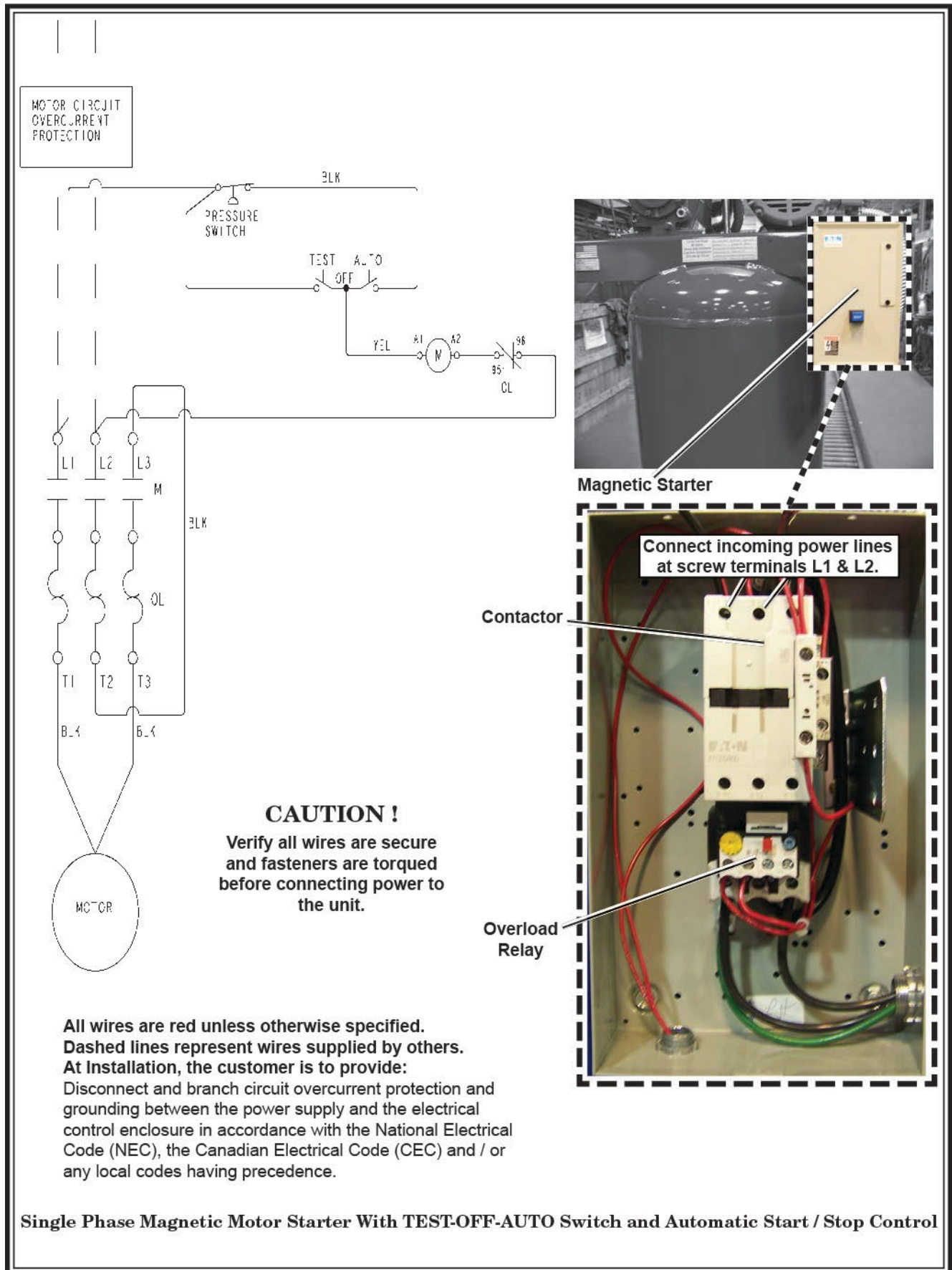


Fig. 3-8

Pressure Switch

To Remove the Cover:

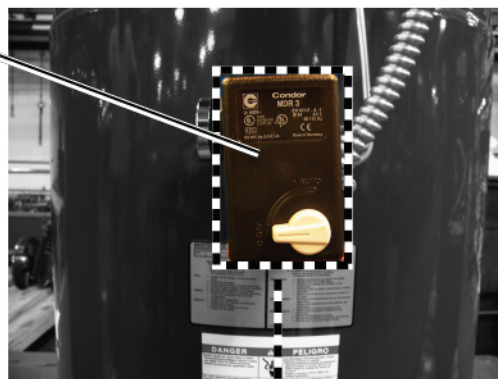
1. Turn the switch handle to "OFF" position.
2. Remove small screws on side of the cover.
3. Pull the cover away from the pressure switch.

To Re-install the Cover:

1. Make sure the switch handle is in the "OFF" position (as shown).
2. Carefully slide the cover over the pressure switch.

DO NOT FORCE!

3. Re-install the small cover screws and tighten.

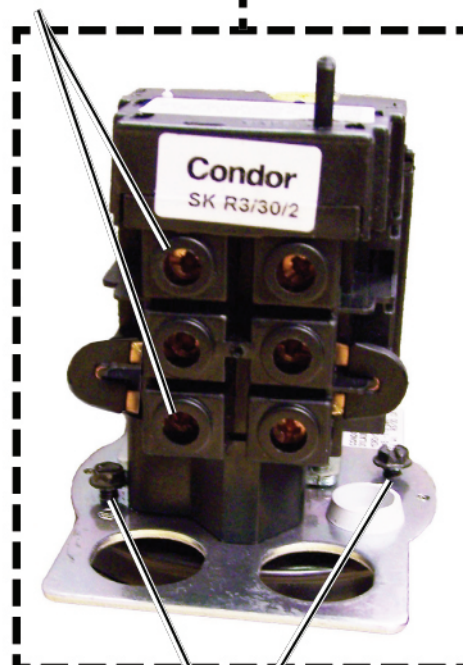
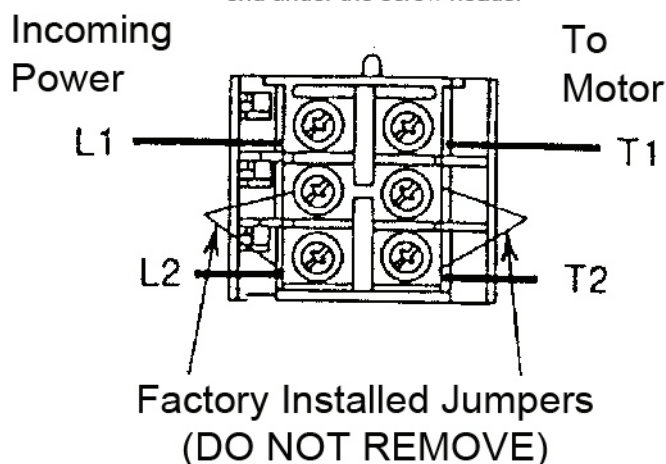


CAUTION !

