

CE Compliant VHE Upwind Heater Installation and Operation

Models:

VHE-18

VHE-24

Owner's Manual - Original Instructions



PNEG-012CE

Date: 09-03-15



PNEG-012CE

GSI GROUP



**CE Declaration of Incorporation
EC MACHINERY DIRECTIVE
2006/42/EC**

1004 East Illinois Street, Assumption, IL, 62510, USA

+1 217 226 4429

The GSI Group declares that the machine, parts or equipment

VHE Upwind Heaters

Models

VHE-24-LN

VHE-18-LN

Heaters are vapor fuel only, using LPG or Natural Gas, with gross calorific values as stated in tables [on Page 21](#) of this manual.

Meet the Essential Requirements of the Machinery Directive 2006/42/EC and has been constructed to meet the requirements of the following standards:

- EN746-2:2010
- EN60204:2006

The equipment above must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the provisions of all relevant Directives or until these components have been assembled in the manner recommended in the manufacturers instructions.

Signed:

Name:

Position:

Date:

Contents

Chapter 1 Safety	4
Safety Guidelines	4
Cautionary Symbols Definitions	5
Safety Cautions	6
Safety Sign-Off Sheet	10
Correct Use	11
Electrical Safety	12
Flammable Fuel Safety	13
Possible Hazards Inside Grain Bins	14
Precautions to Reduce Risk of Fire	15
Chapter 2 Safety Decals	16
Rating Plate	19
Chapter 3 Specifications	20
Heater Specifications	20
Chapter 4 Installation	22
Fan/Heater Location on Silo	22
Fit Heater to Fan	22
Attach to Fan Using HF-4421M Brackets	23
Fit Transition High-Limit (HF-8447) (120°C)	23
Fit Plenum Thermostat/High-Limit	25
Electrical Installation	26
Temperature Control Options - High/Low Control Connections	28
Temperature Control Options - GSI BMGB Modulating Control	28
Temperature Control Options - Non-GSI Modulating Control	29
CE Heater Control Schematics	30
Connect Fuel Supply	32
Chapter 5 Commissioning Heater	33
Set Inlet Pressure	33
Set Over-Pressure Safety Valve	33
Set Regulator	35
Set Air Switch	35
Set Purge Timer	36
Set High Pressure Switch	36
Set Modulating Valve	36
Start Gas Setting	37
High-Fire Setting	38
Commissioning Check List	39
Chapter 6 Troubleshooting	40
Normal Start-Up Sequence	40
Fault Conditions	41
Chapter 7 Parts List	43
Heater 18" CE Base Model - Knockdown (VHE-18) (Pre-2016)	44
Heater 18" CE Base Model (VHE-18) (2016 Onwards)	46
Heater 24" CE Base Model - Knockdown (VHE-24) (Pre-2016)	48
Heater 24" CE Base Model (VHE-24) (2016 Onwards)	50
Chapter 8 Purge Times	52
Chapter 9 Warranty	55

1. Safety

Safety Guidelines

Safety guidelines shall be followed at all times. This manual is written to help you understand safe operating procedures and problems that can be encountered by the operator and other personnel when using this equipment. Save these safety guidelines for future reference.

As owner or operator, you are responsible for understanding the requirements, hazards, and precautions that exist and to inform others as required. Unqualified persons must stay out of the work area at all times.

Alterations shall not be made to the equipment. Alterations can produce dangerous situations resulting in **SERIOUS INJURY or DEATH**.

This equipment shall be installed in accordance with the current installation codes and applicable regulations, which should be carefully followed in all cases. Authorities having jurisdiction shall be consulted before installations are made.

When necessary, you shall consider the installation location relative to electrical, fuel and water utilities.

Personnel operating or working around equipment shall read this manual. This manual shall be delivered with equipment to its owner. Failure to read this manual and its safety instructions is a misuse of the equipment.

ST-0001-2

Cautionary Symbols Definitions

Cautionary symbols appear in this manual and on product decals. The symbols alert the user of potential safety hazards, prohibited activities and mandatory actions. To help you recognize this information, we use the symbols that are defined below.



This symbol indicates an imminently hazardous situation which, if not avoided, **will result in serious injury or death.**



This symbol indicates a potentially hazardous situation which, if not avoided, **may result in serious injury or death.**



This symbol indicates a potentially hazardous situation which, if not avoided, **may result in minor or moderate injury.**



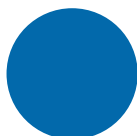
This symbol is used to address practices not related to personal injury.



This symbol indicates a general hazard.



This symbol indicates a prohibited activity.



This symbol indicates a mandatory action.

ST-0005

Safety Cautions

Use Personal Protective Equipment

- Use appropriate personal protective equipment:

Eye Protection



Respiratory Protection



Foot Protection



Hearing Protection



Head Protection



Fall Protection



Hand Protection



- Wear clothing appropriate to the job.
- Remove all jewelry.
- Tie long hair up and back.

ST-0004-1

Follow Safety Instructions

- **Warning:** If the information in the manual is not followed exactly, a fire or explosion may result, causing property damage, personal injury or loss of life.
- Carefully read and follow all safety messages in this manual and safety signs on your machine. Keep signs in good condition. Replace missing or damaged safety signs. Replacement safety signs are available from the manufacturer.
- Learn how to operate the machine correctly. Do not operate without instruction.
- If you do not understand any part of this manual or need assistance, contact your dealer.



ST-0025-1

For Your Safety

- If you smell gas:
 1. Do not try to light any appliance.
 2. Extinguish any open flames.
 3. Do not touch any electrical switch.
 4. Immediately call your gas supplier. Follow the gas supplier's instructions.
 5. If you cannot reach your gas supplier, call the fire department.
- The use and storage of gasoline and other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous.
- Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment. Installation and service must be performed by a qualified installer, service agency or the gas supplier.



ST-0024-1

Maintain Equipment and Work Area

- Understand service procedures before doing work. Keep area clean and dry.
- Do not service equipment while it is operating. Disconnect and lock out power and fuel supply before entering dryer/bin or before performing maintenance.
- Keep your equipment in proper working condition. Replace worn or broken parts immediately.
- Depressurize fuel train before disassembling for service.
- Allow the fan to run for 20 minutes with the burner OFF to purge products of combustion and to cool components before entering dryer/bin.
- Check regularly for any developing gas plumbing leaks. Do not operate the dryer if any gas leak is detected. Shut down and repair before further operation.



ST-0030-1

Handle and Use Equipment Properly

- Equipment is intended for the use of grain drying only. Any other use is a misuse of this equipment.
- The operating instructions in this manual pertain to the common cereal grains as indicated. When drying any other grain, contact GSI for additional recommendations.
- On LP fired units, set pressure regulator to avoid excessive gas pressure applied to the burner during ignition and operation. Do not exceed maximum recommended drying temperatures.
- Equipment has sharp edges that may cause serious injury. To avoid injury, handle sharp edges with caution and use proper protective clothing and equipment at all times.
- All guards must be in place before and during operation. Images of guards removed in this manual are for illustration purposes only.
- Use caution when working around high-speed fans, gas burners, augers and auxiliary conveyors which can start automatically.
- Keep hands, feet and clothing away from moving parts.
- Do not bypass any safety device or interlock.
- Do not enter the dryer/bin while it is operating.
- Do not operate in an area where combustible material will be drawn into the dryer.



ST-0029-1

Install and Operate Electrical Equipment Properly

- Electrical controls should be installed by a qualified electrician and must meet the standards set by the National Electric Code, Canadian Electrical Code and all local and state codes.
- Disconnect and lock out all power sources before installing wires/cables or servicing equipment.
- Heater must be interlocked with an appropriately sized fan and a thermostat must be installed for safe operation.



ST-0026-1

Prevent Roof Damage Due to Vacuum Pressure

- Roof damage can result from excessive vacuum or internal pressure from fans or other air moving systems. The manufacturer does not warrant this type of roof damage.
- Adequate ventilation and/or “makeup air” devices should be provided for all powered air handling systems.
- The manufacturer does not recommend the use of downward flow systems (suction).
- Severe roof damage can result from any blockage of air passages.
- Running fans during high humidity/cold weather conditions can cause air exhaust or intake ports to freeze.



ST-0028-1

Exercise Caution When Drying Flammable Grains

- Be aware that some grains are highly flammable including but not limited to rapeseed, canola, linseed, sunflower and milo.
- All grain and seed must be whole (minimal cracking or crushing), clean and dust free before drying.
- Avoid dust and chaff from being drawn into the fan and heater.
- To reduce risk of fire, keep the fan, heater, drying plenum and ducts clean at all times.
- In the event of a fire (or suspected fire):
 1. Shut down the entire dryer.
 2. Turn OFF fuel at the tank or supply valve.
 3. Shut off and lock electrical power.
 4. Evacuate the area.
 5. Call the fire department.



ST-0032-1

Correct Use



The heater shall be used ONLY.

1. When coupled to a drying fan of similar diameter, delivering airflow in the range stated in Heater Dimension tables on [Page 21](#) or on the heater rating plate.
2. When connected directly to a transition duct, delivering the air into the ventilation system of a grain bin/store/dryer.
3. For drying whole agricultural grains.
4. When fitted with a temperature control system, including over temperature limiting thermostats, as described in this manual.
5. With fuel specified on the rating plate.
6. With adequate air exhaust facility on the bin/store/dryer.



It shall NOT be used:

1. With any safety features by-passed.
2. For domestic or commercial heating.
3. In any potentially explosive area.
4. By an untrained person or any one less than 18 years old.
5. Where there is risk of flammable materials being drawn into or exposed to the flame.
6. If it has been modified in any way.
7. With covers or guards removed or loose.
8. Unless the commissioning sheet (in this manual) has been filled in and signed of by the installing engineer.



In addition:

1. All electrical installation must be carried out by a qualified electrical engineer.
2. All gas installation must be carried out by a qualified gas engineer.
3. The entire installation shall meet the full requirements of all EU Directives, EU standards and local codes and laws.
4. The heater shall never be lit manually.

Electrical Safety



Equipment shall include:

1. Fuse protected main power supply.



- a. The electrical supply should include earth leakage protection, (example) Residual Current Device (RCD) or Residual Current Circuit Breaker (RCCB), to provide automatic disconnection in the event of a fault.

2. Lockable main safety disconnect.



- a. Disconnects all electrical power.

3. Lockable motor service disconnect.



- a. Adjacent to each heater.
- b. Disconnects all power to the heater.

4. Emergency stops.



- a. Stops all equipment immediately when pressed.
- b. Must remain engaged until manually disengaged.
- c. Equipment shall not immediately re-start when the emergency stop is re-set.

5. Door safety interlocks - Where doors provide access to dangerous machinery and/or atmosphere.



- a. Immediately stops and prevents re-start of all equipment when the door is open.
- b. Equipment shall not immediately re-start when the door is closed.
- c. Safety switches shall be SIL3 in accordance with IEC62061:2005.
- d. Safety circuits should be Category 3 in accordance with EN954-1:1997 or PLc in accordance with ISO 13849-1:2006.

6. The electrical supply must include a properly designed protective earth system (PE), with connection to all exposed conductive parts.



7. All motors shall be connected to protective earth at the terminal provided.

8. The control system shall include.

a. Short circuit protection.



b. Equipment shall not immediately re-start following re-establishment of power.

9. All electrical design, installation and testing must be carried out by a qualified electrical engineer, in accordance with EU Directives and Standards, local laws and codes.

Flammable Fuel Safety

This equipment requires a correctly designed fuel supply, including:

1. Primary pressure regulation.
2. Over/under pressure protection.
3. Excess flow protection.
4. Lockable shut off valve.

Fuel supply shall be in accordance with local laws, regulations and codes and shall be approved by authorities having jurisdiction.

1. Safety

Possible Hazards Inside Grain Bins

The inside of a grain bin, no matter what size, is a dangerous location. Grain bins should be kept **locked shut** at all times.



NEVER allow a child or untrained, inexperienced person to enter a grain bin.

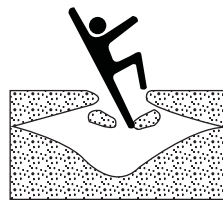
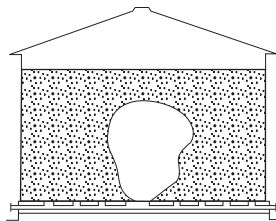
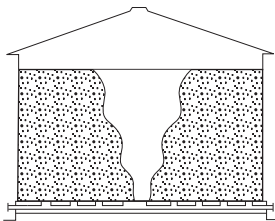
Hazards present at any time may include:



Mass flow of grain when filling or emptying which could draw you in and cause suffocation/burial.



Bridged, crusted or capped grain which could collapse if you stand on it. It is recommended **NEVER** to walk on the surface of the stored material.



If grain has stopped flowing, become bridged, capped or crusted, the **only safe way** to remedy this is from the outside of the bin.



Exposed machinery such as fans, augers and conveyors with which you could become entangled.



It is a recommended additional safety measure to fit grain bin doors and hatches with electrical interlock switches, to stop all equipment if the door or hatch is opened. However this does not override the need to lock out power before entering.



Hazardous substances such as dust, mould spores, vapors and gases or low oxygen levels which could cause respiratory problems.



High temperature combustible material.



Precautions to Reduce Risk of Fire

Combustion equipment presents a risk of fire. To reduce this, follow this procedure at least every 20 working days. Protective equipment required for this task shall be determined by risk assessment.

1. Do not smoke or use naked flames.



2. Shut down and purge heater, plenum and connected areas.



3. Lock out electrical supply.



4. Lock out fuel supply.



5. Open access panels and check for build-up of dust or other combustible debris.
6. Using an industrial vacuum cleaner, clean the plenum. **Do not use compressed air.**
7. If fitted, open plenum clean-out doors and blow out excess dust and chaff.
8. Check inside other dryer accesses and clean as required.
9. Check all personnel are out of the dryer, close and lock all accesses before re-starting drying.
10. This procedure may be carried out more regularly in conditions of extreme dust and dirt.

Exercise great caution when drying highly flammable grains and seeds. For example rapeseed, canola, linseed, sunflower and milo.

1. All grain and seed must be whole (minimal cracked or crushed), clean and dust free.
2. Dry at low temperatures (< 40°C).
3. Avoid dust and chaff being drawn into the fan and heater.
4. Keep the fan, heater, drying plenum and ducts clean at all times.
5. In the event of a fire (or suspected fire).
 - Shut down the entire dryer.
 - Turn OFF fuel at the tank or supply valve.
 - Shut off and lock electrical power.
 - Evacuate the area.
 - Call the fire department.

2. Safety Decals

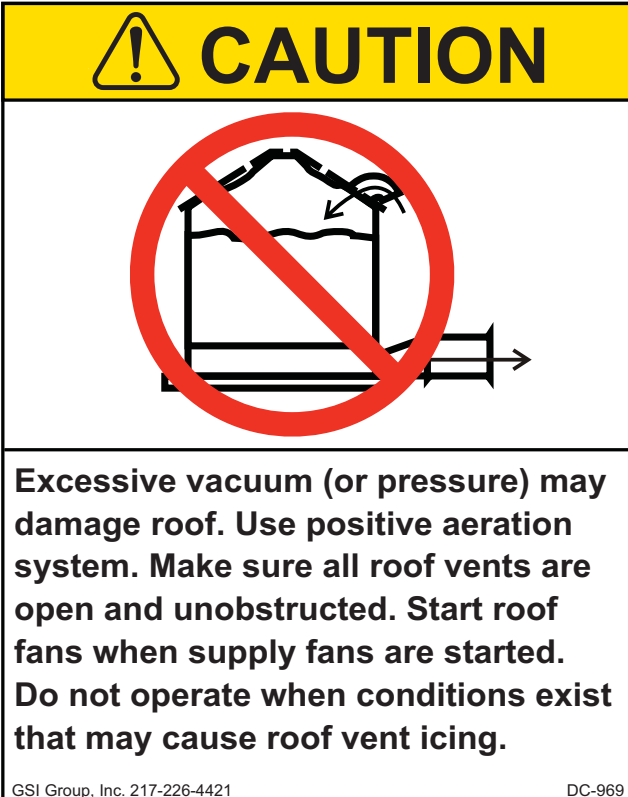
Safety decals are available in non-English versions. Please request LPAK-0004-** if these were not delivered with the equipment.

The safety decals on your equipment are safety indicators which must be carefully read and understood by all personnel involved in the installation, operation, service and maintenance of the equipment.

To replace a damaged or missing decal, contact us to receive a free replacement.

