HEATCRAFT™ Worldwide Refrigeration

Air-Cooled Gas Cooler Installation & Operation

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Air-Cooled Gas Coolers Installation and Operation Guide

Applicable for Bohn, Larkin, Climate Control, and Chandler brands

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Inspection

Responsibility should be assigned to a dependable individual at the job site to receive material. Each shipment should be carefully checked against the bill of lading. The shipping receipt should not be signed until all items listed on the bill of lading have been accounted for.

Check carefully for concealed damage. Any shortage or damages should be reported to the delivering carrier.

Damaged material becomes the delivering carrier's responsibility, and should not be returned to the manufacturer unless prior approval is given to do so. When uncrating, care should be taken to prevent damage. Heavy equipment should be left on units shipping base until it has been moved to the final location.

System Warranty

This equipment is designed to operate properly and produce rated capacity when installed in accordance with accepted industry standards. Failure to meet the following conditions may result in voiding of the system warranty:

1. System piping must be installed following industry standards for good piping practices.
2. Inert gas must be charged into piping during welding.
3. System must be thoroughly leak checked and evacuated before initial charging. High vacuum gauge capable of reading microns is mandatory. Dial indicating pressure gauges are not acceptable.
4. Power supply to system must meet the following conditions:
    a. Voltage for 208/230 motors not less than 195 volts or more than 253 volts.
    b. All other voltages must not exceed +/- 10% of nameplate ratings.
    c. Phase imbalance not to exceed 2%.
5. All controls and safety switch circuits properly connected per wiring diagram.
6. Factory installed wiring must not be changed without written factory approval.

Installation

NOTE: ***Installation and maintenance to be performed only by qualified personnel who are familiar with local codes and regulations, and experienced with this type of equipment.***

CAUTION: ***Sharp edges and coil surfaces are a potential injury hazard. Avoid contact with them.***

Unit Location

Units are designed for outdoor application and may be mounted on a roof or concrete slab (ground level installation). Roof mounted units should be installed level on steel channels or an I-beam frame to support the unit above the roof. Use of vibration pads or isolators is recommended. The roof must be strong enough to support the weight of the unit. Concrete slabs used for unit mounting should be installed level and be properly supported to prevent settling. A one-piece concrete slab with footings extending below the frost line is recommended.

The gas cooler should be located far enough away from any wall or other obstruction to provide sufficient clearance for air entrance. Do not attach ductwork to the coil inlet or fan outlet. Care should be taken to avoid air recirculation conditions that can be caused by sight screening, walls, etc. Also keep unit fan discharge away from any building air intakes. See page 4 for space and location requirements.

Sound Vibration

Units should be installed away from occupied spaces and above or outside of utility areas, corridors and auxiliary spaces to reduce the transmission of sound and vibration to occupied spaces. The refrigerant piping should be flexible enough to prevent the transmission of noise and vibration from the unit into the building. If the refrigerant lines are to be suspended from the structure of the building, isolation hangers should be used to prevent the transmission of vibration. Where piping passes through a wall, it is advisable to pack fiberglass and sealing compound around the lines to minimize vibration and retain flexibility in the lines.

The unit needs to be secured in its final location. Holes are provided in the base runner for this purpose.

WARNING: ***Venting of certain refrigerants to the atmosphere is illegal.***
Refrigerant recovery devices must be used when installing or servicing this product. Consult your local codes for requirements in your location.

WARNING: ***There may be more than one source of electrical current in this unit. Do not service before disconnecting all power supplies.***

Rigging Instructions

1). Spreader bar must be used for all rigging.