Verify all wires are secure and fasteners are torqued before connecting power to the unit.

Use wire lugs on incoming power wires. Do not attempt to twist bare wire end under the screw heads.

Connect incoming power lines at screw terminals L1 & L2.



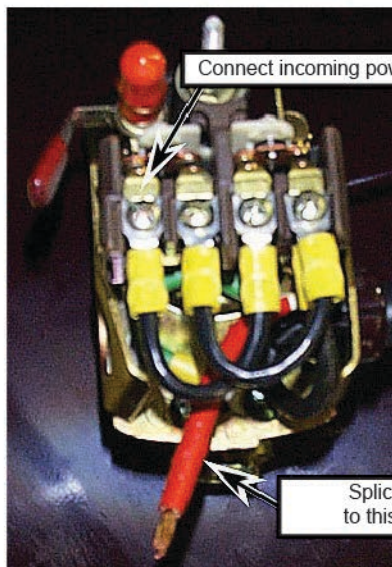
Connect ground wires.

At Installation, the customer is to provide:

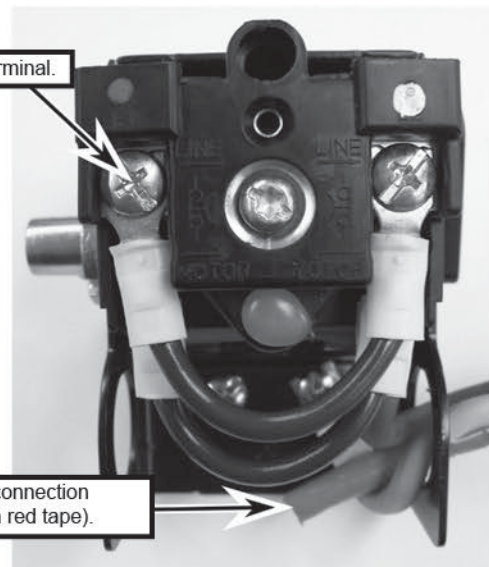
Disconnect and branch circuit overcurrent protection and grounding between the power supply and the electrical control enclosure in accordance with the National Electrical Code (NEC), the Canadian Electrical Code (CEC) and / or any local codes having precedence.

**Single Phase Condor Combination Pressure Switch / Overload Relay
Wired to an 1800 RPM Motor
Connection Diagram**

Fig. 3-9



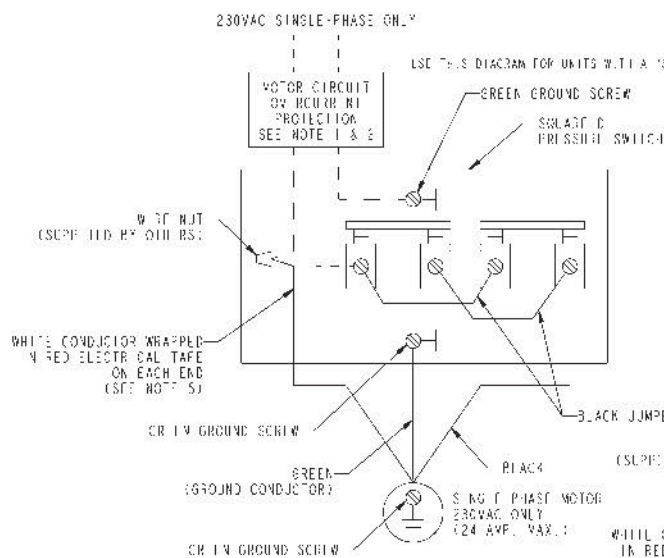
Connect incoming power line at this screw terminal.



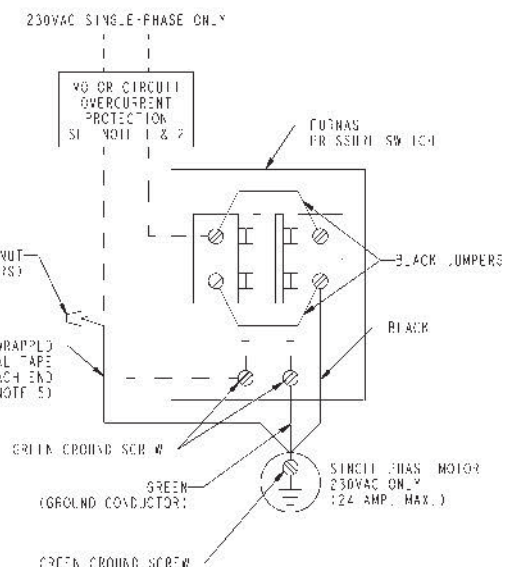
Splice incoming power line connection to this white wire (wrapped in red tape).

SQUARE D PRESSURE SWITCH

FURNAS / HUBBELL PRESSURE SWITCH



USE THIS DIAGRAM FOR UNITS WITH A FURNAS PRESSURE SWITCH



- 1) AT INSTALLATION, THE CUSTOMER IS TO PROVIDE DISCONNECT AND BRANCH CIRCUIT OVERCURRENT PROTECTION IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND/OR ANY LOCAL CODES HAVING PRECEDENCE.
- 2) GROUNDING: AT INSTALLATION, THE CUSTOMER IS TO PROVIDE GROUNDING BETWEEN THE POWER SUPPLY AND THE PRESSURE SWITCH IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND/OR ANY LOCAL CODES HAVING PRECEDENCE.
- 3) HIGH VOLTAGE IS PRESENT IN THE MOTOR WHEN THE PRESSURE SWITCH IS ACTIVATED AND THE MOTOR IS NOT RUNNING. DISCONNECT AND LOCKOUT/TAGOUT PER O.S.A. REGULATION 8.5.147 ALL ELECTRICAL POWER SUPPLIES BEFORE OPENING THE PRESSURE SWITCH OR MOTOR WHEN SERVICING, OR MAKING ANY WORK ON THE COMPRESSOR.
- 4) DASHED LINES REPRESENT WIRES SUPPLIED BY OTHERS AT INSTALLATION.
- 5) THE INSULATION OF THE WHITE WIRE IN THE 3-CONDUCTOR FLEXIBLE CORD SHOULD BE THOROUGHLY WRAPPED WITH RED ELECTRICAL TAPE ON EACH END.