GSI Decals

1004 E. Illinois St.
Assumption, IL. 62510
Phone: 1-217-226-4421

Location	Decal #	Decals	Description
Located next to aeration system.	DC-995		Caution Vacuum Pressure

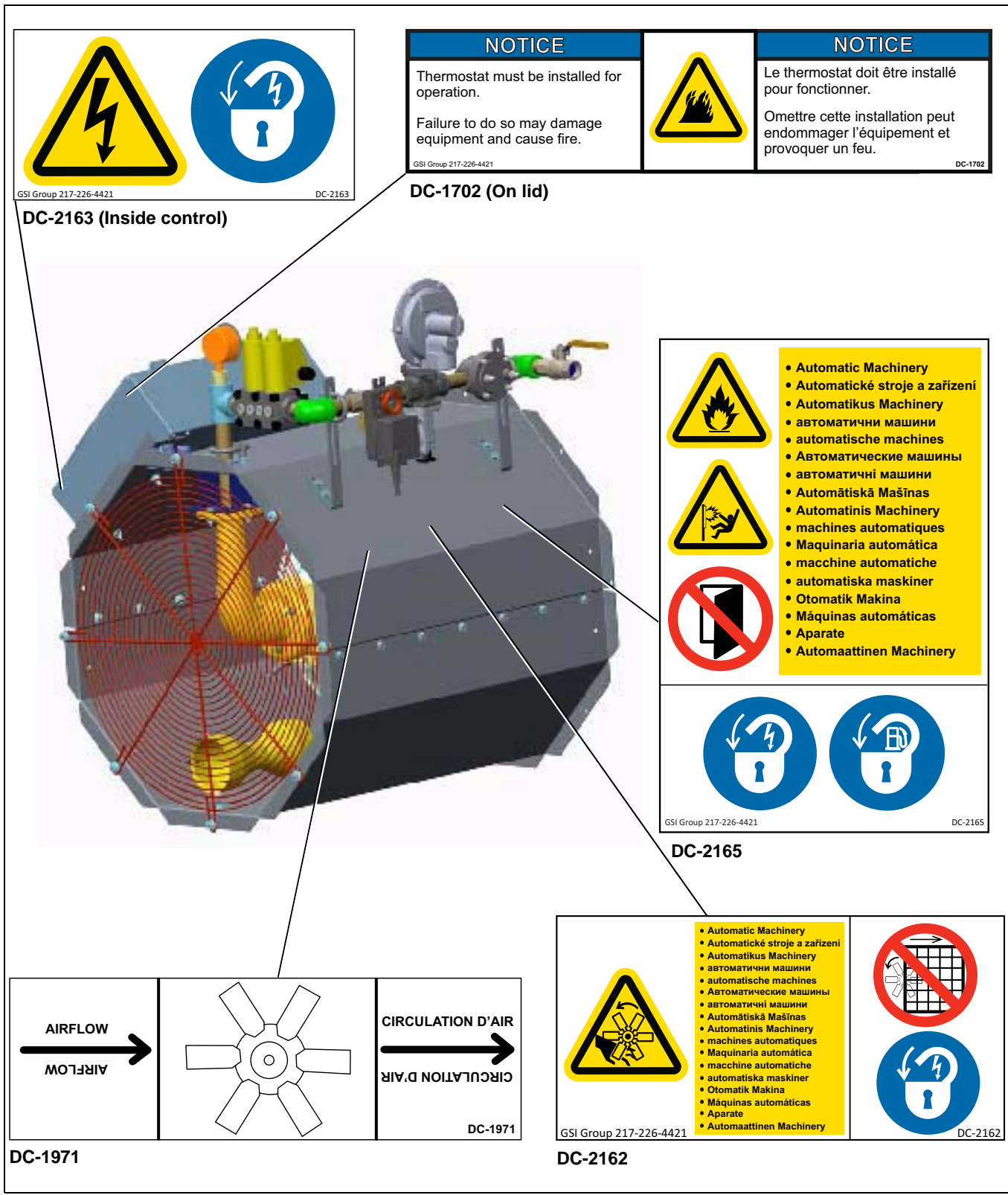


Figure 2A

2. Safety Decals

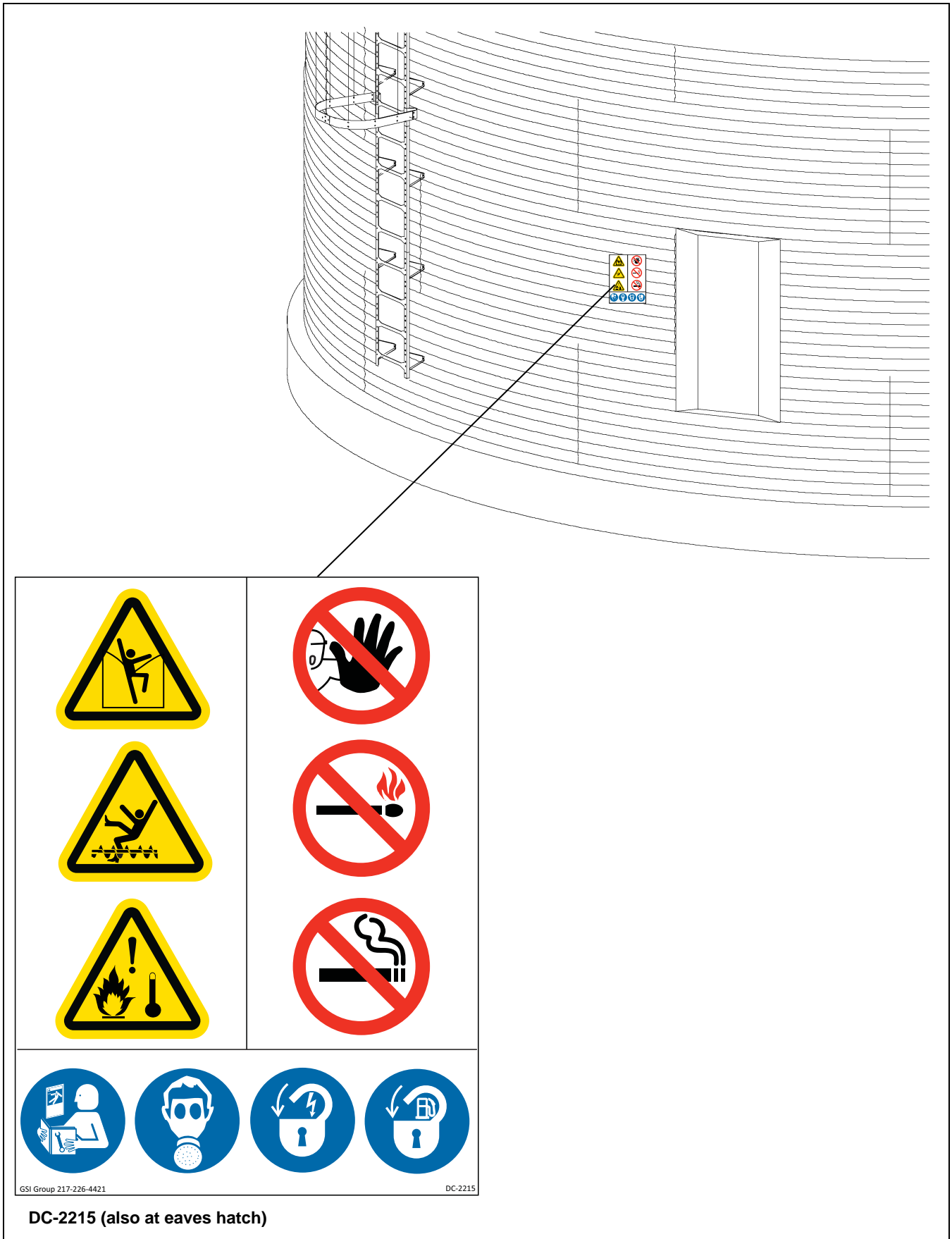
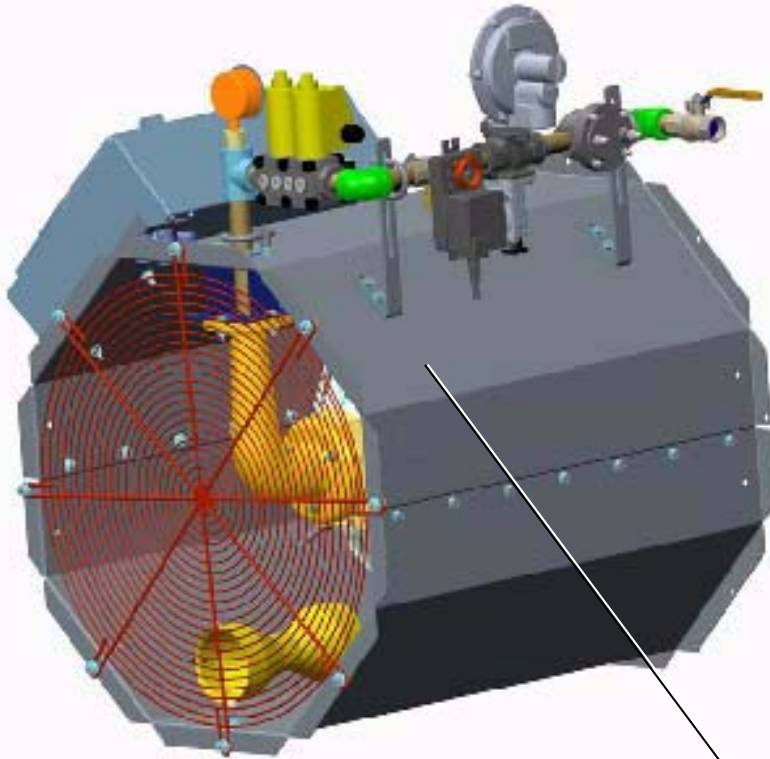


Figure 2B

Rating Plate

CE Rating plate must be fitted as shown in *Figure 2C*.








GSI KFT		VHE HEATER	
1 Erdőalja utca, Vendel Park Biatorbagy H-2051, Hungary			
SN #	-		
Model	VHE-18-LN		
NG	38.6 MJ/m ³		
Inlet pressure	250 mBar		
Regulator pressure	106 mBar		
		120 kW	12 kW
Orifice	∅		
Burner Pressure		102.1 mBar	1 mBar
Flow		11.2 m3/h	1.1 m3/h
LPG	93.9 MJ/m ³		
Inlet pressure	250 mBar		
Regulator pressure	79 mBar		
		160 kW	12 kW
Orifice	∅	5.5 mm	
Burner Pressure		77.8 mBar	0.4 mBar
Flow		6.1 m3/h	0.5 m3/h
Airflow		Max	Min
		9.2 m3/s	3.4 m3/s
	EN746-2:2010	220 - 240 V AC 1 ~ 50 hz 2.0 A	
	24 August 2015		

Figure 2C

3. Specifications

Heater Specifications

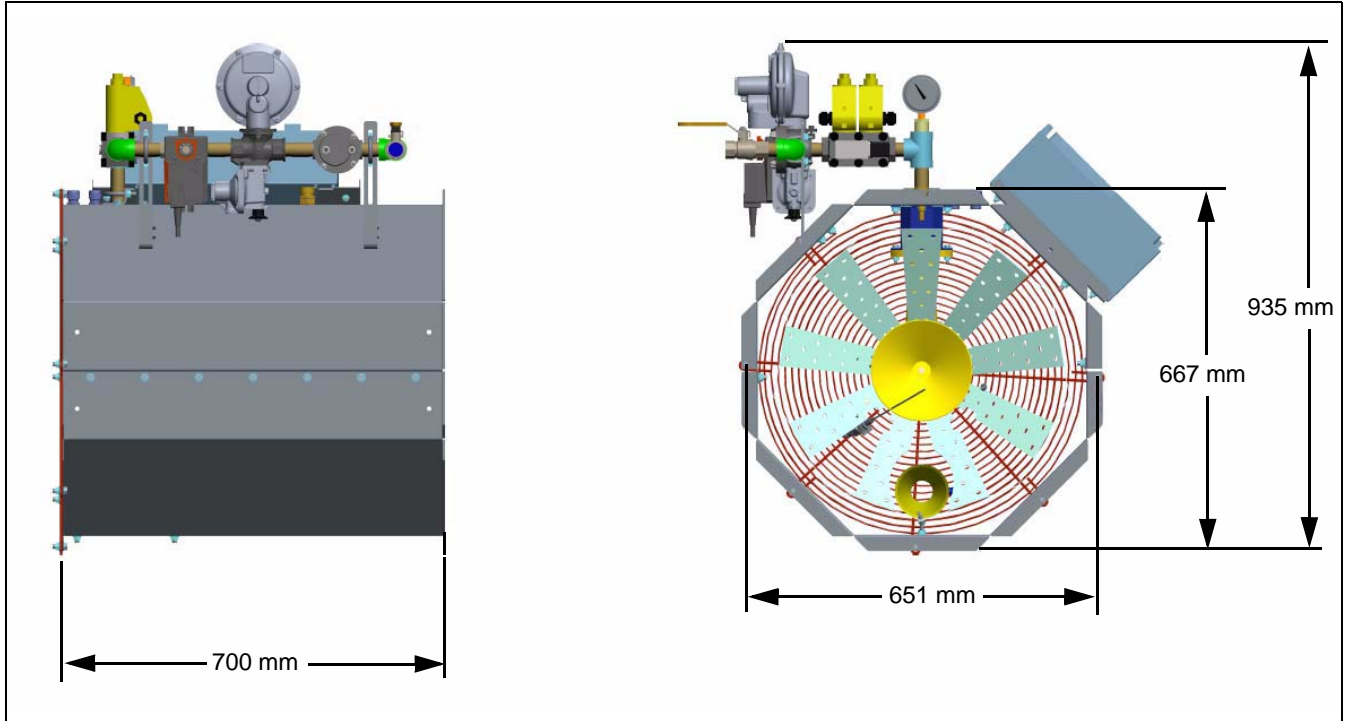


Figure 3A Heater Dimensions (VHE-24-LN)

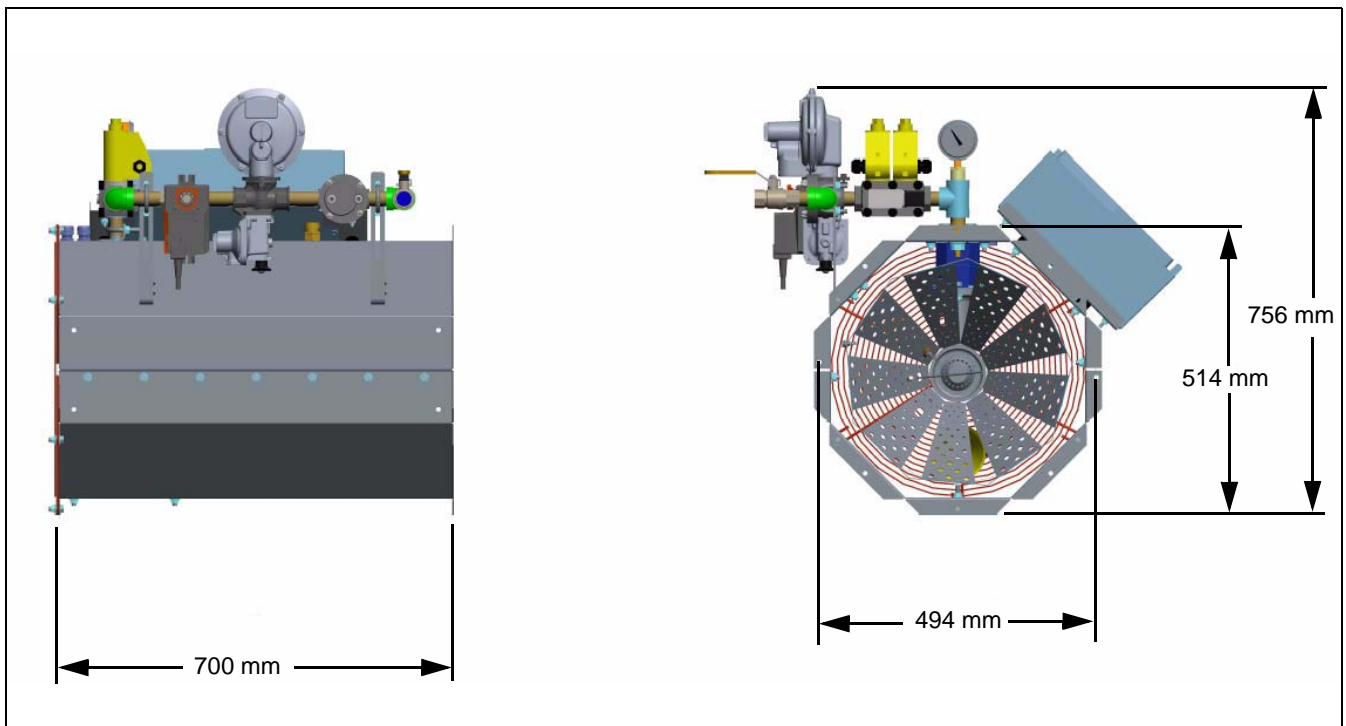


Figure 3B Heater Dimensions (VHE-18-LN)

LPG Vapor Models

LPG	Supply Pressure (mBar)	Regulator Pressure (mBar)	Burner Orifice (mm)	Maximum Heat (kW)	Minimum Heat (kW)	Maximum Burner Pressure (mBar)	Minimum Burner Pressure (mBar)	Maximum Flow Rate (m ³ /h)	Minimum Flow Rate (m ³ /h)
VHE-18	250	79.0	5.5	160.0	23.0	77.8	1.6	6.1	0.9
VHE-24	500	88.0	7.0	270.0	38.0	84.4	1.7	10.4	1.5