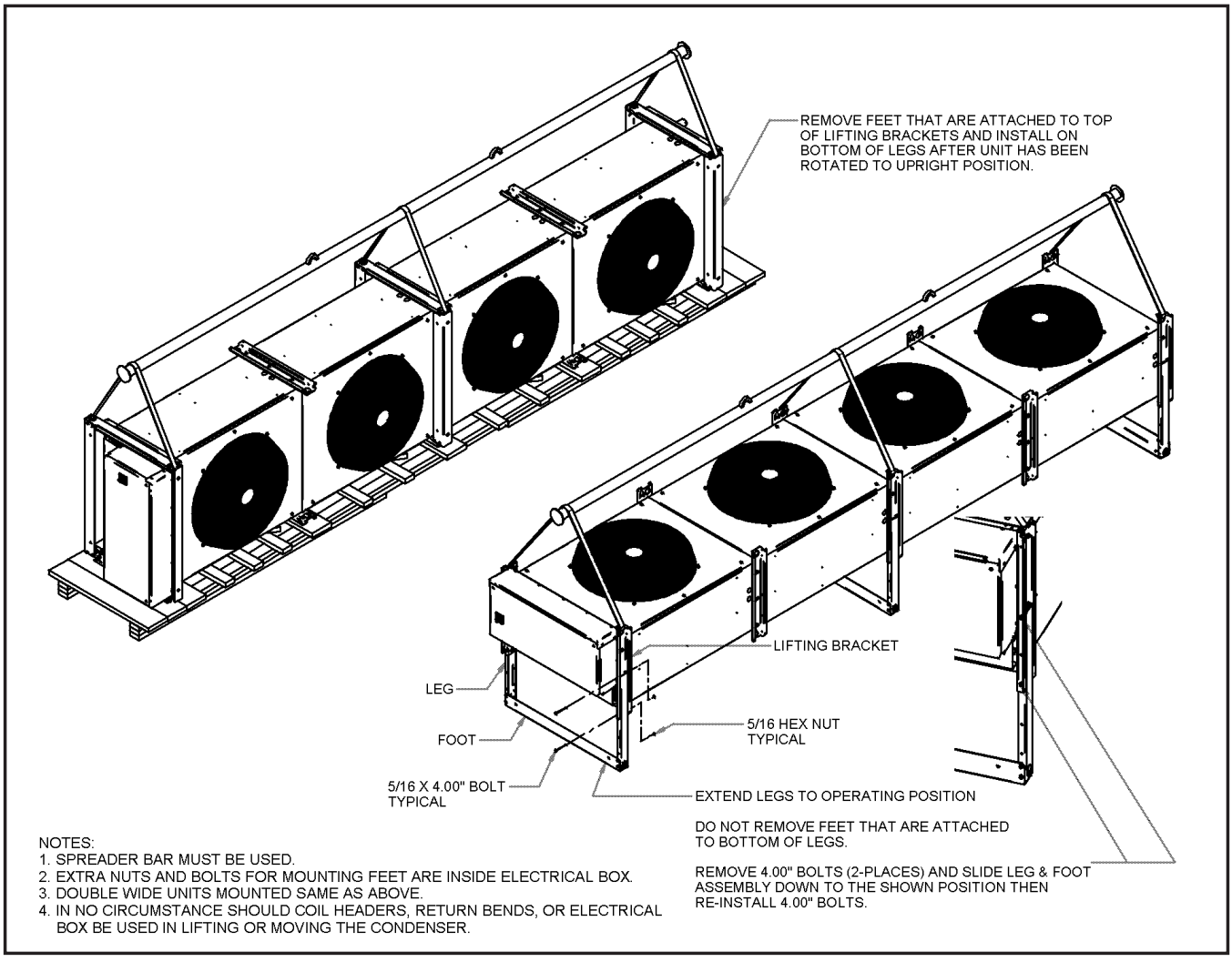
2). Under no circumstance should coil connections, coil headers, return bends, or electrical box be used in lifting or moving the gas cooler.

3). Under no circumstance should any person be under the gas cooler.

4). If there are more than four lifting points on the gas cooler, more than four lifting points should be used.

5). Under no circumstance should the gas cooler lifting points be used to lift a gas cooler that has been attached to other equipment, like a steel frame. If gas cooler has been attached to other equipment, use lifting points provided on other eqipment to lift complete assembly.

Drawing 1. Rigging Instructions for Standard Air-Cooled Gas Cooler



Space and Location Requirements

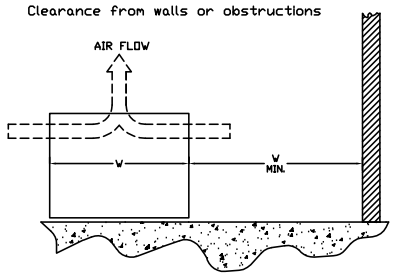
The most important consideration which must be taken into account when deciding upon the location of air-cooled equipment is the provision for a supply of ambient air to the gas cooler, and removal of heated air from the gas cooler area. Where this essential requirement is not adhered to, it will result in higher head pressures, which cause poor operation and possible eventual failure of equipment. Units must not be located in the vicinity of steam, hot air or fume exhausts.