CAUTION !

Verify all wires are secure and fasteners are torqued before connecting power to the unit.

Start / Stop - Pressure Switch / Motor

Fig. 3-10

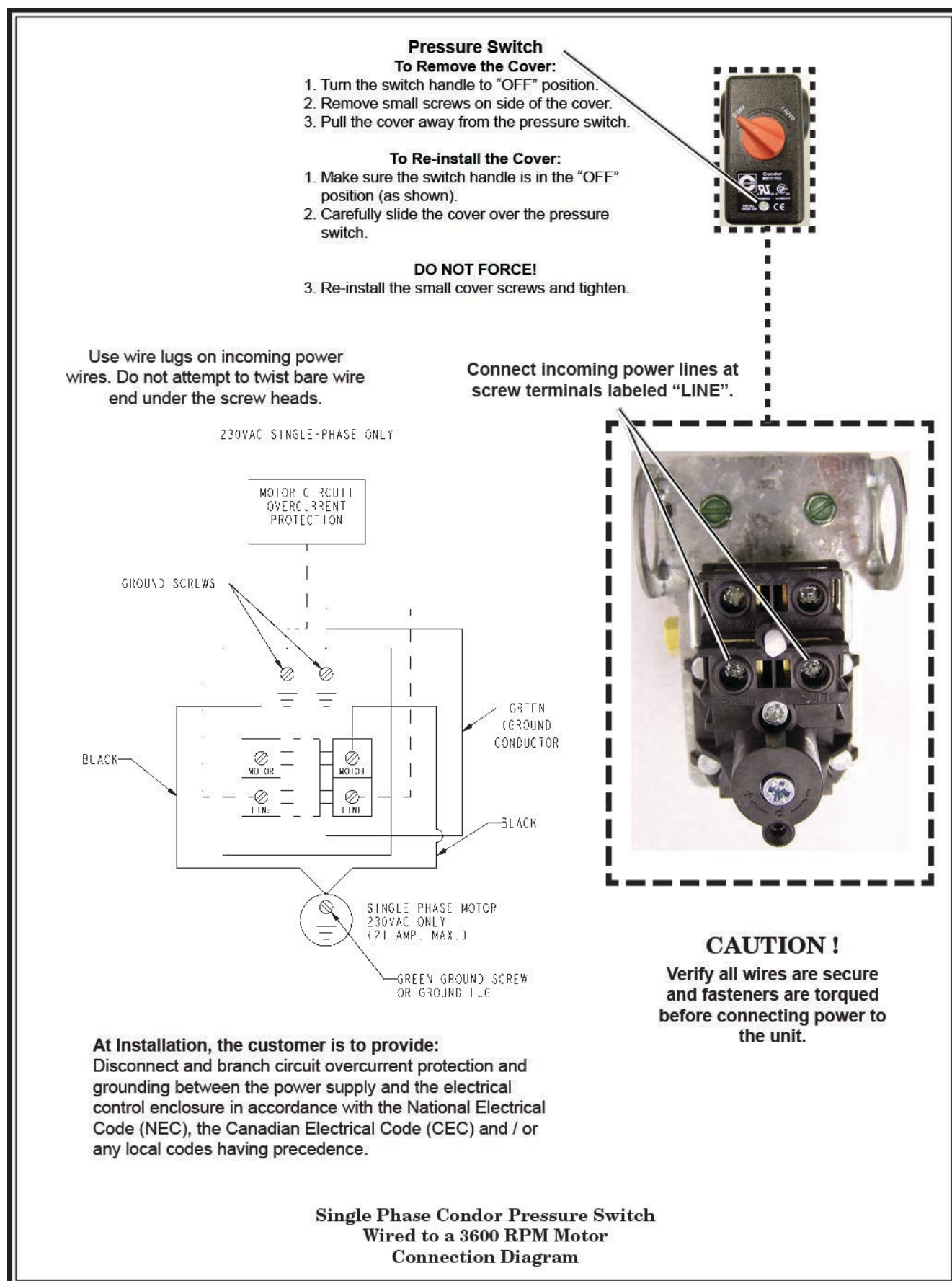


Fig. 3-11

3.3 Fuses and wire sizes

Values shown here have been determined using National Electrical Code (NFPA 70). Local electrical code requirements may differ. Refer to your local electrical code.

	Volts Single Phase (V)	Volts Three Phase (V)	Fuses (Dual Element Time-Delay) (A)	Wire Size (minimum)
CR_5	230	-	50	10
CR_5	-	200	35	14
	-	230	30	14
	-	460	15	14
	-	575	15	14
CR_7.5	230	-	70	8
CR_7.5	-	200	45	10
	-	230	40	12
	-	460	20	14
	-	575	20	14
CR_10	-	200	60	10
	-	230	50	10
	-	460	25	14
	-	575	20	14
CR_15	-	200	90	6
	-	230	80	8
	-	460	40	12
	-	575	30	14

Motor Amperage

This is the maximum Full-Load Three Phase Standard Motors, 1.15 SF.

NEC Table 430.250

Single Phase Full-Load Motor Amps are from NEC Table 430-248

NEC Table 430.52 used for calculating Fuse size.

NEC 240.6 Used to select Standard Fuse Sizes

15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 110, 125, 150, 175, 200, 225, 250, 300, 350, 400, 450, 500, 600, 700, 800, 1000, 1200, 1600, 2000, 2500, 3000, 4000, 5000, and 6000 amperes.

NEC 430.24 used to determine minimum wire size needed.