LP Vapor Models (Gross calorific value = 93.9 MJ/m³)

Natural Gas Models

NG	Supply Pressure (mBar)	Regulator Pressure (mBar)	Burner Orifice (mm)	Maximum Heat (kW)	Minimum Heat (kW)	Maximum Burner Pressure (mBar)	Minimum Burner Pressure (mBar)	Maximum Flow Rate (m ³ /h)	Minimum Flow Rate (m ³ /h)
VHE-18	250	124.0	5.5	130.0	23.0	119.8	3.8	12.1	2.1
VHE-24	750	139.0	7.0	220.0	38.0	130.8	3.9	20.5	3.5

Natural Gas Models (Gross calorific value = 38.6 MJ/m³)

Airflow Requirements

Heater Model	Maximum Airflow (m ³ /s)	Minimum Airflow (m ³ /s)	Air Switch Setting (mBar)
VHE-18-LN	9.0	3.0	1.0
VHE-24-LN	15.0	6.0	1.0

4. Installation

Fan/Heater Location on Silo

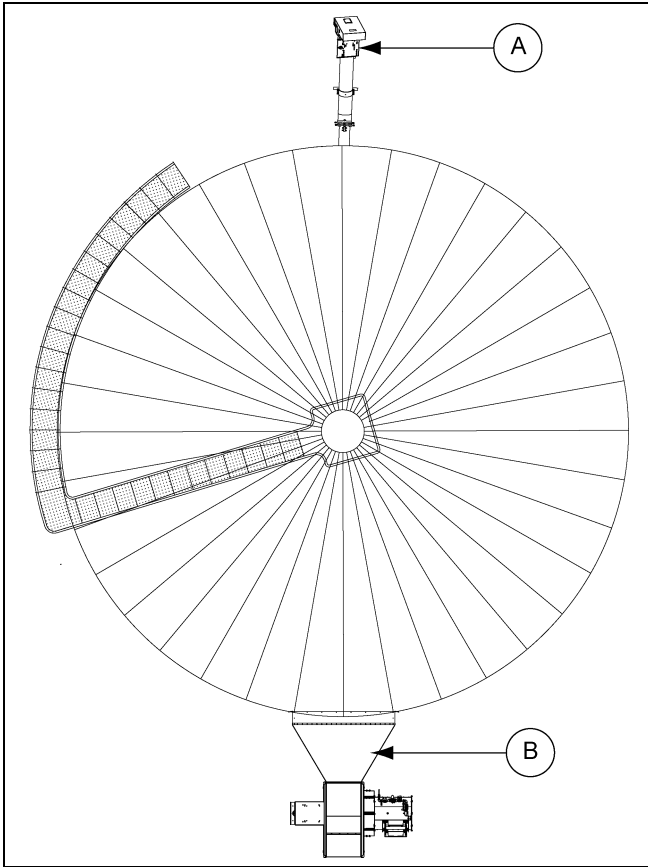


Figure 4A Single Fan/Heater Location

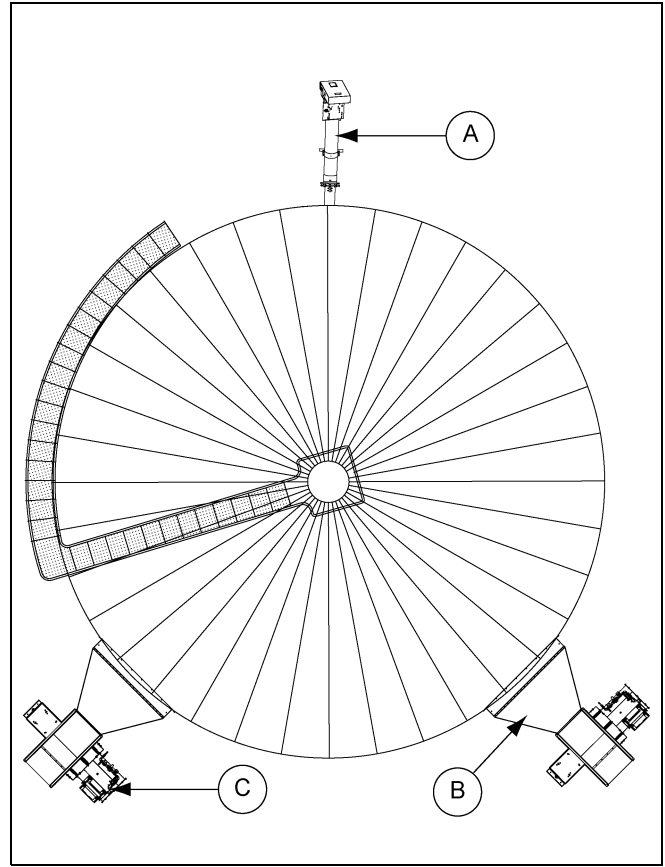


Figure 4B Master Slave Fan/Heater Locations

Ref #	Description
A	Discharge Auger
B	Transition Duct
C	Master Fan/Heater

Fit Heater to Fan

VHE heaters are design to be installed on the inlet side of centrifugal fans.

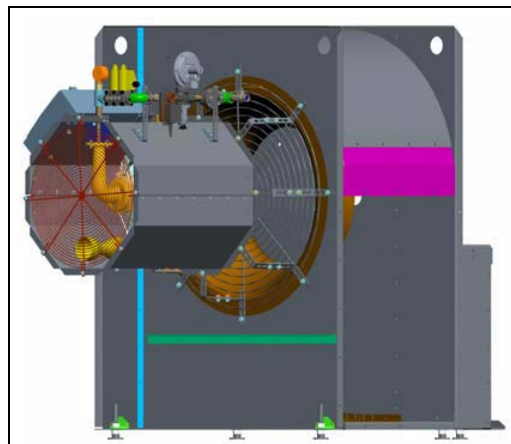


Figure 4C VHE-24 Heater on CF Fan

Attach to Fan Using HF-4421M Brackets

1. Pre-assemble mounting brackets.
2. Loosen and remove nuts and washers from fan guard. Do not remove guard.
3. Fit bracket to fan guard bolt. Replace washers and nuts.
4. Offer heater up to brackets and attach to end flange.
5. Tighten all hardware.

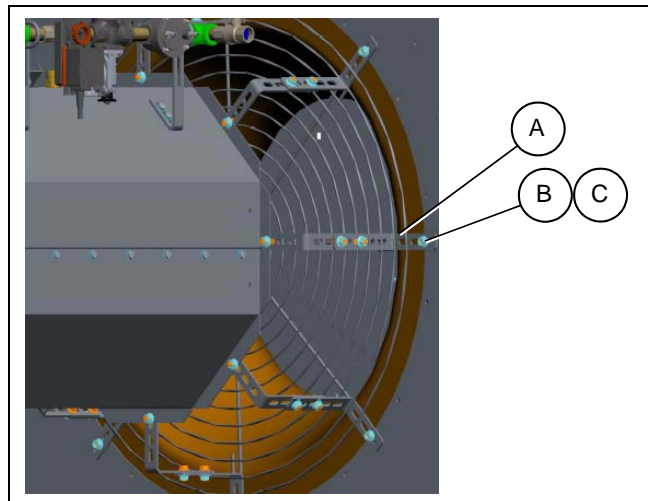


Figure 4D

Attach to Fan Using HF-4421M Brackets

Ref #	Part #	Description	Qty
A	HF-8441M	Mounting Bracket	16
B	S-FBM10020	M10 Flange Bolt	24
C	S-FNM10	M10 Flange Nut	24

Fit Transition High-Limit (HF-8447) (120°C)



Risk of fire. Transition high-limit must be fitted.

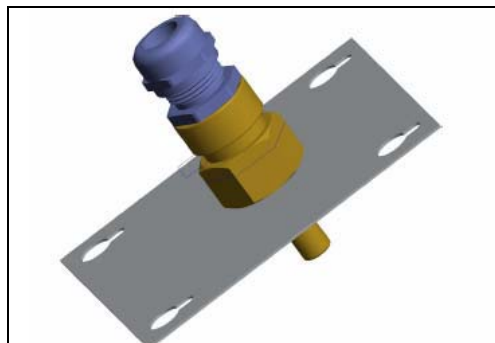


Figure 4E Transition High-Limit (HF-8447) with Mounting Plate (HF-8443)

4. Installation

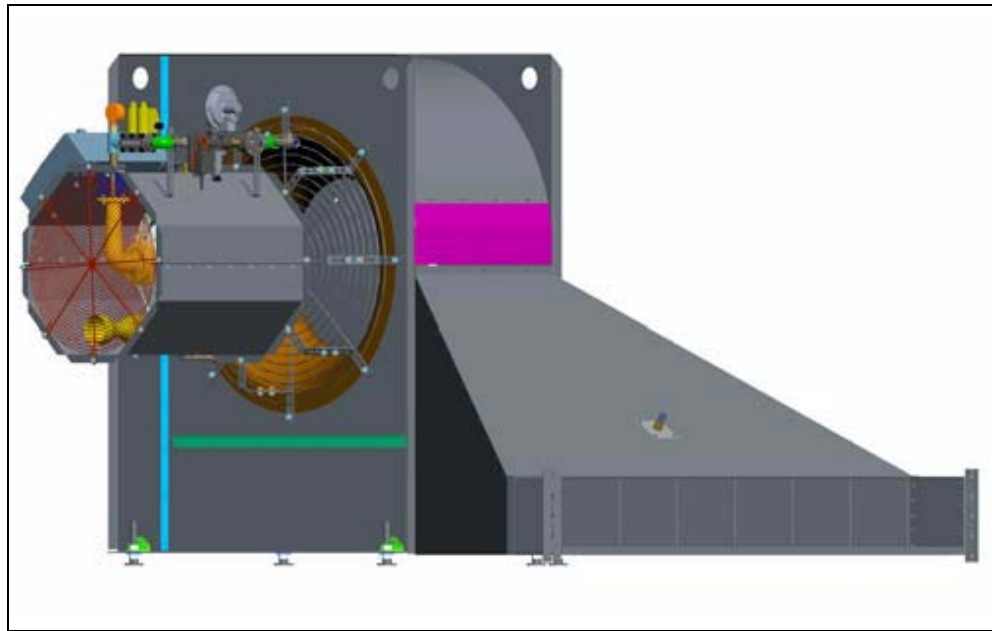


Figure 4F Transition High-Limit

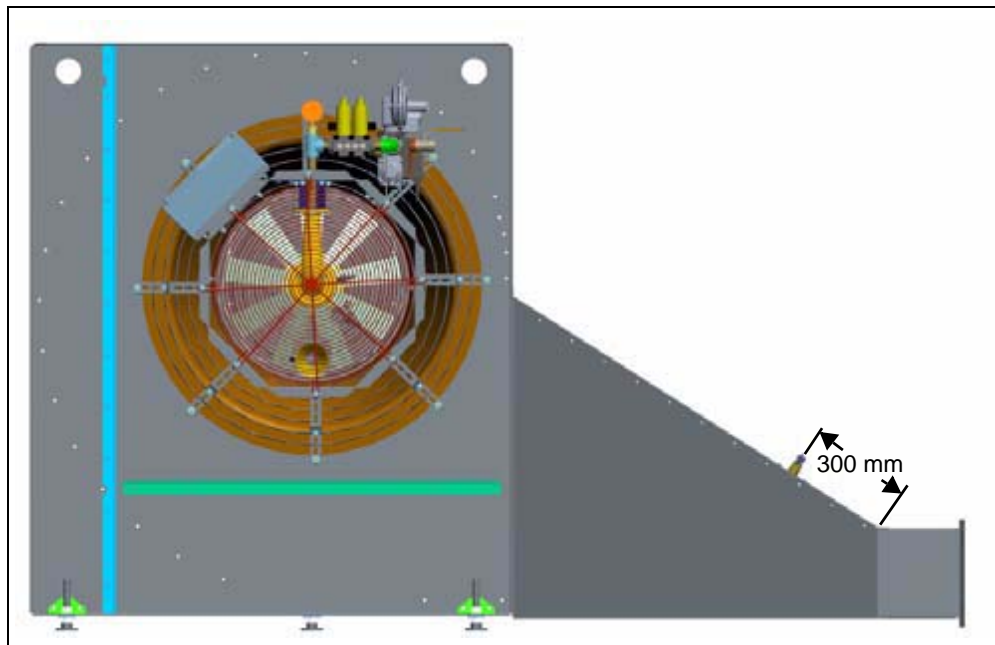


Figure 4G

1. Cut 30 mm diameter hole centrally on transition duct, 300 mm from bottom. *(See Figure 4G.)*
2. Apply silicone around hole.
3. Place transition high-limit and attached with self-drilling screws (S-280) (4). *(See Figure 4F.)*

Fit Plenum Thermostat/High-Limit



Risk of fire.

Where high/low cycling or modulating controls are to be used a separate plenum high-limit must be fitted.

(Housing high-limit (HF-8446) with mounting plate (HF-8443)).

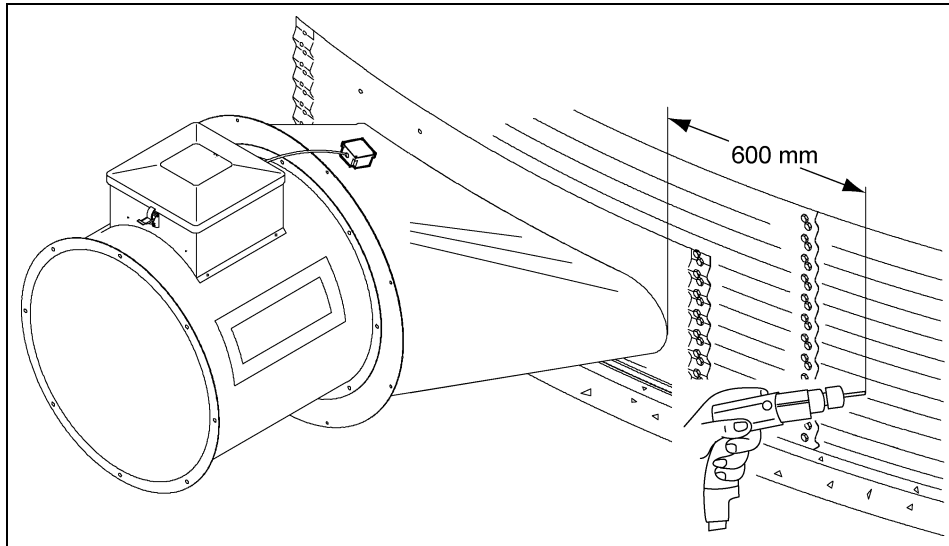
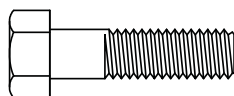


Figure 4H Cut 22 mm Ø Hole



Figure 4I Fit Plenum Thermostat/High-Limit



Part #	Description	Qty
S-280	Self-Drilling Screw #10-16 x 5/8"	6/8

Electrical Installation



Figure 4J



Heater power is 220-240 VAC. Interlock heater power to the fan starter.
(Note for star-delta starters this must be to the LINE contactor.)



Figure 4K Heater Control Front

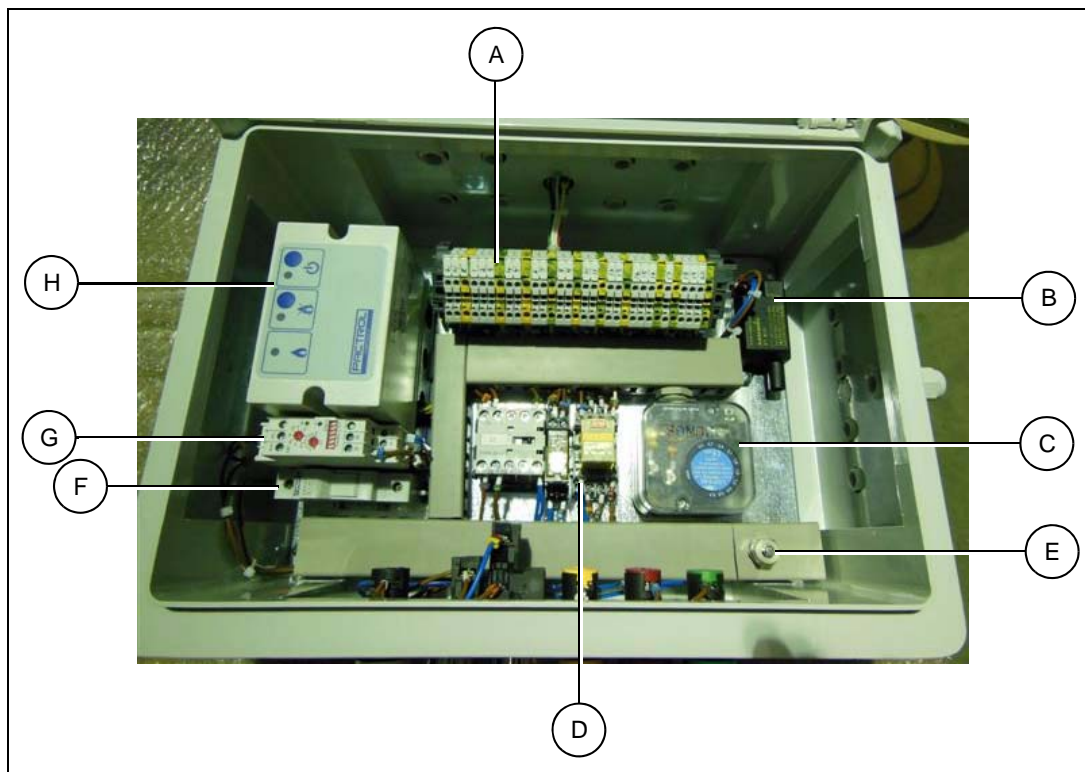


Figure 4L Heater Control Inside

Ref #	Description
A	Terminals
B	HT Ignition Module
C	Air Switch
D	Relays
E	Low-Fire Start Potentiometer
F	Supply Fuse 6A
G	Pre-Purge Timer
H	Burner Control

Make connections to:

1. Power supply (terminals L, N and earth).
2. Plenum high-limit (terminals 12 and 13).

4. Installation

Temperature Control Options - High/Low Control Connections

1. High low control option requires a suitable thermostat with additional over heat cut-off (plenum high-limit).
2. Dummy plug (supplied with control) must be fitted to enable high low control.
3. Connect control thermostat to terminals 6 and 7.