Another consideration which must be taken is that the unit should be mounted away from noise sensitive spaces and must have adequate support to avoid vibration and noise transmission into the building. Units should be mounted over corridors, utility areas, rest rooms and other auxiliary areas where high levels of sound are not an important factor. Sound and structural consultants should be retained for recommendations.

Consideration should also be made to make sure there is sufficient space for removal/replacement of microchannel coils (when supplied). A minimum of one unit width should be allowed on the header end of the unit to provide sufficient clearance.

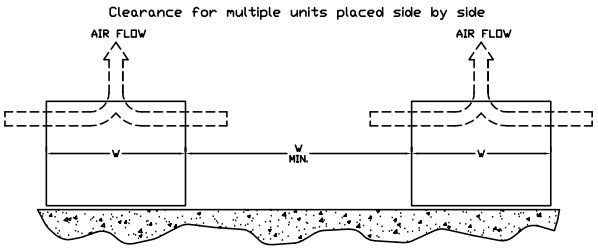
Walls or Obstructions

The unit should be located so that air may circulate freely and not be recirculated. For proper air flow and access all sides of the unit should be a minimum of "W" away from any wall or obstruction. It is preferred that this distance be increased whenever possible. Care should be taken to see that ample room is left for maintenance work through access doors and panels. Overhead obstructions are not permitted. When the unit is in an area where it is enclosed by three walls the unit must be installed as indicated for units in a pit.



Multiple Units

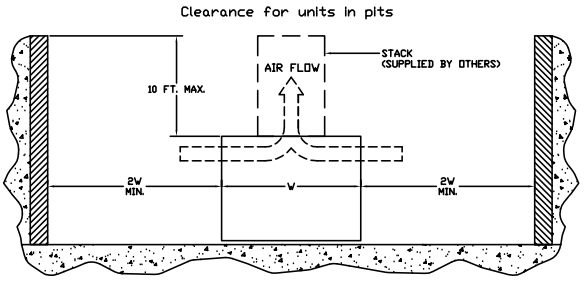
For units placed side by side, the minimum distance between units is the width of the largest unit. If units are placed end to end, the minimum distance between units is 4 feet.



Units in Pits

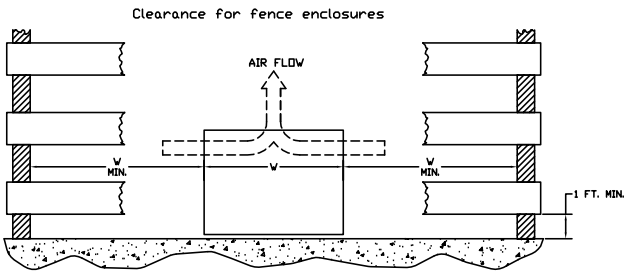
The top of the unit should be level with the top of the pit, and side distance increased to "2W".

If the top of the unit is not level with the top of pit, discharge cones or stacks must be used to raise discharge air to the top of the pit. This is a minimum requirement.



Decorative Fences

Fences must have 50% free area, with 1 foot undercut, a "W" minimum clearance, and must not exceed the top of unit. If these requirements are not met, unit must be installed as indicated for "Units in pits".



* "W" = Total width of the gas cooler.

Typical Arrangements

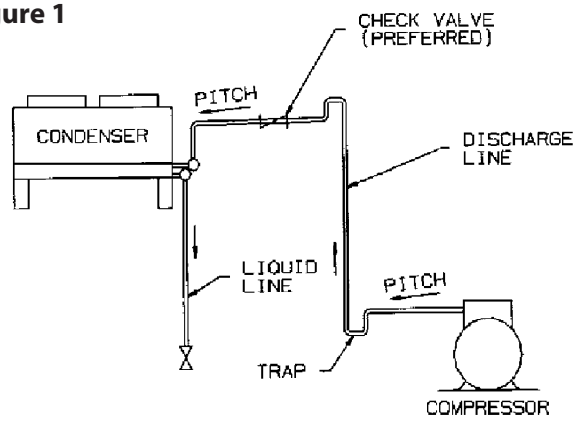
Figure 1 illustrates a typical piping arrangement involving a remote gas cooler located at a higher elevation, as commonly encountered when the gas cooler is on a roof and the compressor and receiver are on grade level or in a basement equipment room.

In this case, the design of the discharge line is very critical. If properly sized for full load condition, the gas velocity might be too low at reduced loads to carry oil up through the discharge line and gas cooler coil. Reducing the discharge line size would increase the gas velocity sufficiently at reduced load conditions; however, when operating at full load, the line would be greatly undersized, and thereby create an excessive refrigerant pressure drop. This condition can be overcome in the following way:

1. The discharge line may be properly sized for the desired pressure drop at full load conditions and an oil separator installed at the bottom of the trap in the discharge line from the compressor.