4 Operating instructions

4.1 Initial start-up

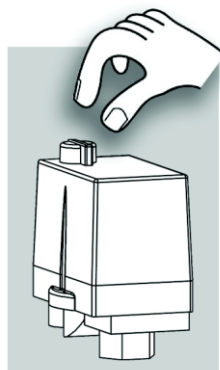
If the compressor has not run for the past 6 months (at initial start-up check the date on the data plate), it is strongly recommended to improve the lubrication of the compressor element: drain the oil, refill the compressor with the same oil while turning the crankshaft.

1. For tank-mounted and base mounted units, remove the RED transport brackets from underneath the compressor.
2. Check the electrical installation, which must be in accordance with the instructions given in Electrical connections.
3. CR units are filled with Piston Fluid compressor oil. Check that the oil level is still at the top of the red circle of sight-glass.
4. Switch on the voltage. Start the motor.
5. Check the operation of the air pressure switch. Refer to Adjustment of pressure switch. Check the operation of the pilot valve when equipped. Refer to Adjustment of pilot valve.
6. On CR 15 compressors, check for correct direction of rotation, as indicated by the arrow on the fan housing.

4.2 Starting

CR

1. Check the oil level, which must be at the top of the red circle of the sight-glass. The minimum level is the lower part of the red circle.
2. Switch on the voltage.
3. Turn the switch to position I (Auto), or turn switch (S1) to position I.



CR Contractor with electrical motor

1. Check the oil level, which must be near the top of the red circle of the sight-glass. The minimum level is the lower part of the red circle.
2. Set the pilot valve in the unload position by turning the red handle 90 degrees. Refer to Adjustment of pilot valve.
3. Attach the air lines to the air outlets.
4. Plug in and switch on the voltage at the main circuit breaker.



Warning:

Never move the compressor after plugging it in.

5. Move the switch to position I or turn switch (S1) to position I.
6. Open the outlet valves (AV1 and AV2).
7. Set the pilot valve in the load position by turning the red handle 90 degrees. Refer to Adjustment of pilot valve.
8. Turn the regulating knob of the pressure regulator clockwise or counter-clockwise to increase or decrease the pressure at the outlet of the pressure regulator.



Regularly drain condensate.

CR Contractor with gas engine

1. On CR check the oil level, which must be near the top of the red circle of the sight-glass. The minimum level is the lower part of the red circle.
2. Check the engine oil level as follows:
 - Remove the oil filler cap and wipe the dipstick clean.
 - Insert the dipstick into the filler neck, but do not screw it in.
 - The oil level must show between the minimum and maximum marks on the dipstick.
3. Fill the fuel tank with unleaded or low-leaded gasoline.
4. Start the engine. Refer to the engine "Owner's manual".
5. Attach the air lines to the air outlets.
6. Open the outlet valves (AV1/2).
7. Set the pilot valve in the load position by turning the red handle 90 degrees. Refer to Adjustment of pilot valve.
8. Turn the regulating knob of the pressure regulator clockwise or counter-clockwise to increase or decrease the pressure at the outlet of the pressure regulator.



Regularly drain condensate.

4.3 Stopping

CR

- 1. Turn the switch to position 0 (Off), or push switch (S1) to position 0.
- 2. Close air outlet valve.
- 3. Switch off the voltage.

If a compressor with pressure switch stops during operation because of a power failure, the pressure from the air outlet pipe must be released by moving the switch on top of the air pressure switch to 0 to prevent the compressor from restarting against back-pressure when the power becomes live again.

CR Contractor with Pilot Valve

- 1. Set the pilot valve in the unload position by turning the red handle 90 degrees. Refer to Adjustment of pilot valve.
- 2. On CR Contractor units with electrical motor, move switch to position 0 or push switch (S1) to position 0. If the compressor is not required for immediate further use, switch off the voltage at the main circuit breaker and unplug.
- 3. On CR Contractor units with gas engine, stop the engine. Refer to the engine “Owner’s manual”.
- 4. Close the air outlet valves (AV1 and AV2). Depressurize and disconnect the air lines from the outlet valves.


4.4 Taking out of operation

At the end of the service life of the compressor, proceed as follows:

- 1. Stop the compressor and close the air outlet valve(s).
- 2. Switch off the voltage and disconnect the compressor from the mains.
- 3. Depressurize the compressor.
- 4. Shut off and depressurize the part of the air net which is connected to the outlet valve. Disconnect the compressor from the air net.
- 5. Drain the oil.

4.5 Storage after installation

Procedure

	If the compressor is going to be stored without running from time to time, protective measures must be taken.
---	---

- Protect the machine against dust and moisture, if possible in a clean, cool, dry and well ventilated area.
- Make sure that the machine is not subject to vibration.
- If the machine is stored in packing, put some vapor corrosion inhibitor (VCI) paper into the packing.
- Store the machine in its normal position, not upside down or on its side.
- If the machine is stored for 1 year or more, rotate the bearings once a month to change the position of the roller balls in the bearings. Consult Atlas Copco Service.

5 Maintenance

5.1 Gas engine maintenance

Consult the engine “Owner’s manual”.

5.2 Preventive maintenance schedule



The schedule contains a summary of the maintenance instructions. Read the respective section before taking maintenance measures.

When servicing, replace all disengaged packing components, e.g. gaskets, O-rings, washers.

The “longer interval” checks must also include the “shorter interval” checks.

Interval	Operation
Daily/8 Hours	Check lubricant levels several minutes after stopping. Drain and replace contaminated lubricant.
	Drain moisture from the receiver tank, drop legs, and air traps. (If subject to freezing, store in heated area first to remove ice.)
	Visually inspect the compressor and safety guards.
	Check for unusual noise or vibration.
	Check for lubricant leaks.
	Check pressurized components for rust, cracks, or leaks.
Weekly/40 Hours	Manually operate the pressure relief valves.
	Clean cooling surfaces of the intercooler, aftercooler, and compressor.
	Check for air leaks in the compressor and air distribution system.
	Clean or replace the air intake filter. (Use a shorter interval in humid/dirty conditions.)
Initial 100 Hours	Completely drain lubricant from the crankcase and replace.
Monthly/160 Hours	Check the belt tension.
3 Months/500 Hours	Change the lubricant. (Use a shorter interval in harsh conditions.)
	Torque the pulley clamp screws or jamnut.
6 Months/1000 Hours	Retorque the cylinder to the head capscrews.
	Inspect the compressor valves for leakage or carbon build-up. If necessary, clean with a safety solvent.
12 Months/2000 Hours	Inspect the pressure switch diaphragm and contacts.
	Inspect the contact points in the motor/starter.