Temperature Control Options - GSI BMGB Modulating Control

1. Temperature sensor (HF-8449) or relative humidity sensor (HF-8448) must be fitted.
2. Housing high-limit (HF-8446) with mounting plate (HF-8443) must be fitted adjacent to the control sensor in the bin plenum.
3. Mount heater control adjacent to heater.
4. HF-8444 is used to control heater based on air temperature or relative humidity.
5. Plug sensor into temperature control.
6. Plug control into heater control.

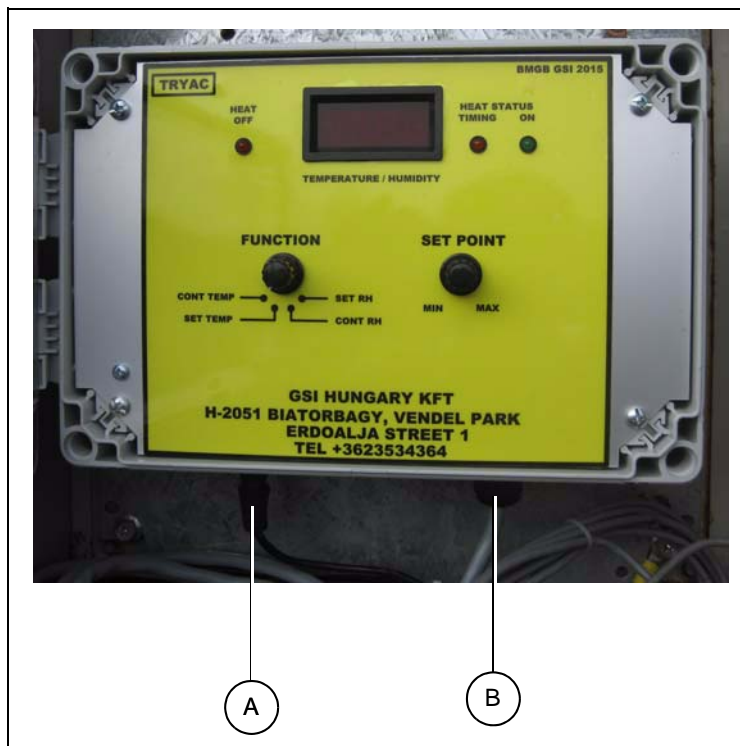


Figure 4M Modulating Control (HF-8444)

Ref #	Description
A	Control Sensor Plug
B	Heater Control Connection

Temperature Control Options - Non-GSI Modulating Control

For other make of modulating control, connections will need to be made inside the dummy plug, supplied with the control.

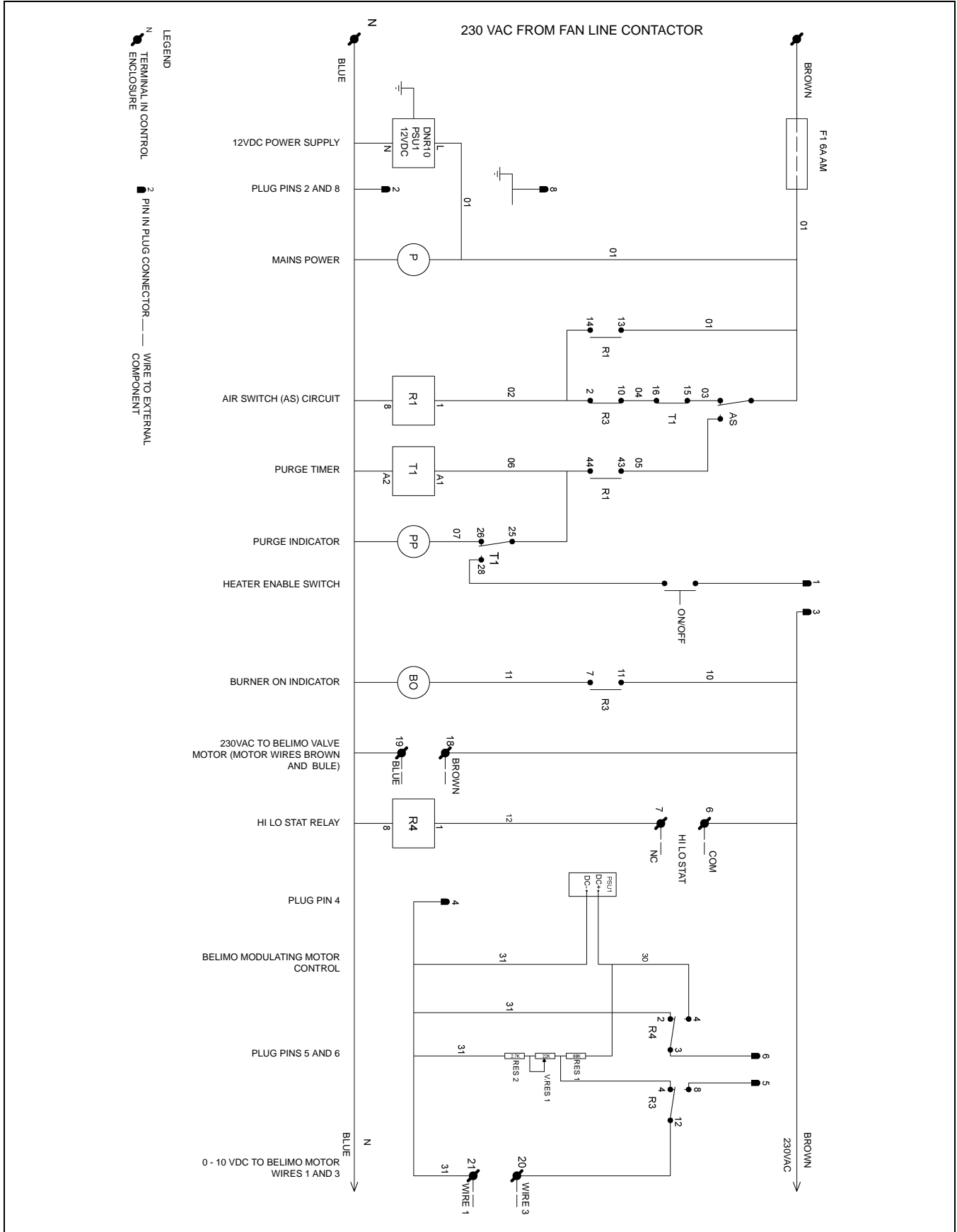
Remove links inside dummy plug between pins 1 and 3, 5 and 6.

Make connections:

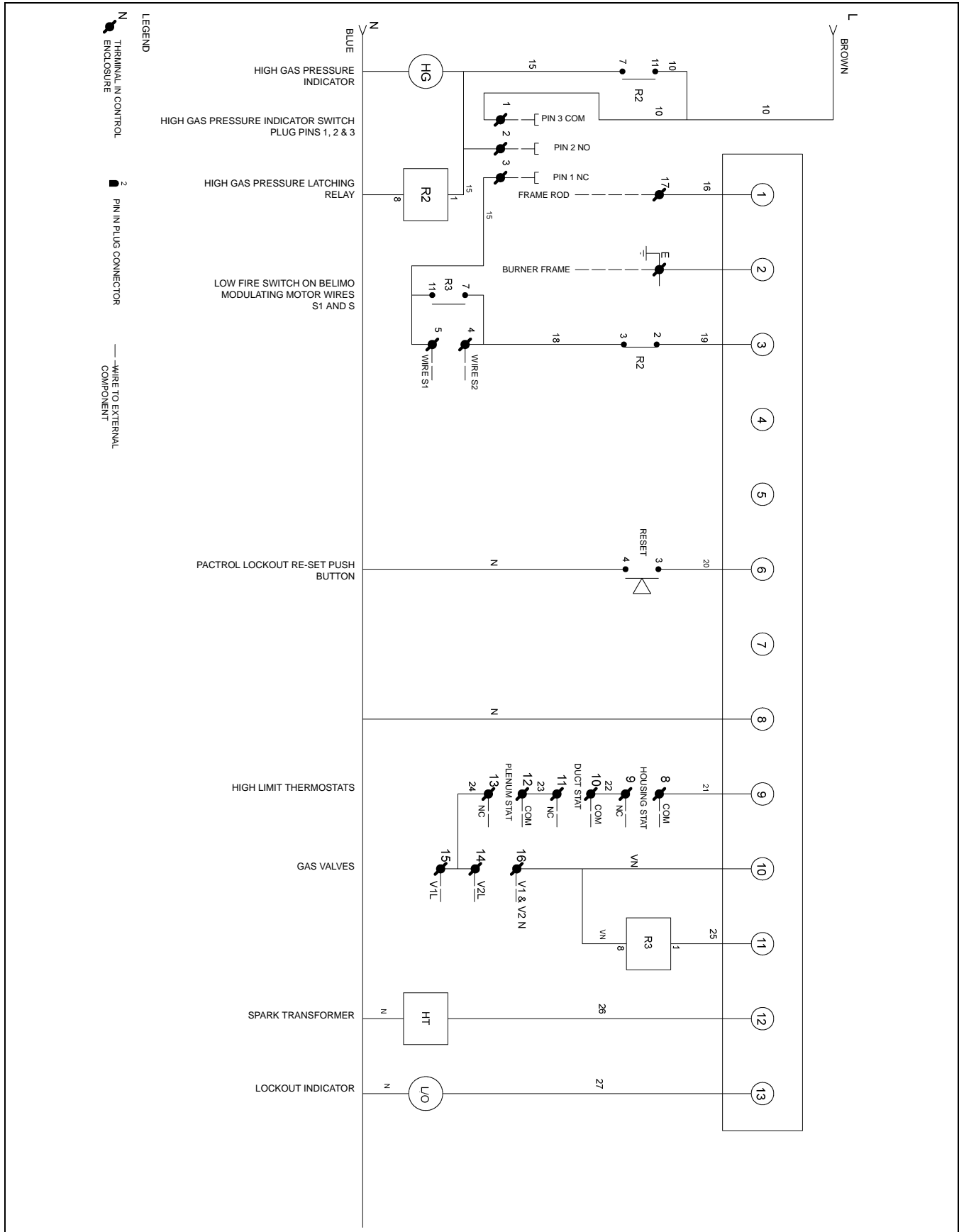
1. Pin 1: 230 VAC to temperature controller.
2. Pin 2: Neutral to temperature controller.
3. Pin 3: Switched 230 VAC back from temperature controller. (Or link pin 1 if no 230 VAC switching in chosen control.)
4. Pin 4: Negative 12 VDC from power supply.
5. Pin 5: 0-10 VDC to modulating valve motor.
6. Pin 6: Positive 12 VDC from power supply.

4. Installation

CE Heater Control Schematics



CE Heater Control Schematics (Continued)



4. Installation

Connect Fuel Supply

Fuel is connected at the 3/4" BSP inlet to the manual shut off valve.

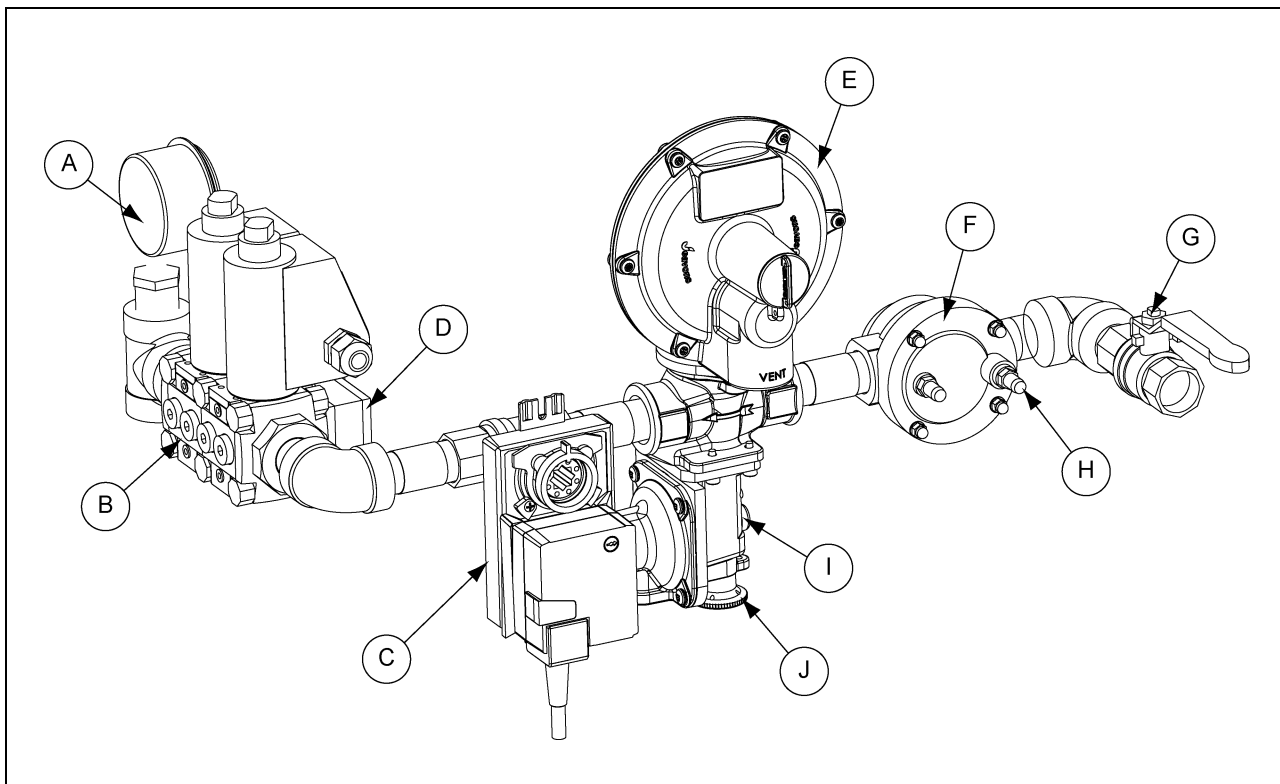


Figure 4N Fuel Train

Ref #	Description
A	Pressure Gauge
B	Safety Shut Off Valves
C	Modulating Valve
D	High Pressure Switch
E	Regulator
F	Filter
G	Fuel Connection 3/4" BSP Manual Shut Off Valve
H	Pressure Test Point (Incoming)
I	Pressure Test Point (Regulated)
J	Over Pressure Valve

Refer to [Page 21](#) for LPG supply and natural gas flow and pressure settings. See also heater rating plate on [Page 19](#).

Incoming pressure should be 1.0-1.5 bar (natural gas and LPG).

A commissioning check sheet is provided with this manual. (See Page 39.) It is recommended to note all the required heater settings from tables on Page 21 and fill these into the sheet before starting the commissioning process.

Set Inlet Pressure

Inlet pressure varies from heater to heater. Refer to Page 21 or the rating plate on the heater for the required pressure.

Pressure may be measured at the test point on the gas filter. (See Figure 5C on Page 34.)