For more complete information, refer to the ASHRAE Handbook on Systems.

Figure 1



Notes:

1. All oil traps are to be as short in radius as possible. Common practice is to fabricate the trap using three 90 degrees ells.

2. For gas cooler, recommended to install pressure relief valve at the inlet of coil.

Installation, Refrigerant Piping

Install piping according to standard accepted refrigeration practice. The following recommendations should be adhered to:

1. See Table 1 for discharge and gas cooler return line sizes for remote gas cooler connections.

2. Use only refrigeration grade copper tubing. CuFe2P of C194000 alloy piping with minimum 1886psig rating or the same as overall system high side design pressure rating.

3. Soft solder joints are not acceptable.

4. Put dry nitrogen through lines while brazing.

5. Do not leave dehydrated piping or components open to the atmosphere any longer than is absolutely necessary.

6. Inverted traps should be located near coil inlets as shown in Figure 1.

Discharge Lines

The proper design of discharge lines involves two objectives:

1. To minimize refrigerant pressure drop, since high pressure losses cause increased compressor horsepower per ton of refrigerant.
2. To maintain sufficiently high gas velocity to carry oil through to the gas cooler coil and receiver at all loading conditions.

Table 1. Gas Cooler Line Size Table

Line Size	Discharge Line			Drain Line
K65 Copper	CO2 Sat.Suction Temp			Gas Cooler Return Line
OD	-40	0	20	
1/2	2.13	2.17	2.15	One size smaller than discharge line
5/8	3.40	3.60	3.47	
7/8	9.18	9.59	9.07	
1-1/8	18.70	18.89	18.67	
1-3/8	32.64	32.68	32.27	
1-5/8	51.68	51.56	50.94	
2-1/8	106.75	106.72	105.36	

Recommended line size is based on average PD 7.5 psi/100ft for gas cooler discharge line, and 5 psi PD on the gas cooler return line.

It may be adjusted based on jobsite piping condition, piping length, and allowable total pressure drop on the system design and running.

Electrical Wiring

The electrical installation should be in accordance with National Electrical Code, local codes and regulations. Proper overcurrent protection should be provided for the fan motors.

All standard motors have internal inherent overload protectors. Therefore, contactors can be used instead of starters requiring thermal protectors, eliminating the problem of furnishing the proper heating elements.

All gas coolers are furnished with EC motor only have 230V or 460V three-phase fan motors which are identified by the unit dataplate.

Electrical leads from each motor terminate at the unit junction box. Field connections must be made from these leads in accordance with local, state and national codes.

Three-phase motors must be connected to three-phase power of voltage to agree with motor and unit dataplate.

The motors are wired into a common junction box. The motors completely wired through the control and to the contactors. The motors must be checked for proper rotation. Be sure to check that motor voltage and control connection agree with electric services furnished.

WARNING: ***There may be more than one source of electrical current in this unit. Do not service before disconnecting all power supplies.***

Start-Up

Check for proper fan rotation. Air is drawn through the coil on all units. Be sure the fans turn freely.

Rotation of the motors and blades should be in a "CW" direction looking at the unit from the blade side. On three phase units, it may be necessary to reverse two of the three power leads to the unit.

Operation

Winter Operation Head Pressure Control

On the rack controller, there is default min. condensing pressure setting on controller which is 700 psi and 4 degree R outlet gas cooler liquid temp subcooling.

High pressure valve on the flash tank and controller will maintain set point.

Variable Speed

Gas cooler head pressure control is provided by varying the air flow through the gas cooler by changing the RPM of the gas cooler fan. All fans are running at same speed, there is no fan cycling.

Refrigerant Charge

The refrigerant charge for summer operation can be found in Table 2.