5.3 Lubrication of compressors

It is strongly recommended to use the Piston Fluid compressor oil to keep the compressor in excellent operating condition.

Traditional lubricants cannot cope with the extreme conditions of piston compressors, resulting in fast oil degradation, overheating and potentially irreversible damage and high repair costs. Therefore, high performing lubricants increase the equipment lifetime.

Considering the low oil content in piston compressors, the economy of lesser quality oils simply is not worth the risk.

Piston Fluid oil can be ordered in different quantities.

5.4 Service kits

Kit	CR 5	CR 7.5	CR 10	CR 15
1 Year Maintenance Kit	2022101700	2022101700	2022101800	—
Overhaul Kit	2022100300	2022100500	2022100700	2022155201 (w/head unloaders)
Gasket Set	2022106702	2022106800	2022106900	2022104800
Intercooler Repair Kit	—	—	2023501682	—
Head Kit	—	—	—	2022154601 2022154801 (w/head unloaders)

Notes:



1. Use only authorized parts. Any damage or malfunction caused by the use of unauthorized parts is not covered by Warranty or Product Liability.
2. Whichever interval comes first. The local Sales Company may overrule the maintenance schedule, especially the service intervals, depending upon the environmental and working conditions of the compressor.
3. For the contents of all kits, consult the Parts list.

5.5 Disposal of used material

Used filters or any other used material (e.g. desiccant, lubricants, cleaning rags, machine parts, etc.) must be disposed of in an environmentally friendly and safe manner, and in line with the local recommendations and environmental legislation.

6 Servicing and adjustment procedures

Warning



Release the pressure from the compressor before starting repair or maintenance works. Switch off the voltage and isolate the compressor from the mains.

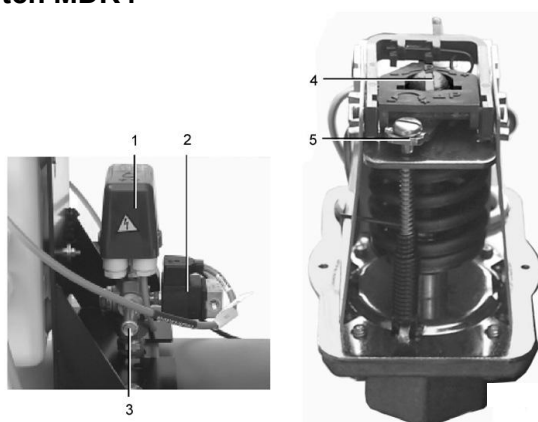
6.1 Air filter

To replace the air filter, follow these steps:

1. Stop the compressor.
2. Unscrew the cap on top of the cover. Lift off the cover and the filter element. Take care that no dirt drops inside the suction silencer.
3. Using a damp cloth, clean the filter chamber and cover. Discard damaged elements.
4. Install the new element, cover and cap.

6.2 Adjustment of MDR4 pressure switch

Views of air pressure switch MDR4



Ref	Name
1	Air pressure switch
2	Solenoid valve
3	Pressure release valve
4	Adjusting screw, stopping pressure
5	Adjusting screw, pressure difference

Function

The adjustment of the maximum or stopping pressure of the compressor is effected by means of the air pressure switch. The switch also controls the pressure difference between the maximum pressure (stopping pressure) and the pressure at which compression is resumed (starting pressure).

Adjustment



- Adjust the air pressure switch while it is pressurized.
- Switch off the voltage before removing the cover of the switch; reinstall it after an adjustment has been made and before the voltage is switched on again.

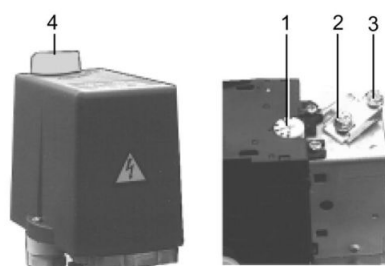
The **maximum pressure** is controlled by adjusting screw (4). Turn the screw clockwise to raise the maximum or stopping pressure, counter-clockwise to lower it.

The **pressure difference** is adjusted by means of screw (5). To reduce the difference between the stopping and starting pressures, i.e. to increase the starting pressure, turn the screw counter-clockwise. To increase the pressure difference, turn the screw clockwise.

6.3 Adjustment of MDR3 pressure switch

Views of air pressure switch MDR3 with ON/OFF switch

This pressure switch has a cover with rotary knob (4) for manual On/Off (Auto/Off).



Reference	Description
1	Dial, overload relay
2	Adjusting screw, stopping pressure
3	Adjusting screw, pressure difference
4	On/off switch (Auto/Off)

Function

The switch allows the operator to select the stopping pressure and the pressure difference between stopping and starting pressures. The stopping and starting pressures are the opening and closing pressures of the switch.

Adjustment



- Adjust the air pressure switch while it is pressurized.
- Switch off the voltage before removing the cover of the switch; reinstall it after an adjustment has been made and before the voltage is switched on again.

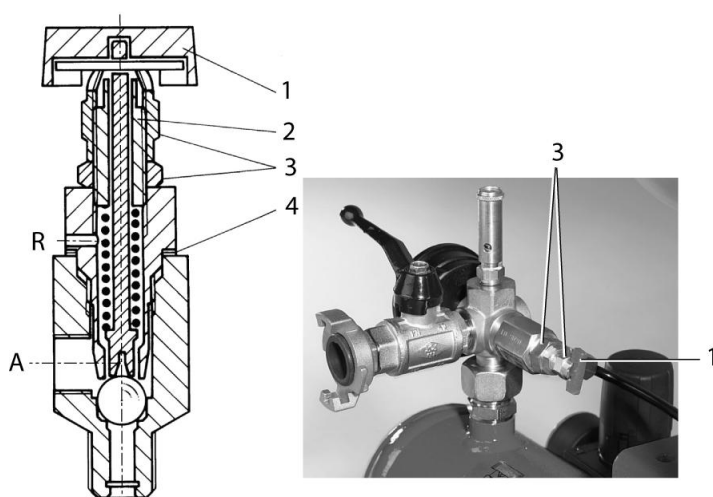
The stopping pressure is controlled by adjusting screw (2). Turn the screw clockwise to raise the stopping pressure, counter-clockwise to lower it.