Set Over-Pressure Safety Valve

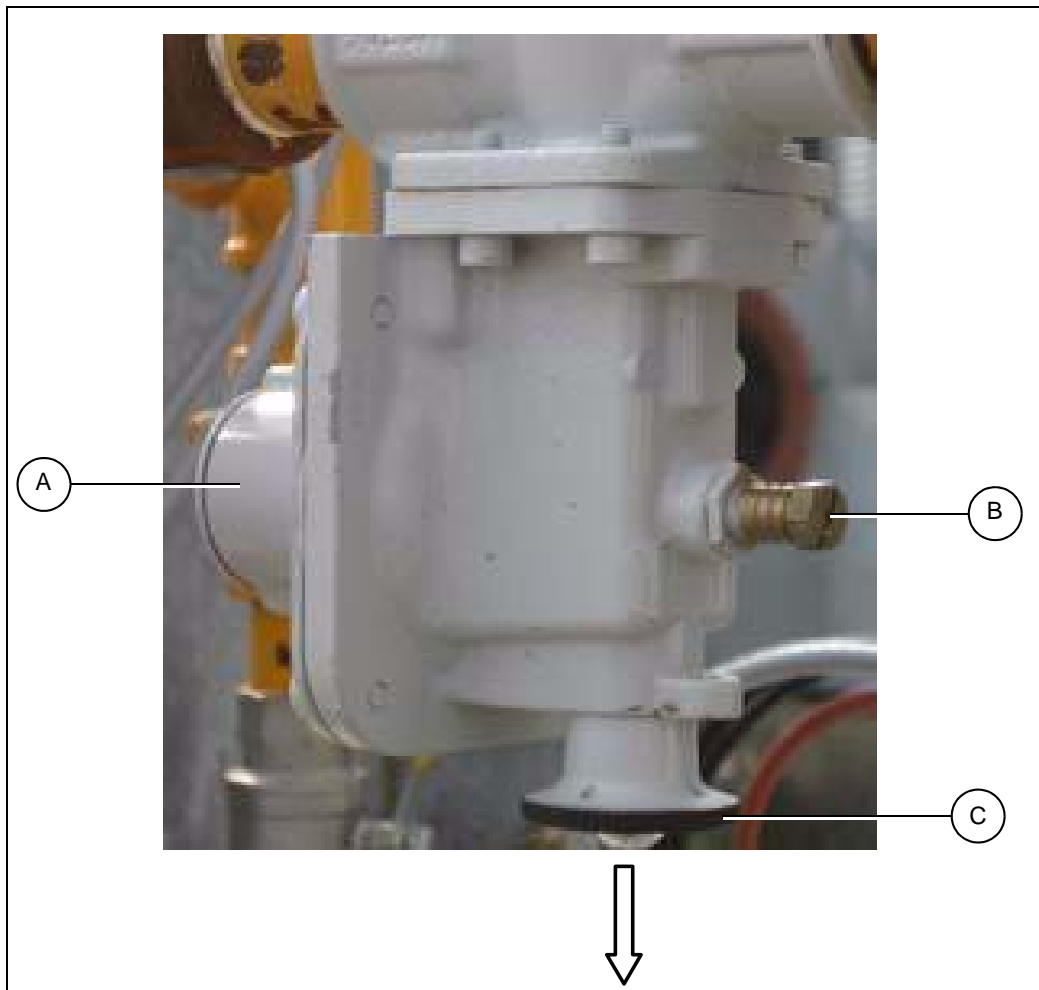


Figure 5A Over Pressure Safety Valve

Ref #	Description
A	Adjuster Spring Cover
B	Test Point
C	Re-Set

5. Commissioning Heater

Use hand bellows and electronic manometer to set the over pressure valve:



Figure 5B *Manometer and Hand Bellows*

1. Remove adjuster spring cover.
2. Use a flat blade screw driver in the slots around the adjuster screw spring in all the way (clockwise) (maximum pressure).
3. Unscrew re-set and pull down to ensure the valve is open. ([See Figure 5A on Page 33.](#))
4. Open test point and fit tube from hand bellows and manometer.



Figure 5C *Pressure Test Equipment*

1. Pressurise the valve to 200 mBar (20 kPa).
2. Gradually unscrew the adjuster spring until the valve shuts.
3. Release pressure, re-set valve and test again to ensure the valve closes at 200 mBar.
4. Re-fit adjuster cover and close test point.

Set Regulator

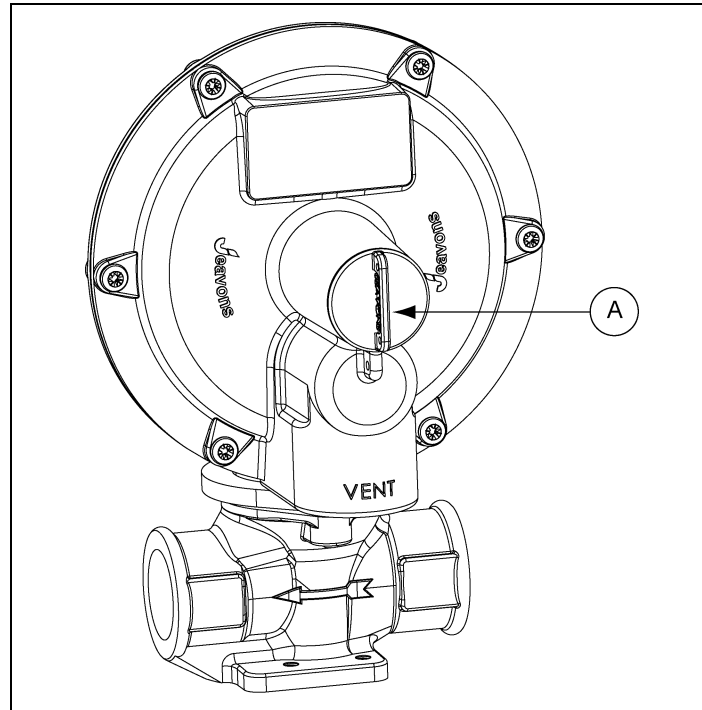


Figure 5D Pressure Regulator

Ref #	Description
A	Regulator Adjuster Cover

Refer to [Page 21](#) for the correct outlet pressure for the heater and gas type.

1. Remove cover from regulator adjuster.
2. Screw adjuster out (minimum pressure).
3. Open pressure test point and fit manometer.
4. Apply pressure via hand bellows to the test point on the filter. ([See Figure 5C on Page 34.](#))
5. Gradually screw in the pressure adjuster until the pressure reads the required setting + 2.5 mBar. (Example for 30 mBar required outlet pressure, set regulator to 32.5 mBar.)
6. Release pressure and re-test.
7. Remove manometer and close test point.

Set Air Switch

1. Locate air switch inside control box.
2. Remove cover.
3. Rotate dial to 1 mBar.
4. Replace cover.

5. Commissioning Heater

Set Purge Timer

When the fan is started, the heater control will follow a prolonged initial purge before the heater can be lit. Once this purge is complete, if the fan is not stopped, the heater will light after only a few seconds following turning the ENABLE switch to ON.

Required purge time is based on the size of silo being dried by the heater. Refer to tables [on Pages 52-54](#) for required purge time settings. Interpolate for bin sizes/fan sizes not given, based on the actual bin size and fan air delivery at 50 N/m² static pressure.

For manual calculation of purge time use:

$$\text{Bin volume (m}^3\text{)} \times 5 / \text{fan airflow (m}^3\text{/min)} = \text{Purge time in minutes}$$

Set High Pressure Switch

1. Locate the gas high pressure switch on the safety shut off valves.
2. Remove the cover.
3. Rotate the setting to the maximum burner pressure + 15 mBar. ([See Page 21.](#))
4. Replace cover

Set Modulating Valve

Low-Fire Setting

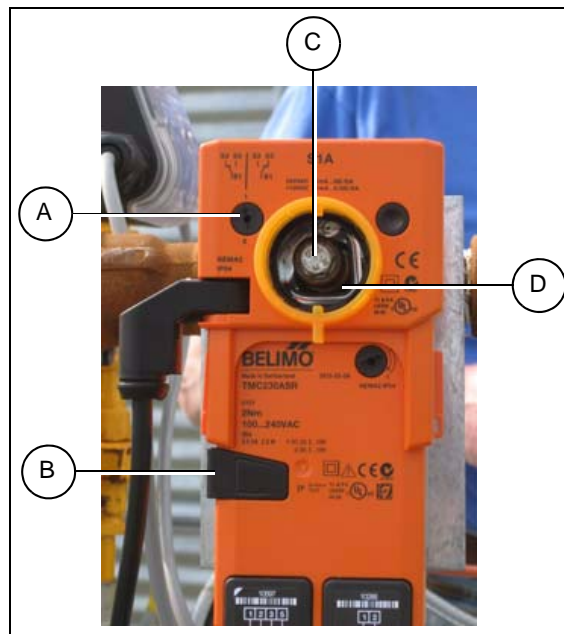


Figure 5E Modulating Valve - Unclip the Low-Fire Switch Assembly

Ref #	Description
A	Low-Fire Switch Adjustment
B	Motor Manual Rotate Release

Ref #	Description
C	Valve Stem Bolt
D	Clamp



Figure 5F Low-Fire Switch Assembly

1. Loosen clamp nuts on modulating motor.
2. Remove the motor from the valve.
3. Place socket over valve stem bolt.
4. Turn valve to fully closed (counter clockwise).
5. Now open valve approximately 20°.
6. Start fan and wait for purge time to complete.
7. Switch heater enable switch to ON.
8. Heater will light.
9. With heater alight close the valve until the pressure on the gauge reads the minimum pressure for the heater/fuel. (*See Tables on Page 21.*)
10. Stop the heater
11. Replace the modulating motor
12. Tighten the motor clamp nuts

Start Gas Setting

Start gas is factory pre-set, but may require minor adjustment if burner does not light satisfactorily. This is done by turning the potentiometer located on the lower right of the control box. This may require re-setting the low-fire switch on the modulating motor.

5. Commissioning Heater

High-Fire Setting

Remove the low-fire switch assembly to access the motor limit stops.



Figure 5G Modulating Motor

Ref #	Description
A	Motor Upper Limit Stop
B	Motor Manual Rotate Release

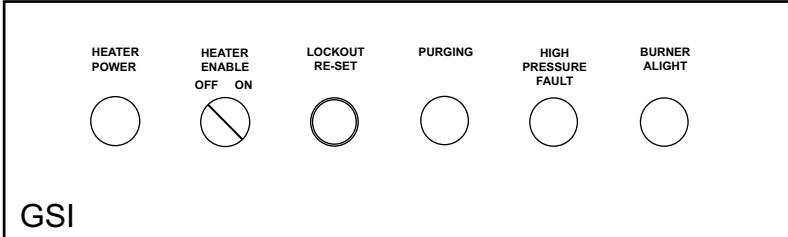
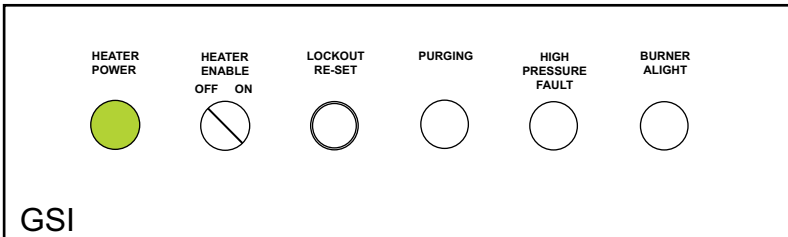
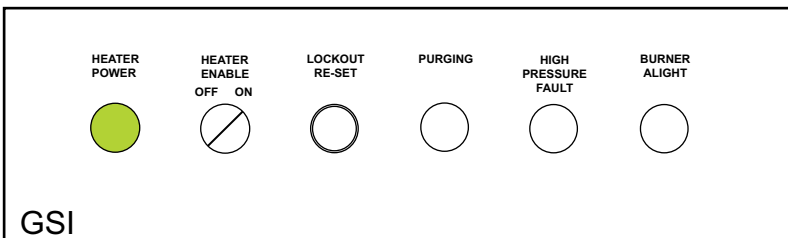
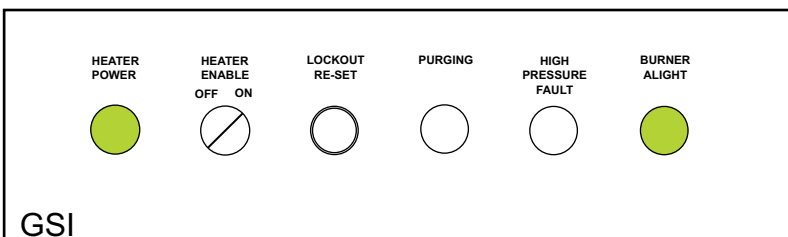
1. Set the heater control temperature to less than ambient temperature.
2. Light the heater.
3. When alight, press the motor manual rotate release and rotate the valve clockwise, noting the reading on the pressure gauge.
4. When the gauge reads the correct pressure for maximum heat, note the position of motor.
(See Tables on Page 21.)
5. Release the motor manual rotate release.
6. Move the motor upper limit stop to the position previously noted for the motor for maximum heat.
7. Adjust the temperature control to well above ambient and check the valve drives to the correct pressure for maximum heat.
8. Re-adjust if necessary.
9. Replace the low-fire switch assembly.

Commissioning Check List

Complete commissioning list below.

Component	Set Point	Function Pass/Fail	Notes
Check Fuel Supply Shut Off Valve			
Check Main Fuel Supply Pressure			<i>(See Tables on Page 21.)</i>
Set/test Over Pressure Shut Off (OPSO) Pressure	200 mBar		
Set/test Main Gas Regulator Pressure			<i>(See Tables on Page 21.)</i>
Set Air Pressure Switch	1 mBar		
Set Pre-purge Timer			<i>(See Tables on Page 52-54.)</i>
Carry Out Leak Test			
Set Gas High Pressure Switch			<i>(See Tables on Page 21.) + 15 mBar</i>
Set Burner Low Flame Pressure			<i>(See Tables on Page 21.)</i>
Set Start Gas			
Set Burner Low Flame Pressure			<i>(See Tables on Page 21.)</i>
Test Main Gas Manual Shut Off Valve			
Set/test Plenum Thermostat			
Check Purge Time			
Check Main Flame Ignition			
Check Modulating Valve Operation			
Check Air Switch (Disconnect Air Tubes, Burner Must Shut Down)			
Check Burner Shut Down			

Normal Start-Up Sequence

Symptom	Control Display Status
<p>Fan OFF</p>	 <p>HEATER POWER: <input type="checkbox"/></p> <p>HEATER ENABLE OFF: <input type="checkbox"/></p> <p>HEATER ENABLE ON: <input checked="" type="checkbox"/></p> <p>LOCKOUT RE-SET: <input type="checkbox"/></p> <p>PURGING: <input type="checkbox"/></p> <p>HIGH PRESSURE FAULT: <input type="checkbox"/></p> <p>BURNER ALIGHT: <input type="checkbox"/></p> <p>GSI</p>
<p>Fan started, heater purging</p>	 <p>HEATER POWER: <input checked="" type="checkbox"/></p> <p>HEATER ENABLE OFF: <input type="checkbox"/></p> <p>HEATER ENABLE ON: <input checked="" type="checkbox"/></p> <p>LOCKOUT RE-SET: <input type="checkbox"/></p> <p>PURGING: <input checked="" type="checkbox"/></p> <p>HIGH PRESSURE FAULT: <input type="checkbox"/></p> <p>BURNER ALIGHT: <input type="checkbox"/></p> <p>GSI</p>
<p>Purge complete, heater in standby</p>	 <p>HEATER POWER: <input checked="" type="checkbox"/></p> <p>HEATER ENABLE OFF: <input type="checkbox"/></p> <p>HEATER ENABLE ON: <input checked="" type="checkbox"/></p> <p>LOCKOUT RE-SET: <input type="checkbox"/></p> <p>PURGING: <input type="checkbox"/></p> <p>HIGH PRESSURE FAULT: <input type="checkbox"/></p> <p>BURNER ALIGHT: <input type="checkbox"/></p> <p>GSI</p>
<p>Heater enabled</p>	 <p>HEATER POWER: <input checked="" type="checkbox"/></p> <p>HEATER ENABLE OFF: <input type="checkbox"/></p> <p>HEATER ENABLE ON: <input checked="" type="checkbox"/></p> <p>LOCKOUT RE-SET: <input type="checkbox"/></p> <p>PURGING: <input type="checkbox"/></p> <p>HIGH PRESSURE FAULT: <input type="checkbox"/></p> <p>BURNER ALIGHT: <input type="checkbox"/></p> <p>GSI</p>
<p>Burner alight, controlling temperature</p>	 <p>HEATER POWER: <input checked="" type="checkbox"/></p> <p>HEATER ENABLE OFF: <input type="checkbox"/></p> <p>HEATER ENABLE ON: <input checked="" type="checkbox"/></p> <p>LOCKOUT RE-SET: <input type="checkbox"/></p> <p>PURGING: <input type="checkbox"/></p> <p>HIGH PRESSURE FAULT: <input type="checkbox"/></p> <p>BURNER ALIGHT: <input checked="" type="checkbox"/></p> <p>GSI</p>

Symptom	Control Display Status
<p>Modulating control has reverted to off-cycle (temperature not coming down below set point) Check modulating control for display status</p>	
<p>Heater stopped, in stand-by mode</p>	