Table 2. Refreigeration Capacity (ton)

Model	No. of Rows	Fans	Internal Volume (ft^3)	Estimated Charge (lb)
BGE012S01^*A	4	1	0.295	9.17
BGE026S02^*A	4	2	0.578	17.98
BGE040S03^*A	4	3	0.861	26.77
BGE047S04^*A	4	4	1.142	35.52
BGE064S05^*A	4	5	1.426	44.33
BGE079S06^*A	4	6	1.709	53.14
BGE094S07^*A	4	7	1.992	61.95
BGE053D04^*A	4	4	1.156	35.96
BGE079D06^*A	4	6	1.721	53.53
BGE094D08^*A	4	8	2.285	71.05
BGE128D10^*A	4	10	2.851	88.66
BGE158D12^*A	4	12	3.418	106.28
BGE189D14^*A	4	14	3.984	123.89

Model	No. of Rows	Fans	Internal Volume (ft^3)	Estimated Charge (lb)
BGE017S01^*A	6	1	0.443	13.77
BGE035S02^*A	6	2	0.867	26.96
BGE052S03^*A	6	3	1.291	40.15
BGE069S04^*A	6	4	1.715	53.34
BGE089S05^*A	6	5	2.140	66.55
BGE101S06^*A	6	6	2.563	79.71
BGE121S07^*A	6	7	2.988	92.92
BGE069D04^*A	6	4	1.734	53.92
BGE103D06^*A	6	6	2.582	80.30
BGE138D08^*A	6	8	3.430	106.67
BGE178D10^*A	6	10	4.280	133.09
BGE202D12^*A	6	12	5.126	159.42
BGE241D14^*A	6	14	5.976	185.84

Tables have already considered winter condition running requirement.

Table 3. Model Cross Reference for Standard for Gas Coolers

Model Reference	Fans	No. of Rows	Model			
			8 FPI	10 FPI	12 FPI	14 FPI
1	1	4	*GE010S01^08A	*GE012S01^10A	*GE013S01^12A	*GE014S01^14A
2	2		*GE025S02^08A	*GE026S02^10A	*GE029S02^12A	*GE032S02^14A
3	3		*GE033S03^08A	*GE040S03^10A	*GE043S03^12A	*GE046S03^14A
4	4		*GE046S04^08A	*GE047S04^10A	*GE052S04^12A	*GE056S04^14A
5	5		*GE054S05^08A	*GE064S05^10A	*GE068S05^12A	*GE074S05^14A
6	6		*GE067S06^08A	*GE079S06^10A	*GE086S06^12A	*GE093S06^14A
7	7		*GE080S07^08A	*GE094S07^10A	*GE0102S07^12A	*GE112S07^14A
8	4		*GE049D04^08A	*GE053D04^10A	*GE058D04^12A	*GE063D04^14A
9	6		*GE067D06^08A	*GE079D06^10A	*GE086D06^12A	*GE093D06^14A
10	8		*GE093D08^08A	*GE094D08^10A	*GE103D08^12A	*GE112D08^14A
11	10		*GE108D10^08A	*GE128D10^10A	*GE136D10^12A	*GE148D10^14A
12	12		*GE134D12^08A	*GE158D12^10A	*GE171D12^12A	*GE186D12^14A
13	14		*GE159D14^08A	*GE189D14^10A	*GE205D14^12A	*GE223D14^14A
14	1	6	*GE015S01^10A	*GE017S01^10A	*GE019S01^12A	*GE020S01^14A
15	2		*GE031S02^10A	*GE035S02^10A	*GE038S02^12A	*GE040S02^14A
16	3		*GE045S03^10A	*GE052S03^10A	*GE056S03^12A	*GE059S03^14A
17	4		*GE063S04^10A	*GE069S04^10A	*GE075S04^12A	*GE080S04^14A
18	5		*GE078S05^10A	*GE089S05^10A	*GE097S05^12A	*GE102S05^14A
19	6		*GE089S06^10A	*GE101S06^10A	*GE110S06^12A	*GE116S06^14A
20	7		*GE106S07^10A	*GE121S07^10A	*GE131S07^12A	*GE138S07^14A
21	4		*GE062D04^10A	*GE069D04^10A	*GE076D04^12A	*GE080D04^14A
22	6		*GE090D06^10A	*GE103D06^10A	*GE112D06^12A	*GE119D06^14A
23	8		*GE125D08^10A	*GE138D08^10A	*GE151D08^12A	*GE160D08^14A
24	10		*GE156D10^10A	*GE178D10^10A	*GE194D10^12A	*GE204D10^14A
25	12		*GE177D12^10A	*GE202D12^10A	*GE220D12^12A	*GE232D12^14A
26	14		*GE212D14^10A	*GE241D14^10A	*GE262D14^12A	*GE275D14^14A

Maintenance

Air-cooled gas coolers require a minimum of maintenance. The unit coil will require a periodic cleaning and this can be accomplished by a brush, vacuum cleaner, pressurized air stream or a commercially available coil cleaning foam.