The pressure difference between starting and stopping is adjusted by means of adjusting screw (3). The adjustment range is shown in the graph below. Turn the screw counter-clockwise to reduce the pressure difference, clockwise to increase it.

6.4 Adjustment of pilot valve

The adjustment of the maximum or unloading pressure of the compressor is effected by means of pilot valve. The valve also controls the difference between the preset maximum pressure and that at which compression is resumed.

Pilot valve



Reference	Description
A	Control air to unloader
R	Vent hole
1	Unloading handle
2	Pressure adjusting screw
3	Nuts
4	Shims

Unload mechanism


The pilot valve is equipped with a hand-operated unload mechanism: by turning the red handle (1) 90 degrees, the plunger of the valve will be lifted, releasing the spring force. The air pressure from the pulsation dampers will force down unloader plunger (8) and the compressor will run unloaded. By turning handle (1) 90 degrees further, the plunger returns to its original position so that the pilot valve will again unload and load the compressor at the pre-set pressures.

Setting of the pilot valve

The maximum pressure is controlled by adjusting screw (2):

1. Loosen handle (1) and the two nuts (3).
2. Turn the adjusting screw (2) clockwise to increase the maximum pressure.
3. The pressure difference can be increased by removing one or more shims (4).
4. Fit the two nuts (3) and handle (1) in their original position.

6.5 Pressure relief valve

	Replace the valve if it does not open at the correct pressure. No adjustment is allowed. Testing: Testing as described below shall only be carried out by competent personnel.
	If pressure relief valve is not used for longer than 6 months, pressurize for 4h to have working pressure.

Testing

1. Close the air outlet valve, depressurize and disconnect the hose or pipe from the valve.
2. Start the compressor and run it until it stops automatically.
3. Switch off the voltage.
Remove the cover from the air pressure switch and, with the air receiver now under pressure, turn the adjusting screw one turn clockwise to increase the stopping pressure Adjustment of MDR4S pressure switch and Adjustment of MRD3 pressure switch. Reinstall the cover.
4. Switch on the voltage, slightly open the outlet valve and start the compressor.
5. Gradually close the outlet valve while checking the air pressure gauge. If the pressure relief valve has not opened at the pressure specified in Compressor data, it must be replaced by a new one. If the compressor unloads before the specified opening pressure is reached, repeat the procedure as mentioned from step 3.
6. Readjust the unloading pressure as described in sections Adjustment of MDR4S pressure switch and Adjustment of MRD3 pressure switch.
7. Reconnect the hose or pipe to the closed air outlet valve.

Testing on Contractor units

1. Close the air outlet valves, depressurize and disconnect the hoses from the valves.
2. Loosen the red handle of the pilot valve (1) and the two nuts (3).
3. Open outlet valve a fraction. Start the compressor.
4. Gradually turn adjusting screw (2) clockwise while checking pressure gauge. If the pressure relief valve has not opened at the pressure specified in Compressor data, it must be replaced by a new one.
5. Readjust the normal working pressure after testing. Consult section Adjustment of pilot valve.
6. Fit nuts (3) and handle (1) in their original positions.

7 Problem solving

Condition	Fault
Low discharge pressure	Restricted inlet
	Defective compressor valves or valve unloading mechanism
	Leaks in the compressed air distribution system at fittings, connections, etc.
	Unloader pilot valve defective or set wrong
	Pressure switch defective or set wrong
	Drive belt slipping
	Incorrect speed
	Worn piston rings or loose piston
	Leaking head gasket
	Drain valve open
	Defective pressure gauge
	Pressure relief valve leaking
	Clogged intercooler
	Compressor incorrectly sized for the altitude it is operating at
	Piston rings not seated; allow 100 hours at full pressure
Water in the crankcase (lubricant appears milky)	Compressor does not run long enough to get hot and vaporize the liquids squeezed out of the air during compression (compressor may be too large for application)
	Incorrect or inferior grade of lubricant
	System pressure leaking back through discharge valve
Rusty valves and/or cylinders	Compressor operated too infrequently
	Compressor does not run long enough to get hot and vaporize the liquids squeezed out of the air during compression (compressor may be too large for application)
	Compressor not properly prepared for storage
	Discharge line from compressor head is pointed upward allowing condensation to drain back at shutdown
Excessive vibration	Incorrect speed
	Compressor valves not functioning properly
	Loose pulley/sheave
	Compressor, motor or engine not secured tightly, or tightened into a bind
	Foundation or frame inadequate
	Piping inadequately supported or tightened into a bind
	Excessive discharge pressure
	Compressor feet may need to be leveled with shims
Excessive drive belt wear	Pulley/sheave out of alignment
	Belt too loose or too tight
	Belt slipping
	Pulley/sheave wobbling
	Pulley/sheave groove damaged or rough
	Incorrect belts

Condition	Fault
Low oil pressure	Oil sump strainer plugged
	Excessive leakage at crankshaft seals
	Low oil level
	Oil pump incorrectly assembled to the bearing carrier ("o" ring not properly located between oil pump body & bearing carrier)
	Oil pressure adjusting screw not set properly
	Defective oil pressure gauge
Compressor loads and unloads excessively	Air receiver too small
	Compressor valves or unloaders defective
	Excessive system leakage
	Compressor operating at incorrect speed
	Unloader pilot differential set too close
	Pressure switch defective
Defective pressure switch	Moisture and/or oil build-up on the pressure switch diaphragm
	Ruptured diaphragm
	Burned contact points
	Plugged air passage from the receiver to the pressure switch
	Loose electrical connection
Excessive air pressure in air receiver	Air pressure gauge inaccurate
	Leaks in unloader piping system
	Defective compressor head unloader
	Pilot valve or pressure switch set incorrectly or defective
	Pressure switch wired incorrectly
	Tube to compressor head unloader plugged
Excessive intercooler pressure	Intercooler restricted or plugged
	Compressor valves in second stage broken or not functioning properly
	Pilot valve or pressure switch set incorrectly or defective
Intercooler pressure	Compressor valves or head unloaders in first stage not functioning abnormally low properly or defective
	Restricted air inlet filter or suction line
	Pilot valve or pressure switch set incorrectly or defective
	Pressurized air at head unloader not venting properly when demand for air is required
	Compressor valve or head gasket leaking
	Worn piston rings
	Leaking air at intercooler or intercooler connections
Compressor overheats	Clogged intake system
	Defective compressor valves
	Pressure setting too high
	Clogged intercooler, internally or externally
	Inadequate ventilation, or recirculation of hot air
	Pulley/sheave rotation wrong
	Incorrect speed
	Lubrication inadequate
	Compressor incorrectly sized