Fault Conditions

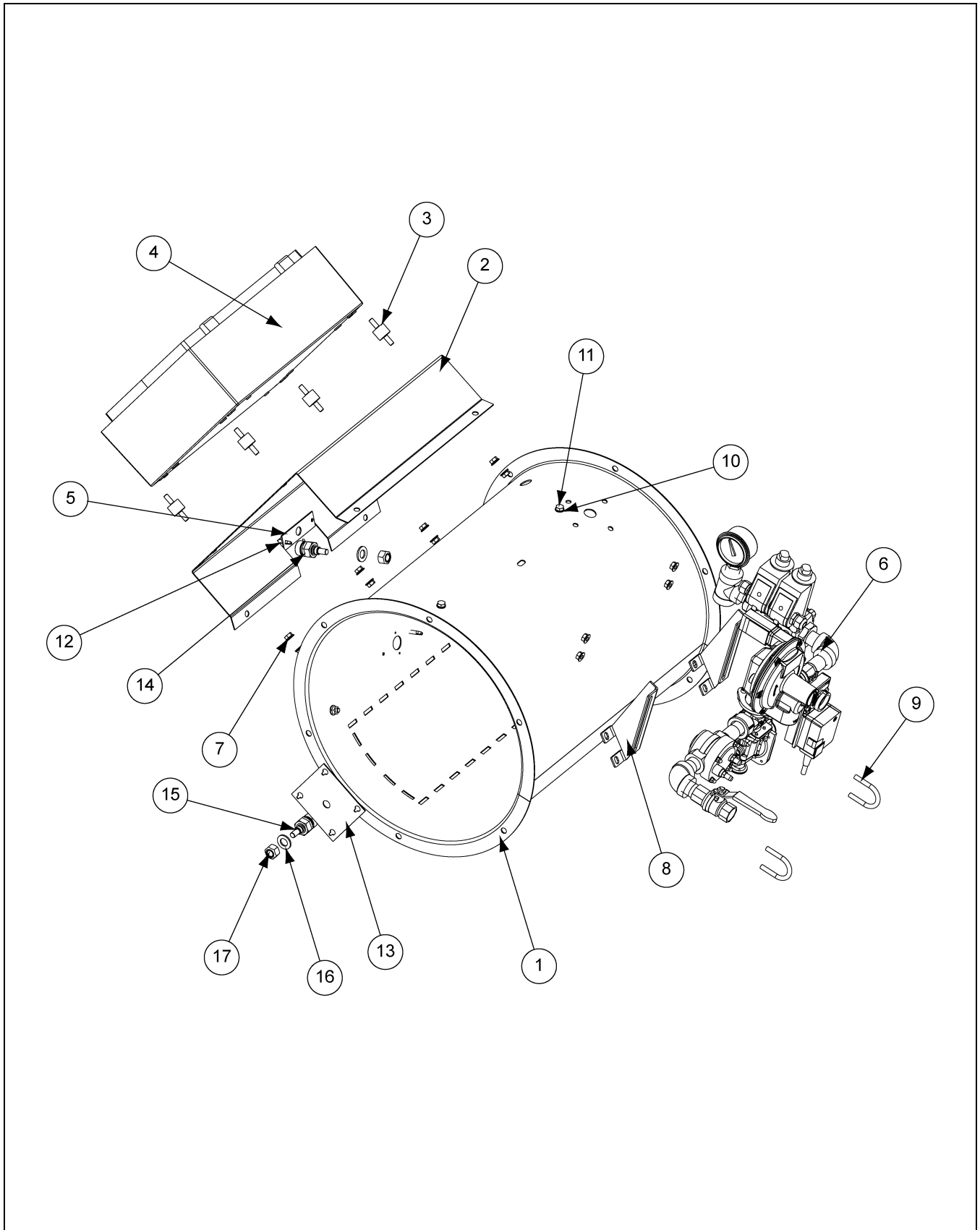
Symptom	Control Display Status
<p>Fan ON, no heater power</p> <ul style="list-style-type: none"> • Check heater fuse • Fan interlock fault • Faulty connection 	
<p>Fan started, heater does not go to purge Insufficient airflow</p> <ul style="list-style-type: none"> • Move heater closer to fan inlet • Reduce quantity of grain in bin • Impeded air inlet <ul style="list-style-type: none"> Air switch fault Check air switch setting (1 mBar) Check tube connections to air switch and airflow venturi Clean venturi Replace air switch 	

6. Troubleshooting

Symptom	Control Display Status
<p style="text-align: center;">Heater failed to light</p> <ul style="list-style-type: none"> • No gas • Check gas supply • Check over pressure shut off • Check safety shut off valves • Check filter • No spark • Check spark lead • Check spark plug (gap should be 3-5 mm) • Replace ignition module • Low-fire switch did not close • Check modulating valve is driving to low- fire start position • Adjust low-fire switch • Increase low-fire start rate 	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <p style="margin-top: 10px;">GSI</p> <p>Press re-set for 3 seconds to attempt re-ignition</p> </div>
<p style="text-align: center;">Heater lit but failed to stay alight</p> <ul style="list-style-type: none"> • No flame signal • Check flame rod connections • Clean flame rod • Reposition flame rod to intercept flame • Replace flame rod 	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <p style="margin-top: 10px;">GSI</p> <p>Press re-set for 3 seconds to attempt re-ignition</p> </div>
<p style="text-align: center;">Burner lit, remained alight but then went out</p> <ul style="list-style-type: none"> • Over heat (in transition, heater housing or plenum) • Reduce drying temperature • Increase airflow (reduce amount of grain the bin) 	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <p style="margin-top: 10px;">GSI</p> <p>Press re-set for 3 seconds to attempt re-ignition</p> </div>
<p style="text-align: center;">High pressure fault</p> <ul style="list-style-type: none"> • High pressure switch has detected excess pressure going to the burner • Modulating valve out of adjustment – re-set high setting • Pressure regulator out of adjustment, re-set regulated pressure • Pressure switch incorrectly set – re-set 	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <p style="margin-top: 10px;">GSI</p> <p>Cycle power, restart and pressure re-set for 3 seconds to attempt re-ignition</p> </div>

1. Heater 18" CE Base Model - Knockdown (VHE-18) (Pre-2016) - [\(See Pages 44-45.\)](#)
2. Heater 18" CE Base Model (VHE-18) (2016 Onwards) - [\(See Pages 46-47.\)](#)
3. Heater 24" CE Base Model - Knockdown (VHE-24) (Pre-2016) - [\(See Pages 48-49.\)](#)
4. Heater 24" CE Base Model (VHE-24) (2016 Onwards) - [\(See Pages 50-51.\)](#)

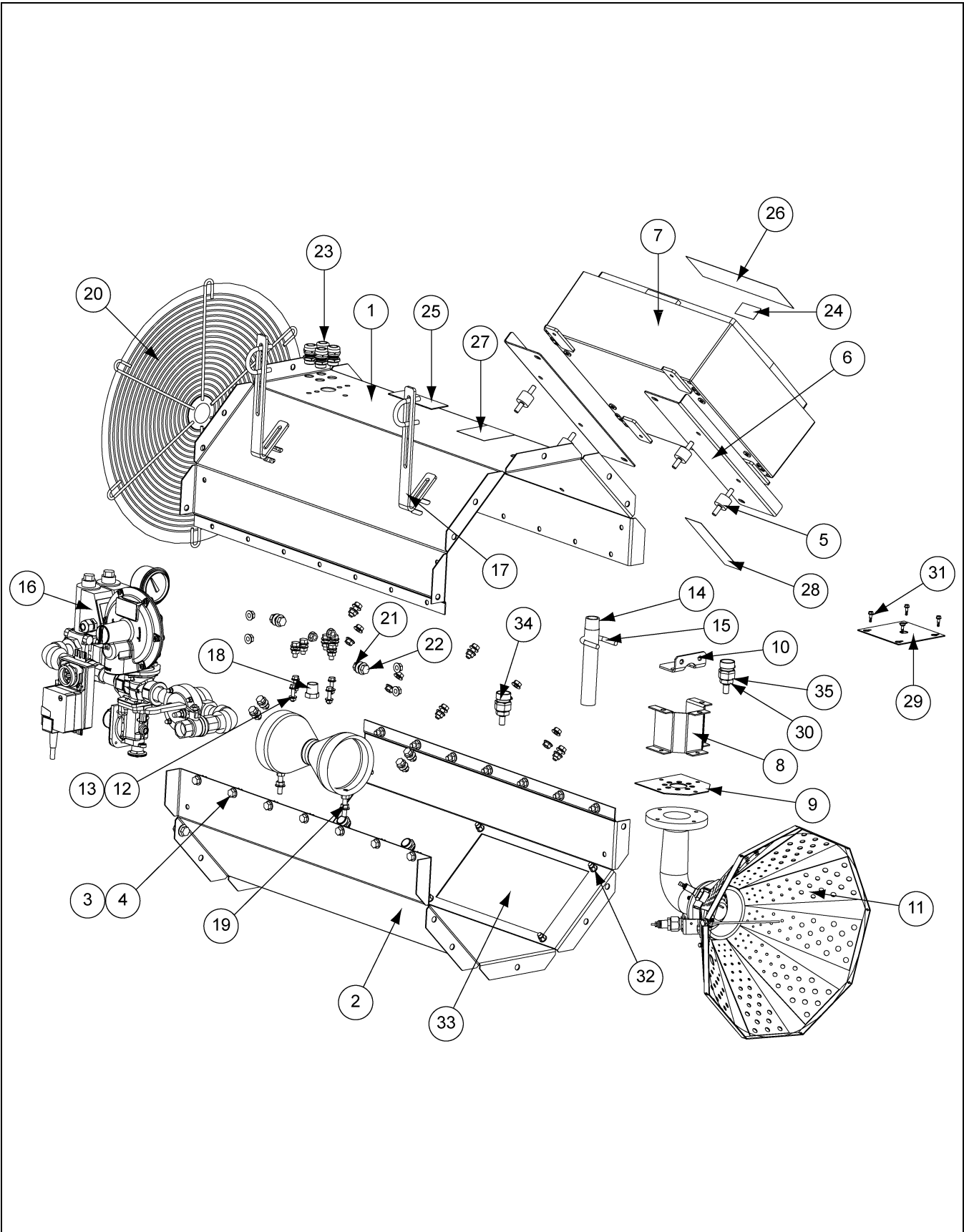
Heater 18" CE Base Model - Knockdown (VHE-18) (Pre-2016)



Heater 18" CE Base Model - Knockdown (VHE-18) (Pre-2016) Parts List

Ref #	Part #	Description	Qty
1	HF-8358	Housing, Wrapper 18" Heater	1
2	HF-8454M	CE Heater Control Mount Plate	1
3	S-PR202560M08	Puffer, Rubber, 20 mm H, Diameter 25 mm, 60 mm L, M08	4
4	HF-8443	Heater Control CE Pin Heater 230V, 50 Hz	1
5	HF-8455M	VH Heaters Housing High-Limit Plate	1
6	HF-8441	Gas Train 3/4 Modulating LP/NG Vapor CE Bin Heaters	1
7	S-FNM08	Flange Nut M8 ZN 8.8 GB/T6177.1	16
8	HF-8456M	Pipe Train Support VHE Heaters	2
9	S-BUM08032	U-Bolt Clamp, Universal, M8-32 mm	2
10	S-FWM8	Flat Washer M8 ZN GB/T95	4
11	S-BM08020	Bolt, HHCS M8 x 20 ZN Glass 8.8	4
12	S-BSTM06030	DIN7504K, Bolt, Self-Tap M6 x 30	2
13	HF-8453M	Housing High-Limit Plate	1
14	HF-8447	Thermostat Transition High-Limit 120°	1
15	HF-8446	Thermostat Heater Housing High-Limit 90°	1
16	S-FWM14	Flat Washer M14 ZN GB/T95	2
17	S-SNM14	DIN980, Nut Stover M14 ZN	2
N/S	S-TP0608-2M	Tube, Inside Diameter 6 mm; Outside	1
N/S	H07-4C-1.5-10	Cable H07-RN-F 4 Core x 1.5 mm	1
N/S		Spark Cable	1
N/S		Spark	1

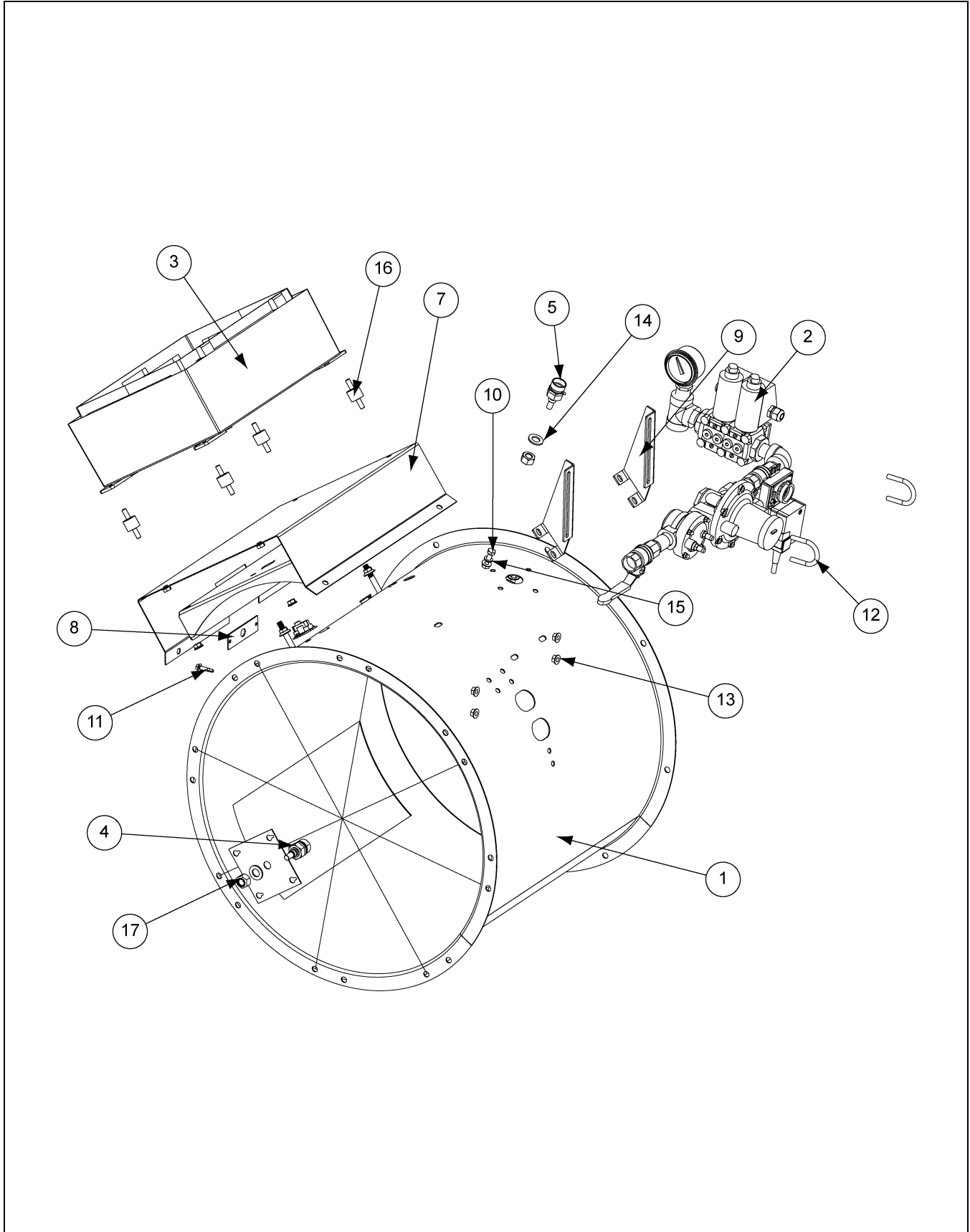
Heater 18" CE Base Model (VHE-18) (2016 Onwards)