All of the gas cooler fan motors have sealed ball bearings. The only acceptable service to these bearings is replacement.

General Cleaning Instructions

Heatcraft recommends that the finned surface of this unit be cleaned approximately every six months; more frequent cleaning may be required if extreme conditions cause clogging or fouling of air passages through the finned surface.

Calgon Corporation's CalClean 41352 (or equal) should be acceptable for cleaning this unit. CalClean should be applied liberally to entering air and leaving air surfaces of the finned area in accordance with the label directions.

CAUTION: ***Under no circumstances should this unit be cleaned with an acid-based cleaner.***

In-Warranty Return Material Procedure

Material may not be returned except by permission of authorized factory service personnel of Heatcraft Refrigeration Products in Stone Mountain, Georgia. A "Return Goods" tag will be sent to be included with the returned material. Enter the required information on the tag in order to expedite handling at our factories and prompt issuance of credits. All parts shall be returned to the factory designated on the "Return Goods" tag, transportation charges prepaid.

The return of a part does not constitute an order for replacement. Therefore, a purchase order must be entered through your nearest Heatcraft Refrigeration Products representative. The order should include part number, model number and serial number of the unit involved.

Following our careful inspection of the returned part and if it is determined that the failure is due to faulty material or workmanship, credit will be issued on customer's purchase order.

Parts by InterLink™

When writing to the factory for service or replacement parts, refer to the model number and serial number of the unit as stamped on the serial plate attached to the unit. If replacement parts are required, mention the date of installation of the unit and date of failure, along with an explanation of the malfunctions and a description of the replacement parts required.

InterLINK
Commercial Refrigeration Parts

Table 4. InterLink™ Gas Cooler Parts List

Fan RPM	Motor Size	Fan Motor Part No.	Fan Blade Part No.	Fan Guard Part No.
1130 (E Models, 230V)	2.0 kW	25318801 (5 blade)		--
1130 (E Models, 460V)	2.0 kW	25318901 (5 blade)		--

Contact the InterLink™ Customer Service Department for parts to specific gas cooler models at 800-686-7278, interlinkparts@heatcraftrpd.com, or www.interlinkparts.com.

Motors with Integrated Variable Speed

Gas Coolers use an EC motor/fan blade combination to provide variable speed gas cooler control. All components required to run the motor at variable speeds are built into the motor.

WARNING: ***When connecting the unit to the supply power, dangerous voltages occur. Do not open the motor within the first 5 minutes after disconnection of all phases.***

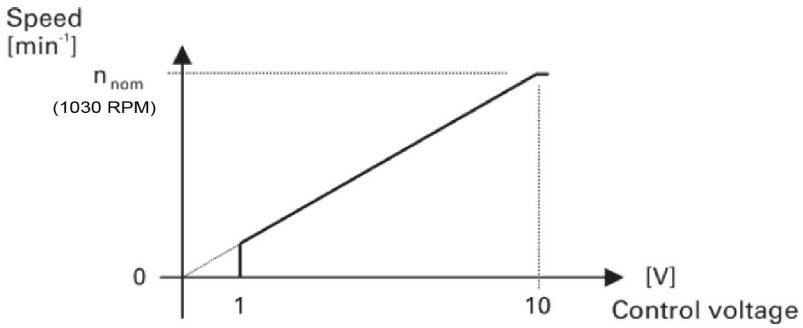
Be sure that the unit is isolated.

WARNING: ***With a control voltage fed in or a set speed value being saved, the motor will restart automatically after a power failure.***

WARNING: ***Dangerous external voltages can be present at terminal KL2 even with the unit turned off.***

Speed Adjustment Characteristics

The EC motor varies it's speed linearly based on a 0-10V input signal. At 10 VDC, the motor runs at full speed. At 0 VDC, the motor turns off. A chart of the speed control curve is shown below.



The input control signal can be supplied from any controller that outputs a 0-10 VDC signal. For units with a control signal supplied from a rack control or other external controller, the unit is provided with a terminal board for control signal wiring.

External Control Signal

Contact control manufacturer for setup of external controller to provide 0-10 VDC control signal. Wire the control signal to terminal board in unit control box. See Diagram #1 for typical external signal control wiring.