Condition	Fault
High discharge temperature	Compressor valve assemblies defective
	Discharge pressure too high
	Inadequate ventilation or hot air recirculating
	Cooling surfaces of compressor or intercooler excessively dirty
	Ambient temperature too high
	Scored or excessively worn cylinder walls
Compressor knocks	Head clearance insufficient
	Piston loose in cylinder bore, cylinder bore worn, piston or piston rings worn
	Worn rods or main bearing
	Wrong pressure setting, discharge pressure excessive
	Crankcase lubrication inadequate
	Loose pulley/sheave
Excessive oil consumption	Compressor runs unloaded too long
	Worn piston rings
	Restricted intake system
	Compressor running too hot
	Breather valve not functioning properly
	Oil level in crankcase too high
	Oil viscosity wrong for the application
	Connecting rod out of alignment, bent or twisted
	Leaking oil seal
	Piston rings not seated (allow 100 hours for seating)
	Wrong oil (may be a detergent oil with a tendency to foam)
	Inferior grade of oil
Excessive current draw <i>(To determine maximum amperage allowed, multiply the FLA on the motor nameplate by the service factor.)</i>	Low voltage (must be within 10% of nameplate voltage)
	Loose electrical connection
	Wire size too small
	Incorrect oil
	Discharge pressure too high
	Intercooler plugging
	Bearings tight or seizing
	No crankshaft endplay
	Motor sized incorrectly
	Motor defective
	Drive belts too tight
	Power not on
	Blown circuit fuse
	Overload relay tripped
CAUTION ! Motor surface temperature normally exceeds 170° F.	Low voltage
	Faulty start switch
	Power failure
	Pressure switch incorrectly adjusted or faulty
	Loose or broken wire
	Motor defective
	Compressor seized
	Motor stalled
	Motor overloaded
CAUTION! Overload relays are designed to protect the motor from damage due to motor overload. If the overload relay trips persistently, DO NOT CONTINUE TO PUSH THE RESET BUTTON! Contact your local Quincy distributor for assistance.	Power not on
	Blown circuit fuse
	Overload relay tripped
	Low voltage
	Faulty start switch
	Power failure
	Pressure switch incorrectly adjusted or faulty
	Loose or broken wire
	Motor defective
	Compressor seized
Failure to start	Power not on
	Blown circuit fuse
Motor stalls	Motor overloaded

8 Technical data

8.1 Reference conditions

Inlet pressure (absolute)	psi	14.5
Relative air humidity	%	0
Air inlet temperature	°F	68
Working pressure:	psi	145-175*

* 145 psi for single stage units, 175 for two-stage units

8.2 Limitations

Minimum inlet temperature	°F	32
Maximum inlet temperature	°F	104
Maximum working pressure	psi	See below
Only applicable for Full Feature variants. (with refrigerant dryer)		
Minimum ambient air temperature	°F	41

8.3 Compressor data

Compressor Data		CRC10	CRC15	CRC20	CRP20	CRI5	CRI7.5	CRI10	CRI15
Compressor shaft speed	RPM	1425	1117	941	1028	942	1026	968	923
Motor HP	HP	2	3	5	5	5	7.5	10	15
Motor shaft speed	RPM	3450	3450	3450	3450	1750	1750	1750	1750
Max working pressure	Psig	145	145	145	175	175	175	175	175
FAD @MWP	CFM	4.1	7.6	9.5	14.5	17.2	22.6	35	51
FAD @90psig	CFM	4.9	9.1	11.4	15.1	17.9	23.5	36.4	53
Power input @MWP	HP	2.4	3.9	5.3	6.8	6.6	8.6	12.1	18.8
Oil capacity	Gal	0.06	0.12	0.17	0.211	0.475	0.475	0.625	1
Noise level @MWP	dBA	84	86	87	83	81	82	83	83

9 Instructions for use

Air receiver (tank-mounted units)

1	Corrosion must be prevented: depending on the conditions of use, condensate may accumulate inside the tank and must be drained every day. This may be done manually, by opening the drain valve, or by means of the automatic drain, if fitted to the tank. Nevertheless, a weekly check of correct functioning of the automatic valve is needed. This has to be done by opening the manual drain valve and checking for condensate.
2	Periodical service inspection of the air receiver is needed, as internal corrosion can reduce the steel wall thickness with the consequent risk of bursting. Local rules need to be respected, if applicable. The use of the air receiver is forbidden once the wall thickness reaches the minimum value as indicated in the service manual of the air receiver (part of the documentation delivered with the unit).
3	Lifetime of the air receiver mainly depends on the working environment. Avoid installing the compressor in a dirty and corrosive environment, as this can reduce the vessel lifetime dramatically.
4	Do not anchor the vessel or attached components directly to the ground or fixed structures. Fit the pressure vessel with vibration dampers to avoid possible fatigue failure caused by vibration of the vessel during use.
5	Use the vessel within the pressure and temperature limits stated on the nameplate and the testing report.
6	No alterations must be made to this vessel by welding, drilling or other mechanical methods.

ATLAS COPCO STANDARD TERMS AND CONDITIONS

LEGAL EFFECT: Except as expressly otherwise agreed to in writing by an authorized representative of Seller, the following terms and conditions shall apply to and form a part of this order and any additional and/or different terms of Buyer's purchase order or other form of acceptance are rejected in advance and shall not become a part of this order.

The rights of Buyer hereunder shall be neither assignable nor transferable except with the written consent of Seller.

This order may not be canceled or altered except with the written consent of Seller and upon terms which will indemnify Seller against all loss occasioned thereby. All additional costs incurred by Seller due to changes in design or specifications, modification of this order or revision of product must be paid for by Buyer.

In addition to the rights and remedies conferred upon Seller by this order, Seller shall have all rights and remedies conferred at law and in equity and shall not be required to proceed with the performance of this order if Buyer is in default in the performance of such order or of any other contract or order with seller.