Heater 18" CE Base Model (VHE-18) (2016 Onwards) Parts List

Ref #	Part #	Description	Qty
1	VHE-001M	Housing; Wrapper 18" Heater 1	1
2	VHE-002M	Housing; Wrapper 18" Heater 2	1
3	S-FBM08020	DIN6921, Flange Bolt M08 x 20 ZN Class 8.8 Serrated	31
4	S-FNM08	DIN6923, Flange Nut M8 ZN Class 8 Serrated	43
5	S-PR202560M08	Puffer, Rubber, 20mm H, Diameter 25 mm, 60 mm L, M08	4
6	VHE-003M	Control Box Bracket	2
7	HF-8443	Heater Control CE Bin Heaters 230V, 50 Hz	1
8	VHE-004M	Burner Inner Mounting Bracket	1
9	VHE-005M	Collector Plate 24" and 26" Heater	1
10	VHE-006M	Burner Mounting Bracket	1
11	HF-7687-FW	Burner Assembly: 18" Deluxe 04	1
12	S-FBM06025	DIN6921, Flange Bolt M06 x 25 ZN Class 8.8 Serrated	4
13	S-FNM06	DIN6923, Flange Nut M6 ZN Serrated	4
14	HH-7027	Orifice Pipe 3/4" x 6-1/2"	1
15	S-BUM08032	U-Bolt Clamp, Universal, M8-32 mm	3
16	HF-8441	Gas Train 3/4" Modulating LP/NG Vapor CE Bin Heaters	1
17	VHE-009M	Gas Train Mounting Bracket	2
18	HH-7024-055M	Plug Brass 3/4" Pipe - 1/2" NPT Hex, Drilled 5-1/2 mm	1
19	VHE-011M	Venturi Assembly	1
20	F-7179	18" Grill Guard	1
21	S-FBM10020	DIN6921, Flange Bolt M10 x 20 ZN Class 8.8 Serrated	6
22	S-FNM10	DIN6923, Flange Nut M10 ZN Class 8 Serrated	6
23	S-CGM16	Cable Gland; M16	6
24	DC-108	Decal, High-Limit Button	1
25	DC-113	Decal, Airflow	1
26	DC-1559	Decal, Warning: DC-1225/DC-1227	1
27	DC-1620	Decal, Cone Removal Heater	1
28	DC-1718	Decal, Warning Heater Fire	1
29	HF-8453M	Heater/Transition High-Limit Mounting Plate	1
30	S-HNLC14	DIN936, Jam Nut, Hex M14 YDP Class 8.8	2
31	S-SDS04016	DIN-7504K; Screw, Self-Drilling, M4 x 16 mm	4
32	S-RNM08	Rivet Nut M08	4
33	VHE-022M	VHE Heater Inspection Door	1
34	HF-8446	Thermostat Housing High-Limit 80 C CE Bin Heaters	1
35	HF-8447	Thermostat Transition High-Limit 110 C CE Bin Heaters	1
N/S	H07-3C-1.5-10	Cable H07-RN-F 3 Core x 1-1/2 mm ²	1
N/S	S-SCFZ-LS/5	Spark Cable Heater Ignition	1
N/S	S-SPEWG-11U	Spark Plug Elbow	1
N/S	S-SPS120	Spark Plug Straight 120 mm H	1
N/S	S-TP0608-2M	Tube; Inside Diameter 6 mm; Outside 8 mm, Nylon, Black, UV Resistant	1

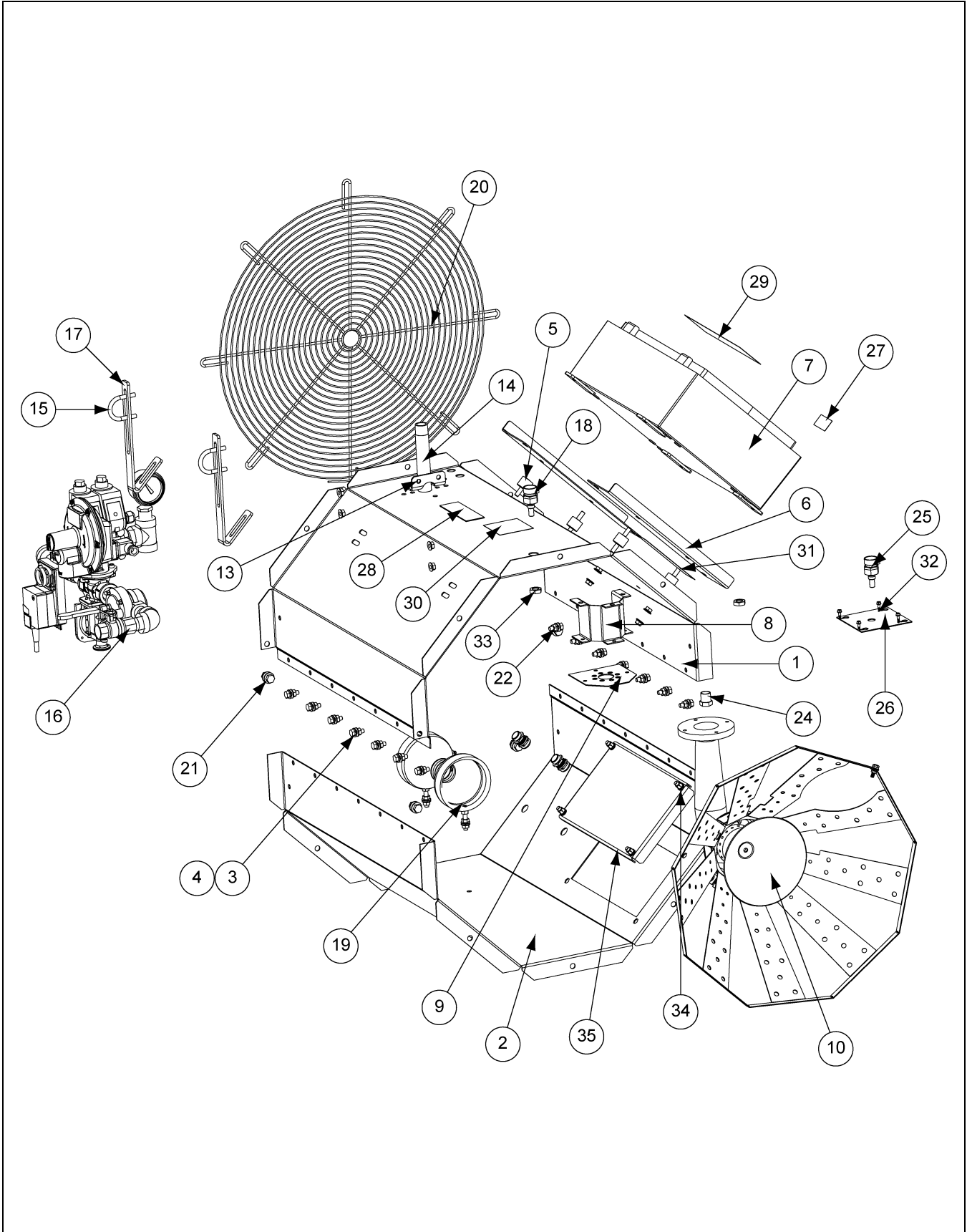
Heater 24" CE Base Model - Knockdown (VHE-24) (Pre-2016)



Heater 24" CE Base Model - Knockdown (VHE-24) (Pre-2016) Parts List

Ref #	Part #	Description	Qty
1	HF-7646	Housing Assembly, VA Heater 24" 03	1
2	HF-8441	Gas Train 3/4" - Modulating LP/NG Vapor CE	1
3	HF-8443	Heater Control - CE Bin Heaters 230V, 50 Hz	1
4	HF-8446	Thermostat Heater Housing High-Limit 90°	1
5	HF-8447	Thermostat Transition High-Limit 120°	1
6	HF-8453M	Housing High-Limit Plate	1
7	HF-8454M	CE Heater Control Mount Plate	1
8	HF-8455M	VH Heater Housing High-Limit Plate	1
9	HF-8456M	Pipe Train Support VHE Heaters	2
10	S-BM08020	Bolt, HHCS M08 x 20 ZN Class 8.8	8
11	S-BSTM06030	DIN7504K, Bolt, Self-Tap M6 x 30	2
12	S-BUM08032	U-Bolt Clamp, Universal, M8-32 mm	2
13	S-FNM08	Nut, Flange M8 ZN 8.8 GB/T6177.1	20
14	S-FWM14	Washer, Flat M14 ZN GB/T95	2
15	S-FWM8	Washer, Flat M8 ZN GB/T95	4
16	S-PR202560M08	Puffer, Rubber, 20 mm H, Diameter 25 mm, 60 mm L, M08	4
17	S-SNM14	DIN980, Nut, Stover M14 ZN	2
N/S	S-TP0608-2M	Tube, Inside Diameter 6 mm; Outside	1
N/S	H07-4C-1.5-10	Cable H07-RN-F 4 Core x 1.5 mm	1
N/S		Spark Cable	1
N/S		Spark	1

Heater 24" CE Base Model (VHE-24) (2016 Onwards)



Heater 24" CE Base Model (VHE-24) (2016 Onwards) Parts List

Ref #	Part #	Description	Qty
1	VHE-016M	Housing; Wrapper 24" Heater 1	1
2	VHE-017M	Housing; Wrapper 24" Heater 2	1
3	S-FBM08020	DIN6921, Flange Bolt M08 x 20 ZN Class 8.8 Serrated	31
4	S-FNM08	DIN6923, Flange Nut M8 ZN Class 8 Serrated	43
5	S-PR202560M08	Puffer, Rubber, 20 mm H, Diameter 25 mm, 60 mm L, M08	4
6	VHE-003M	Control Box Bracket	2
7	HF-8443	Heater Control CE Bin Heaters 230V, 50 Hz	1
8	VHE-004M	Burner Inner Mounting Bracket	1
9	VHE-005M	Collector Plate 24" and 26" Heater	1
10	HF-7689	Burner Assembly: 24"-26"	1
11	S-FBM06025	DIN6921, Flange Bolt M06 x 25 ZN Class 8.8 Serrated	4
12	S-FNM06	DIN6923, Flange Nut M6 ZN Serrated	4
13	VHE-006M	Burner Mounting Bracket	1
14	HH-7027	Orifice Pipe 3/4" x 6-1/2"	1
15	S-BUM08032	U-Bolt Clamp, Universal, M8-32 mm	3
16	HF-8441	Gas Train 3/4" Modulating LP/NG Vapor CE Bin Heaters	1
17	VHE-009M	Gas Train Mounting Bracket	2
18	HF-8446	Thermostat Housing High-Limit 80 C CE Bin Heaters	1
19	VHE-011M	Venturi Assembly	1
20	F-7182	Grill Guard: 24" Painted ILC	1
21	S-FBM10020	DIN6921, Flange Bolt M10 x 20 ZN Class 8.8 Serrated	8
22	S-FNM10	DIN6923, Flange Nut M10 ZN Class 8 Serrated	8
23	S-CGM16	Cable Gland; M16	6
24	HH-7024-07M	Plug Brass 3/4" Pipe - 1/2" NPT Hex, Drilled 7 mm	1
25	HF-8447	Thermostat Transition High-Limit 110 C CE Bin Heaters	1
26	HF-8453M	Heater/Transition High-Limit Mounting Plate	1
27	DC-108	Decal, High-Limit Button	1
28	DC-113	Decal, Airflow	1
29	DC-1559	Decal, Warning: DC-1225/DC-1227	1
30	DC-1620	Decal, Cone Removal Heater	1
31	DC-1718	Decal, Warning Heater Fire	1
32	S-SDS04016	DIN7504K; Screw, Self-Drilling, M4 x 16 mm	4
33	S-HNLC14	DIN936, Jam Nut, Hex M14 YDP Class 8.8	2
34	S-RNM08	Rivet Nut M08	4
35	VHE-022M	VHE Heater Inspection Door	1
N/S	H07-3C-1.5-10	Cable H07-RN-F 3 Core x 1-1/2 mm ²	1
N/S	S-SCFZ-LS/5	Spark Cable Heater Ignition	1
N/S	S-SPEWG-11U	Spark Plug Elbow	1
N/S	S-SPS120	Spark Plug Straight 120 mm H	1
N/S	S-TP0608-2M	Tube; Inside Diameter 6 mm; Outside 8 mm, Nylon, Black, UV Resistant	1

8. Purge Times

Purge Times for GSI CF-10 Fan

Fan	Airflow (m ³ /s)	Purge Time in Minutes											
CF-10	5.69	Bin Height (m)											
Bin Diameter (m)	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50	9.00
5.00	0.80	0.92	1.03	1.15	1.26	1.38	1.49	1.61	1.72	1.84	1.95	2.07	2.18
5.50	0.98	1.12	1.26	1.40	1.54	1.68	1.82	1.96	2.10	2.23	2.37	2.41	2.65
6.00	1.18	1.35	1.52	1.68	1.85	2.01	2.18	2.34	2.51	2.68	2.84	3.01	3.17
6.50	1.41	1.60	1.80	1.99	2.19	2.38	2.58	2.77	2.96	3.16	3.35	3.55	3.74
7.00	1.66	1.88	2.11	2.33	2.56	2.78	3.01	3.23	3.46	3.68	3.91	4.14	4.36
7.50	1.93	2.18	2.44	2.70	2.96	3.22	3.48	3.74	4.00	4.25	4.51	4.77	5.03
8.00	2.22	2.51	2.81	3.10	3.40	3.69	3.99	4.28	4.57	4.87	5.16	5.46	5.75
8.50	2.54	2.87	3.20	3.53	3.87	4.20	4.53	4.86	5.20	5.53	5.86	6.19	6.53
9.00	2.88	3.25	3.63	4.00	4.37	4.74	5.12	5.49	5.86	6.23	6.61	6.98	7.35
9.50	3.25	3.67	4.08	4.50	4.91	5.33	5.74	6.16	6.57	6.99	7.40	7.82	8.23
10.00	3.65	4.11	4.57	5.03	5.49	5.95	6.41	6.87	7.33	7.79	8.25	8.71	9.17
10.50	4.07	4.57	5.08	5.59	6.10	6.60	7.11	7.62	8.12	8.63	9.14	9.65	10.15
11.00	4.52	5.07	5.63	6.19	6.74	7.30	7.86	8.41	8.97	9.53	10.08	10.64	11.20
11.50	5.00	5.60	6.21	6.82	7.43	8.04	8.65	9.25	9.86	10.47	11.08	11.69	12.30
12.00	5.50	6.17	6.83	7.49	8.15	8.82	9.48	10.14	10.80	11.47	12.13	12.79	13.45
12.50	6.04	6.76	7.48	8.20	8.92	9.64	10.35	11.07	11.79	12.51	13.23	13.95	14.67
13.00	6.61	7.39	8.16	8.94	9.72	10.50	11.27	12.05	12.83	13.61	14.38	15.16	15.94
13.50	7.21	8.05	8.88	9.72	10.56	11.40	12.24	13.08	13.91	14.75	15.59	16.43	17.27
14.00	7.84	8.74	9.64	10.54	11.45	12.35	13.25	14.15	15.05	15.95	16.85	17.76	18.66
14.50	8.50	9.47	10.44	11.40	12.37	13.34	14.30	15.27	16.24	17.21	18.17	19.14	20.11
15.00	9.20	10.23	11.27	12.30	13.34	14.37	15.41	16.44	17.48	18.51	19.55	20.58	21.62

Purge Times for GSI CF-15 Fan

Fan	Airflow (m ³ /s)	Purge Time in Minutes											
CF-15	7.18	Bin Height (m)											
Bin Diameter (m)	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50	9.00
5.00	0.63	0.73	0.82	0.91	1.00	1.09	1.18	1.27	1.36	1.46	1.55	1.64	1.73
5.50	0.78	0.89	1.00	1.11	1.22	1.33	1.44	1.55	1.66	1.77	1.88	1.99	2.10
6.00	0.94	1.07	1.20	1.33	1.46	1.60	1.73	1.86	1.99	2.12	2.25	2.38	2.51
6.50	1.12	1.27	1.43	1.58	1.73	1.89	2.04	2.20	2.35	2.50	2.66	2.81	2.97
7.00	1.31	1.49	1.67	1.85	2.03	2.21	2.38	2.56	2.74	2.92	3.10	3.28	3.46
7.50	1.53	1.73	1.94	2.14	2.35	2.55	2.76	2.96	3.17	3.37	3.58	3.78	3.99
8.00	1.76	1.99	2.23	2.46	2.69	2.93	3.16	3.39	3.63	3.86	4.09	4.33	4.56
8.50	2.01	2.28	2.54	2.80	3.07	3.33	3.59	3.86	4.12	4.38	4.65	4.91	5.17
9.00	2.28	2.58	2.87	3.17	3.47	3.76	4.06	4.35	4.65	4.94	5.24	5.53	5.83
9.50	2.58	2.91	3.23	3.56	3.89	4.22	4.55	4.88	5.21	5.54	5.87	6.20	6.53
10.00	2.89	3.25	3.62	3.98	4.35	4.71	5.08	5.44	5.81	6.17	6.54	6.90	7.27
10.50	3.22	3.63	4.03	4.43	4.83	5.23	5.64	6.04	6.44	6.84	7.25	7.65	8.05
11.00	3.58	4.02	4.46	4.91	5.35	5.79	6.23	6.67	7.11	7.55	7.99	8.44	8.88
11.50	3.96	4.44	4.93	5.41	5.89	6.37	6.85	7.34	7.82	8.30	8.78	9.27	9.75
12.00	4.36	4.89	5.41	5.94	6.46	6.99	7.51	8.04	8.56	9.09	9.61	10.14	10.66
12.50	4.79	5.36	5.93	6.50	7.07	7.64	8.21	8.78	9.35	9.92	10.49	11.06	11.63
13.00	5.24	5.86	6.47	7.09	7.70	8.32	8.94	9.55	10.17	10.79	11.40	12.02	12.64
13.50	5.71	6.38	7.04	7.71	8.37	9.04	9.70	10.37	11.03	11.70	12.36	13.03	13.69
14.00	6.21	6.93	7.64	8.36	9.07	9.79	10.50	11.22	11.93	12.65	13.36	14.08	14.79
14.50	6.74	7.51	8.27	9.04	9.81	10.57	11.34	12.11	12.87	13.64	14.41	15.17	15.94
15.00	7.29	8.11	8.93	9.75	10.57	11.39	12.21	13.04	13.86	14.68	15.50	16.32	17.14