Standard Wiring Configuration

Standard VSEC units are wired in a Direct Acting Series Wired configuration. This configuration allows for the maximum sound and energy reduction as well as the most stable head pressure control. The control signal is delivered to the lead motor (located at the header end of the unit). The lead motor relays the control signal to the adjacent lag motor. This relay is done until the last motor is reached. As each lag relays the control signal, it adjusts the signal so the next lag will run slightly slower than the upstream motor. The end result of this is that when a motor receives a small enough signal, it will turn off. This provides built-in fan cycling.

Protective Features

The EC motors have many built-in protective features.

The EC motors have functions within the motor to protect against:

- over-temperature of electronics
- over-temperature of motor
- incorrect rotor position detection

With any of these failures, the motor stops electronically and the alarm relay is switched. With one of these failures, the motor WILL NOT automatically restart. To reset, the power supply has to be switched off for a minimum 20 seconds once the motor is at standstill.

Locked-rotor protection

As soon as the rotor is blocked, the motor gets switched off electronically and the alarm relay is switched. After de-blocking, the motor WILL restart automatically.

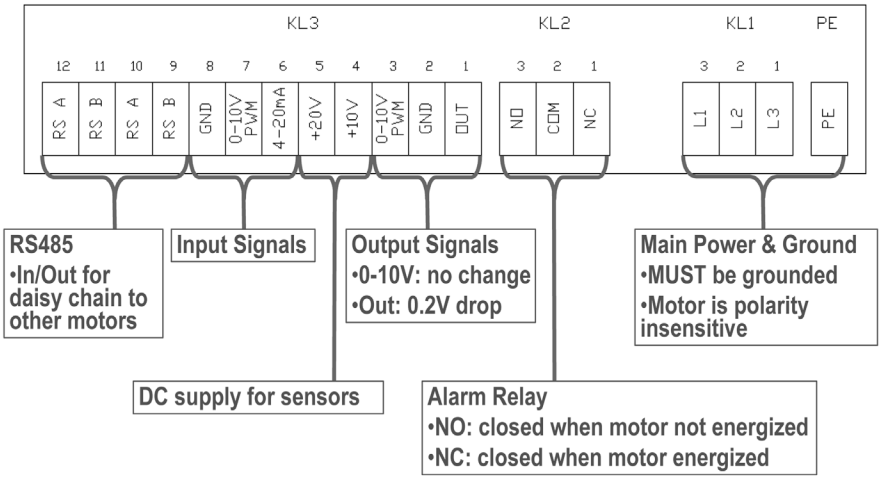
Under-voltage protection

If power supply voltage falls below ~150VAC/3Ø (for 230V motors) or ~290VAC/3Ø (for 460V motors) for 5 seconds minimum, the motor will be switched off electronically and the alarm relay is switched. If power supply voltage returns to correct values, the motor WILL restart automatically.

Phase failure

If 1 phase fails for 5 seconds minimum, the motor will be switched off electronically and the alarm relay is switched. If all 3 phases return to correct values, the motor WILL restart automatically within 10-40 seconds.