TERMS OF PAYMENT: Unless otherwise specified in the order acknowledgment, the terms of payment shall be 1% 15, net forty-five (45) days after shipment. These terms shall apply to partial as well as complete shipments. If any proceeding be initiated by or against Buyer under any bankruptcy or insolvency law, or in the judgment of Seller the financial condition of Buyer, at the time the equipment is ready for shipment, does not justify the terms of payment specified, Seller reserves the right to require full payment in cash prior to making shipment. If such payment is not received within fifteen (15) days after notification of readiness for shipment, Seller may cancel the order as to any unshipped item and require payment of its reasonable cancellation charges.

If Buyer delays shipment, payments based on date of shipment shall become due as of the date when ready for shipment. If Buyer delays completion of manufacture, Seller may elect to require payment according to percentage of completion. Equipment held for Buyer shall be at Buyer's risk and storage charges may be applied at the discretion of Seller.

Accounts past due shall bear interest at the highest rate lawful to contract for but if there is no limit set by law, such interest shall be eighteen percent (18%). Buyer shall pay all cost and expenses, including reasonable attorney's fees, incurred in collecting the same, and no claim, except claims within Seller's warranty of material or workmanship, as stated below, will be recognized unless delivered in writing to Seller within thirty (30) days after date of shipment.

TAXES: All prices exclude present and future sales, use, occupation, license, excise, and other taxes in respect of manufacture, sales or delivery, all of which shall be paid by Buyer unless included in the purchase price at the proper rate or a proper exemption certificate is furnished.

ACCEPTANCE: All offers to purchase, quotations and contracts of sales are subject to final acceptance by an authorized representative at Seller's plant.

DELIVERY: Except as otherwise specified in this quotation, delivery will be F. O. B. point of shipment. In the absence of exact shipping instruction, Seller will use its discretion regarding best means of insured shipment. No liability will be accepted by Seller for so doing. All transportation charges are at Buyer's expense. Time of delivery is an estimate only and is based upon the receipt of all information and necessary approvals. The shipping schedule shall not be construed to limit seller in making commitments for materials or in fabricating articles under this order in accordance with Seller's normal and reasonable production schedules.

Seller shall in no event be liable for delays caused by fires, acts of God, strikes, labor difficulties, acts of governmental or military authorities, delays in transportation or procuring materials, or causes of any kind beyond Seller's control. No provision for liquidated damages for any cause shall apply under this order. Buyer shall accept delivery within thirty (30) days after receipt of notification of readiness for shipment. Claims for shortages will be deemed to have been waived if not made in writing with ten (10) days after the receipt of the material in respect of which any such shortage is claimed. Seller is not responsible for loss or damage in transit after having received "In Good Order" receipt from the carrier. All claims for loss or damage in transit should be made to the carrier.

TITLE & LIEN RIGHTS: The equipment shall remain personal property, regardless of how affixed to any realty or structure. Until the price (including any notes given therefore) of the equipment has been fully paid in cash, Seller shall, in the event of Buyer's default, have the right to repossess such equipment.

PATENT INFRINGEMENT: If properly notified and given an opportunity to do so with friendly assistance, Seller will defend Buyer and the ultimate user of the equipment from any actual or alleged infringement of any published United States patent by the equipment or any part thereof furnished pursuant hereto (other than parts of special design, construction, or manufacture specified by and originating with Buyer), and will pay all damages and costs awarded by competent court in any suit thus defended or of which it may have had notice and opportunity to defend as aforesaid.

STANDARD WARRANTY: Seller warrants that products of its own manufacture will be free from defects in workmanship and materials under normal use and service for the period specified in the product instruction manual. Warranty for service parts will be Ninety (90) days from date of factory shipment. Electric Motors, gasoline and diesel engines, electrical apparatus and all other accessories, components and parts not manufactured by Seller are warranted only to the extent of the original manufacturer's warranty.

Notice of the alleged defect must be given to the Seller, in writing with all identifying details including serial number, type of equipment and date of purchase within thirty (30) days of the discovery of the same during the warranty period.

Seller's sole obligation on this warranty shall be, at its option, to repair or replace or refund the purchase price of any product or part thereof which proves to be defective. If requested by Seller, such product or part thereof must be promptly returned to seller, freight prepaid, for inspection.

Seller warrants repaired or replaced parts of its own manufacture against defects in materials and workmanship under normal use and service for ninety (90) days or for the remainder of the warranty on the product being repaired.

This warranty shall not apply and Seller shall not be responsible or liable for:

- (a) Consequential, collateral or special losses or damages;
- (b) Equipment conditions caused by fair wear and tear, abnormal conditions of use, accident, neglect or misuse of equipment, improper storage or damage resulting during shipping;
- (c) Deviation from operating instructions, specifications or other special terms of sale;
- (d) Labor charges, loss or damage resulting from improper operation, maintenance or repairs made by person(s) other than Seller or Seller's authorized service station.

In no event shall Seller be liable for any claims whether arising from breach of contract or warranty or claims of negligence or negligent manufacture in excess of the purchase price.

THIS WARRANTY IS THE SOLE WARRANTY OF SELLER AND ANY OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED IN LAW OR IMPLIED IN FACT, INCLUDING ANY WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR USE ARE HEREBY SPECIFICALLY EXCLUDED.

LIABILITY LIMITATIONS: Under no circumstances shall the Seller have any liability for liquidated damages or for collateral, consequential or special damages or for loss of profits, or for actual losses or for loss of production or progress of construction, whether resulting from delays in delivery or performance, breach of warranty, negligent manufacture or otherwise.

ENVIRONMENTAL AND OSHA REQUIREMENTS: At the time of shipment of the equipment from the factory, Atlas Copco will comply with the various Federal, State and local laws and regulations concerning occupational health and safety and pollution. However, in the installation and operation of the equipment and other matters over which the seller has no control, the Seller assumes no responsibility for compliance with those laws and regulations, whether by the way of indemnity, warranty or otherwise.

June 30, 2003



In order to be First in Mind-First in Choice® for all your quality compressed air needs, Atlas Copco delivers the products and services that help to increase your business' efficiency and profitability.

Atlas Copco's pursuit of innovation never ceases, driven by our need for reliability and efficiency. Always working with you, we are committed to providing you the customized quality air solution that is the driving force behind your business.