Purge Times for GSI CF-20 Fan

Fan	Airflow (m ³ /s)	Purge Time in Minutes											
CF-20	8.97	Bin Height (m)											
Bin Diameter (m)	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50	9.00
5.00	0.51	0.58	0.65	0.73	0.80	0.87	0.95	1.02	1.09	1.16	1.24	1.31	1.38
5.50	0.62	0.71	0.80	0.89	0.98	1.06	1.15	1.24	1.33	1.42	1.51	1.59	1.68
6.00	0.75	0.86	0.96	1.07	1.17	1.28	1.38	1.49	1.59	1.70	1.80	1.91	2.01
6.50	0.89	1.02	1.14	1.26	1.39	1.51	1.63	1.76	1.88	2.00	2.13	2.25	2.37
7.00	1.05	1.19	1.34	1.48	1.62	1.77	1.91	2.05	2.19	2.34	2.48	2.62	2.77
7.50	1.22	1.39	1.55	1.71	1.88	2.04	2.21	2.37	2.53	2.70	2.86	3.03	3.19
8.00	1.41	1.59	1.78	1.97	2.15	2.34	2.53	2.71	2.90	3.09	3.27	3.46	3.65
8.50	1.61	1.82	2.03	2.24	2.45	2.66	2.87	3.08	3.30	3.51	3.72	3.93	4.14
9.00	1.83	2.06	2.30	2.54	2.77	3.01	3.24	3.48	3.72	3.95	4.19	4.43	4.66
9.50	2.06	2.32	2.59	2.85	3.11	3.38	3.64	3.90	4.17	4.43	4.69	4.96	5.22
10.00	2.31	2.60	2.90	3.19	3.48	3.77	4.06	4.35	4.65	4.94	5.23	5.52	5.81
10.50	2.58	2.90	3.22	3.54	3.87	4.19	4.51	4.83	5.15	5.47	5.80	6.12	6.44
11.00	2.87	3.22	3.57	3.92	4.28	4.63	4.98	5.34	5.69	6.04	6.40	6.75	7.10
11.50	3.17	3.55	3.94	4.33	4.71	5.10	5.48	5.87	6.26	6.64	7.03	7.41	7.80
12.00	3.49	3.91	4.33	4.75	5.17	5.59	6.01	6.43	6.85	7.27	7.69	8.11	8.53
12.50	3.83	4.29	4.74	5.20	5.65	6.11	6.57	7.02	7.48	7.93	8.39	8.85	9.30
13.00	4.19	4.68	5.18	5.67	6.16	6.66	7.15	7.64	8.14	8.63	9.12	9.62	10.11
13.50	4.57	5.10	5.63	6.17	6.70	7.23	7.76	8.29	8.82	9.36	9.89	10.42	10.95
14.00	4.97	5.54	6.11	6.69	7.26	7.83	8.40	8.97	9.55	10.12	10.69	11.26	11.83
14.50	5.39	6.01	6.62	7.23	7.85	8.46	9.07	9.69	10.30	10.91	11.53	12.14	12.75
15.00	5.83	6.49	7.15	7.80	8.46	9.12	9.77	10.43	11.08	11.74	12.40	13.05	13.71

Purge Times for GSI CF-25 Fan

Fan	Airflow (m ³ /s)	Purge Time in Minutes											
CF-25	10.75	Bin Height (m)											
Bin Diameter (m)	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50	9.00
5.00	0.42	0.48	0.55	0.61	0.67	0.73	0.79	0.85	0.91	0.97	1.03	1.09	1.16
5.50	0.52	0.59	0.67	0.74	0.82	0.89	0.96	1.04	1.11	1.18	1.26	1.33	1.40
6.00	0.63	0.72	0.80	0.89	0.98	1.07	1.15	1.24	1.33	1.42	1.50	1.59	1.68
6.50	0.75	0.85	0.95	1.06	1.16	1.26	1.36	1.47	1.57	1.67	1.78	1.88	1.98
7.00	0.88	1.00	1.12	1.24	1.35	1.47	1.59	1.71	1.83	1.95	2.07	2.19	2.31
7.50	1.02	1.16	1.29	1.43	1.57	1.71	1.84	1.98	2.12	2.25	2.39	2.53	2.66
8.00	1.18	1.33	1.49	1.64	1.80	1.96	2.11	2.27	2.42	2.58	2.74	2.89	3.05
8.50	1.34	1.52	1.70	1.87	2.05	2.22	2.40	2.58	2.75	2.93	3.10	3.28	3.46
9.00	1.53	1.72	1.92	2.12	2.32	2.51	2.71	2.91	3.10	3.30	3.50	3.70	3.89
9.50	1.72	1.94	2.16	2.38	2.60	2.82	3.04	3.26	3.48	3.70	3.92	4.14	4.36
10.00	1.93	2.17	2.42	2.66	2.91	3.15	3.39	3.64	3.88	4.12	4.37	4.61	4.85
10.50	2.15	2.42	2.69	2.96	3.23	3.50	3.77	4.03	4.30	4.57	4.84	5.11	5.38
11.00	2.39	2.69	2.98	3.28	3.57	3.87	4.16	4.46	4.75	5.05	5.34	5.64	5.93
11.50	2.65	2.97	3.29	3.61	3.94	4.26	4.58	4.90	5.22	5.55	5.87	6.19	6.51
12.00	2.92	3.27	3.62	3.97	4.32	4.67	5.02	5.37	5.72	6.07	6.42	6.77	7.13
12.50	3.20	3.58	3.96	4.34	4.72	5.10	5.48	5.86	6.25	6.63	7.01	7.39	7.77
13.00	3.50	3.91	4.32	4.74	5.15	5.56	5.97	6.38	6.79	7.21	7.62	8.03	8.44
13.50	3.82	4.26	4.71	5.15	5.59	6.04	6.48	6.93	7.37	7.81	8.26	8.70	9.15
14.00	4.15	4.63	5.11	5.58	6.06	6.54	7.02	7.49	7.97	8.45	8.93	9.40	9.88
14.50	4.50	5.02	5.53	6.04	6.55	7.06	7.58	8.09	8.60	9.11	9.63	10.14	10.65
15.00	4.87	5.42	5.97	6.52	7.06	7.61	8.16	8.71	9.26	9.81	10.35	10.90	11.45

8. Purge Times

Purge Times for GSI CF-30 Fan

Fan	Airflow (m ³ /s)	Purge Time in Minutes											
CF-30	12.09	Bin Height (m)											
Bin Diameter (m)	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50	9.00
5.00	0.38	0.43	0.49	0.54	0.59	0.65	0.70	0.76	0.81	0.86	0.92	0.97	1.03
5.50	0.46	0.53	0.59	0.66	0.72	0.79	0.86	0.92	0.99	1.05	1.12	1.18	1.25
6.00	0.56	0.64	0.71	0.79	0.87	0.95	1.03	1.10	1.18	1.26	1.34	1.42	1.49
6.50	0.66	0.75	0.85	0.94	1.03	1.12	1.21	1.30	1.40	1.49	1.58	1.67	1.76
7.00	0.78	0.89	0.99	1.10	1.20	1.31	1.42	1.52	1.63	1.73	1.84	1.95	2.05
7.50	0.91	1.03	1.15	1.27	1.39	1.52	1.64	1.76	1.88	2.00	2.12	2.25	2.37
8.00	1.04	1.18	1.32	1.46	1.60	1.74	1.88	2.01	2.15	2.29	2.43	2.57	2.71
8.50	1.19	1.35	1.51	1.66	1.82	1.98	2.13	2.29	2.45	2.60	2.76	2.92	3.07
9.00	1.36	1.53	1.71	1.88	2.06	2.23	2.41	2.58	2.76	2.93	3.11	3.29	3.46
9.50	1.53	1.73	1.92	2.12	2.31	2.51	2.70	2.90	3.09	3.29	3.48	3.68	3.87
10.00	1.72	1.93	2.15	2.37	2.58	2.80	3.01	3.23	3.45	3.66	3.88	4.10	4.31
10.50	1.91	2.15	2.39	2.63	2.87	3.11	3.35	3.59	3.82	4.06	4.30	4.54	4.78
11.00	2.13	2.39	2.65	2.91	3.17	3.44	3.70	3.96	4.22	4.48	4.75	5.01	5.27
11.50	2.35	2.64	2.92	3.21	3.50	3.78	4.07	4.36	4.64	4.93	5.22	5.50	5.79
12.00	2.59	2.90	3.21	3.53	3.84	4.15	4.46	4.77	5.09	5.40	5.71	6.02	6.33
12.50	2.84	3.18	3.52	3.86	4.20	4.54	4.87	5.21	5.55	5.89	6.23	6.57	6.90
13.00	3.11	3.48	3.84	4.21	4.57	4.94	5.31	5.67	6.04	6.40	6.77	7.14	7.50
13.50	3.39	3.79	4.18	4.58	4.97	5.37	5.76	6.16	6.55	6.94	7.34	7.73	8.13
14.00	3.69	4.11	4.54	4.96	5.39	5.81	6.24	6.66	7.08	7.51	7.93	8.36	8.78
14.50	4.00	4.46	4.91	5.37	5.82	6.28	6.73	7.19	7.64	8.10	8.55	9.01	9.46
15.00	4.33	4.82	5.30	5.79	6.28	6.77	7.25	7.74	8.23	8.71	9.20	9.69	10.18

Purge Times for GSI CF-40 Fan

Fan	Airflow (m ³ /s)	Purge Time in Minutes											
CF-40	14.52	Bin Height (m)											
Bin Diameter (m)	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50	9.00
5.00	0.31	0.36	0.40	0.45	0.49	0.54	0.58	0.63	0.67	0.72	0.76	0.81	0.85
5.50	0.38	0.44	0.49	0.55	0.60	0.66	0.71	0.77	0.82	0.88	0.93	0.98	1.04
6.00	0.46	0.53	0.59	0.66	0.72	0.79	0.85	0.92	0.98	1.05	1.11	1.18	1.24
6.50	0.55	0.63	0.70	0.78	0.86	0.93	1.01	1.09	1.16	1.24	1.31	1.39	1.47
7.00	0.65	0.74	0.83	0.91	1.00	1.09	1.18	1.27	1.36	1.44	1.53	1.62	1.71
7.50	0.75	0.86	0.96	1.06	1.16	1.26	1.36	1.46	1.57	1.67	1.77	1.87	1.97
8.00	0.87	0.99	1.10	1.22	1.33	1.45	1.56	1.68	1.79	1.91	2.02	2.14	2.25
8.50	0.99	1.12	1.25	1.39	1.52	1.65	1.78	1.91	2.04	2.17	2.30	2.43	2.56
9.00	1.13	1.27	1.42	1.57	1.71	1.86	2.01	2.15	2.30	2.44	2.59	2.74	2.88
9.50	1.27	1.44	1.60	1.76	1.92	2.09	2.25	2.41	2.57	2.74	2.90	3.06	3.23
10.00	1.43	1.61	1.79	1.97	2.15	2.33	2.51	2.69	2.87	3.05	3.23	3.41	3.59
10.50	1.59	1.79	1.99	2.19	2.39	2.59	2.79	2.99	3.18	3.38	3.58	3.78	3.98
11.00	1.77	1.99	2.21	2.42	2.64	2.86	3.08	3.30	3.52	3.73	3.95	4.17	4.39
11.50	1.96	2.20	2.43	2.67	2.91	3.15	3.39	3.63	3.87	4.10	4.34	4.58	4.82
12.00	2.16	2.42	2.68	2.94	3.20	3.45	3.71	3.97	4.23	4.49	4.75	5.01	5.27
12.50	2.37	2.65	2.93	3.21	3.49	3.78	4.06	4.34	4.62	4.90	5.18	5.47	5.75
13.00	2.59	2.89	3.20	3.50	3.81	4.11	4.42	4.72	5.03	5.33	5.64	5.94	6.25
13.50	2.82	3.15	3.48	3.81	4.14	4.47	4.80	5.12	5.45	5.78	6.11	6.44	6.77
14.00	3.07	3.43	3.78	4.13	4.48	4.84	5.19	5.54	5.90	6.25	6.60	6.96	7.31
14.50	3.33	3.71	4.09	4.47	4.85	5.23	5.61	5.98	6.36	6.74	7.12	7.50	7.88
15.00	3.60	4.01	4.42	4.82	5.23	5.63	6.04	6.44	6.85	7.25	7.66	8.07	8.47

GSI Group, LLC Limited Warranty

The GSI Group, LLC ("GSI") warrants products which it manufactures to be free of defects in materials and workmanship under normal usage and conditions for a period of 12 months after sale to the original end-user or if a foreign sale, 14 months from arrival at port of discharge, whichever is earlier. The end-user's sole remedy (and GSI's only obligation) is to repair or replace, at GSI's option and expense, products that in GSI's judgment, contain a material defect in materials or workmanship. Expenses incurred by or on behalf of the end-user without prior written authorization from the GSI Warranty Group shall be the sole responsibility of the end-user.

Warranty Extensions:

The Limited Warranty period is extended for the following products:

	Product	Warranty Period	
AP Fans and Flooring	Performer Series Direct Drive Fan Motor	3 Years	* Warranty prorated from list price: 0 to 3 years - no cost to end-user 3 to 5 years - end-user pays 25% 5 to 7 years - end-user pays 50% 7 to 10 years - end-user pays 75%
	All Fiberglass Housings	Lifetime	
	All Fiberglass Propellers	Lifetime	
AP and Cumberland	Flex-Flo/Pan Feeding System Motors	2 Years	** Warranty prorated from list price: 0 to 3 years - no cost to end-user 3 to 5 years - end-user pays 50%
Cumberland Feeding/Watering Systems	Feeder System Pan Assemblies	5 Years **	
	Feed Tubes (1-3/4" and 2.00")	10 Years *	
	Centerless Augers	10 Years *	
	Watering Nipples	10 Years *	
Grain Systems	Grain Bin Structural Design	5 Years	† Motors, burner components and moving parts not included. Portable dryer screens included. Tower dryer screens not included.
Grain Systems Farm Fans Zimmerman	Portable and Tower Dryers	2 Years	
	Portable and Tower Dryer Frames and Internal Infrastructure †	5 Years	

GSI further warrants that the portable and tower dryer frame and basket, excluding all auger and auger drive components, shall be free from defects in materials for a period of time beginning on the twelfth (12th) month from the date of purchase and continuing until the sixtieth (60th) month from the date of purchase (extended warranty period). During the extended warranty period, GSI will replace the frame or basket components that prove to be defective under normal conditions of use without charge, excluding the labor, transportation, and/or shipping costs incurred in the performance of this extended warranty.

Conditions and Limitations:

THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE LIMITED WARRANTY DESCRIPTION SET FORTH ABOVE. SPECIFICALLY, GSI MAKES NO FURTHER WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE IN CONNECTION WITH: (I) PRODUCT MANUFACTURED OR SOLD BY GSI OR (II) ANY ADVICE, INSTRUCTION, RECOMMENDATION OR SUGGESTION PROVIDED BY AN AGENT, REPRESENTATIVE OR EMPLOYEE OF GSI REGARDING OR RELATED TO THE CONFIGURATION, INSTALLATION, LAYOUT, SUITABILITY FOR A PARTICULAR PURPOSE, OR DESIGN OF SUCH PRODUCTS.

GSI shall not be liable for any direct, indirect, incidental or consequential damages, including, without limitation, loss of anticipated profits or benefits. The sole and exclusive remedy is set forth in the Limited Warranty, which shall not exceed the amount paid for the product purchased. This warranty is not transferable and applies only to the original end-user. GSI shall have no obligation or responsibility for any representations or warranties made by or on behalf of any dealer, agent or distributor.

GSI assumes no responsibility for claims resulting from construction defects or unauthorized modifications to products which it manufactured. Modifications to products not specifically delineated in the manual accompanying the equipment at initial sale will void the Limited Warranty.

This Limited Warranty shall not extend to products or parts which have been damaged by negligent use, misuse, alteration, accident or which have been improperly/inadequately maintained. This Limited Warranty extends solely to products manufactured by GSI.

Prior to installation, the end-user has the responsibility to comply with federal, state and local codes which apply to the location and installation of products manufactured or sold by GSI.

This equipment shall be installed in accordance with the current installation codes and applicable regulations, which should be carefully followed in all cases. Authorities having jurisdiction should be consulted before installations are made.



**1004 E. Illinois St.
Assumption, IL 62510-0020
Phone: 1-217-226-4421
Fax: 1-217-226-4420
www.gsiag.com**



GSI is a worldwide brand of AGCO Corporation.