Motors with 7 Fan Blades



Motors with 5 Fan Blades

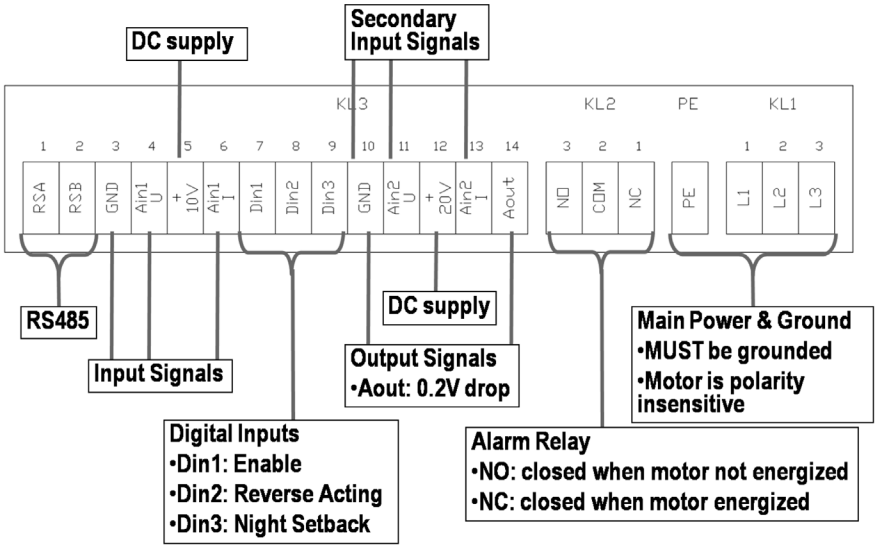
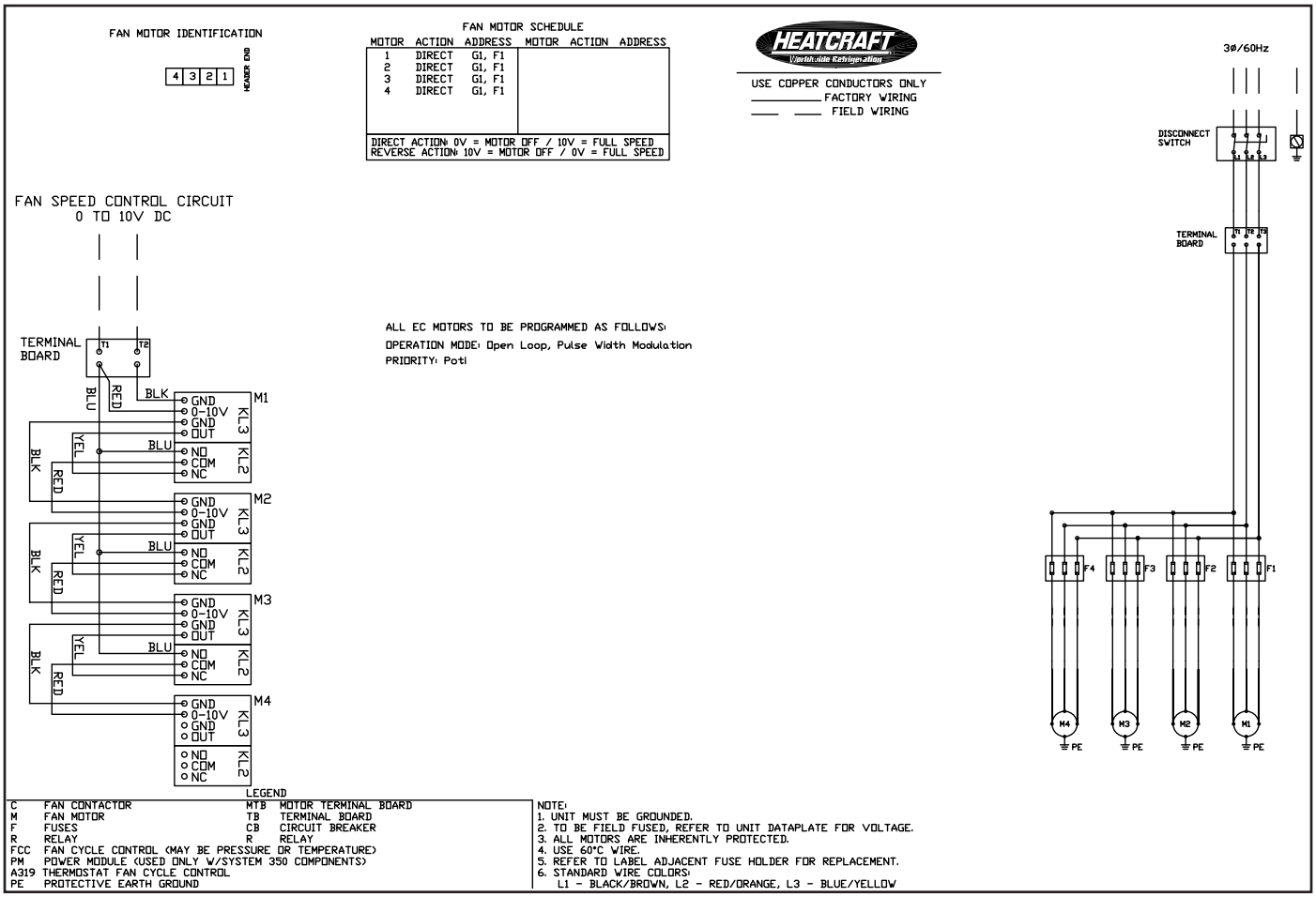


Diagram 1. Typical Gas Cooler Wiring Diagram with External Signal



Installation Check List

Gas Cooler

Start Up Date _____

Model # _____

Serial # _____

Electrical

Voltage _____

Amperage _____

Installer: **Name & Address**

_____

_____

_____

Telephone:

_____

Please retain this information with the gas cooler

NOTES

NOTES

Since product improvement is a continuing effort, we reserve the right to make changes in specifications without notice.

www.heatcraftrpd.com