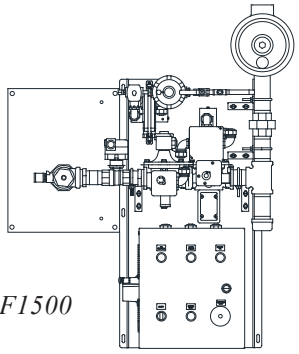
Installation and Service Instructions



HMA2A DF1500

HMA2A

DF1500 - 1843002

Gas Burner - OEM

- In the United States, installation must conform with local codes or in the absence of local codes, with the National Fuel Gas Code, ANSI Z223.1-latest edition available from American National Standard Institute. Further reference should be made to the recommendation of your fuel supplier.

- In Canada, installation must conform with local codes or in the absence of local codes, with Installation Codes for Gas Burning Appliances and Equipment, CGA Standard CAN/CGA 1-B-149.1 or 2.

- ⚠ **WARNING: Additions, changes, conversions and service must be performed by an authorized Midco representative, service agency or the fuel supplier. Use only MIDCO specified and approved parts.**

- INSTALLER: Inform and demonstrate to the user the correct operation and maintenance of the gas utilization equipment. Inform the user of the hazards of storing flammable liquids and vapors in the vicinity of this gas utilization equipment and remove such hazards. Affix this manual and associated literature to the burner.

  CODE COMPLIANCE IS THE SOLE RESPONSIBILITY OF THE INSTALLER.

- USER: Retain this manual for future reference. If other than routine service or maintenance as described in this manual and associated literature is required, contact a qualified service agency. DO NOT ATTEMPT REPAIRS. An inadvertent service error could result in a dangerous condition.

AVOID ERROR IN PARTS SELECTION. When ordering use complete MIDCO Part Number and Description. Furnish Burner Model Number, Bill of Material Number and Serial Number (if available) from the specification plate found on the product.

IMPORTANT: Availability of parts as well as specifications are subject to change without notice. Please consult factory for item availability.

⚠ WARNING: If the information in these instructions is not followed exactly, a fire or explosion may result, causing property damage, personal injury or death.

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS:

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately phone your gas supplier from another building. Follow the gas supplier's instructions. If you cannot reach your gas supplier call the fire department.

Installation and service must be performed by a qualified installer, service agency or the gas supplier.

BURNER MODEL: _____

BILL OF MATERIAL NUMBER: _____

SERIAL NUMBER #: _____

WIRING DIAGRAM: _____

FOR SERVICE CONTACT

Name: _____

Address: _____

_____

Phone: _____

Date of Installation: _____

Midco® International Inc.
4140 West Victoria Street
Chicago, Illinois 60646
toll free 866.705.0514
tel 773.604.8700
fax 866.580.8700
web www.midcointernational.com
e-mail sales@midcointernational.com

SAFETY INFORMATION TERMS: The following terms are used to identify hazards, safety precaution of special notations and have standard meanings throughout this manual. They are printed in all capital letters using a bold type face as shown below, and preceded by the exclamation mark symbol. When you see the safety alert symbol and one of the safety information terms as shown below, be aware of the hazard potential.

⚠

DANGER: Identifies the most serious hazards which will result in severe personal injury or death.
WARNING: Signifies a hazard that could result in personal injury or death.
CAUTION: Identifies unsafe practices which would result in minor personal injury or product and property damage.

Part 1 - Installation and Service

Specifications

Identification and Specifications of the Direct Fired HMA2A - Model DF1500 - Modulating: Purpose of the Burner: The burner system will provide heating with modulation.

	Natural Gas	Propane Gas
Max. Capacity	1700 MBH	1550 MBH
Burner Manifold Pressure	7.5" W.C.	3.0" W.C.
Pilot Manifold Gas Pressure	3.5" W.C.	2.0" W.C.*
Min. Inlet Pressure	13.0" W.C.	7.5" W.C.
Max. Inlet Pressure (psi)	5	
*Firing Rate	Max. 1,700 MBH	
Pilot Capacity	18,500 Btu/hr	
Max. Supply Pressure	5 PSI	
Gas Train Size	1-1/2"	
Operation Mode	Full Modulation	
Electric .....120V, 50/60Hz ..... 2.0 Amps ..... Single Phase		

Table 1: *1843002 Direct Fired Burner Specifications - *with 4957-07 orifice*

I Installation

The installation shall conform with local codes, or in the absence of local codes, in accordance with the National Fuel Gas Code, ANSI Z223.1/NFPA 54, or the Natural Gas and Propane Installation Codes, CAN/CSA B149.1.

The burner is normally supplied dismantled in two separate elements, burner and valve train mounted panel. They must therefore be assembled and installed on site by qualified personnel.

⚠ **WARNING: DO NOT INSTALL THE GAS IGNITION CONTROL WHERE IT IS DIRECTLY EXPOSED TO WATER SPRAY, RAIN, OR DRIPPING WATER.**

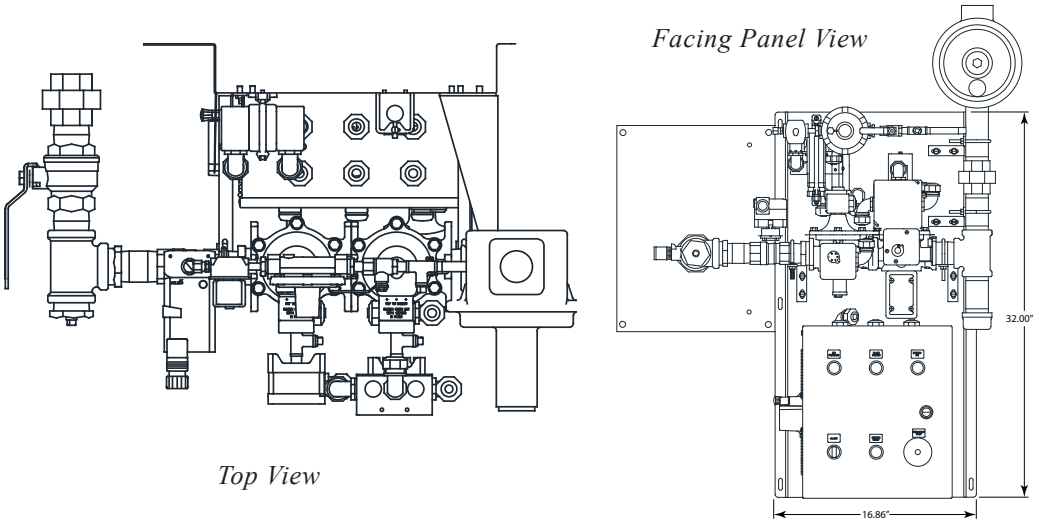


Figure 1: *Assembled burner and valve train panel and relevant dimensions*

I Installation ...Continued

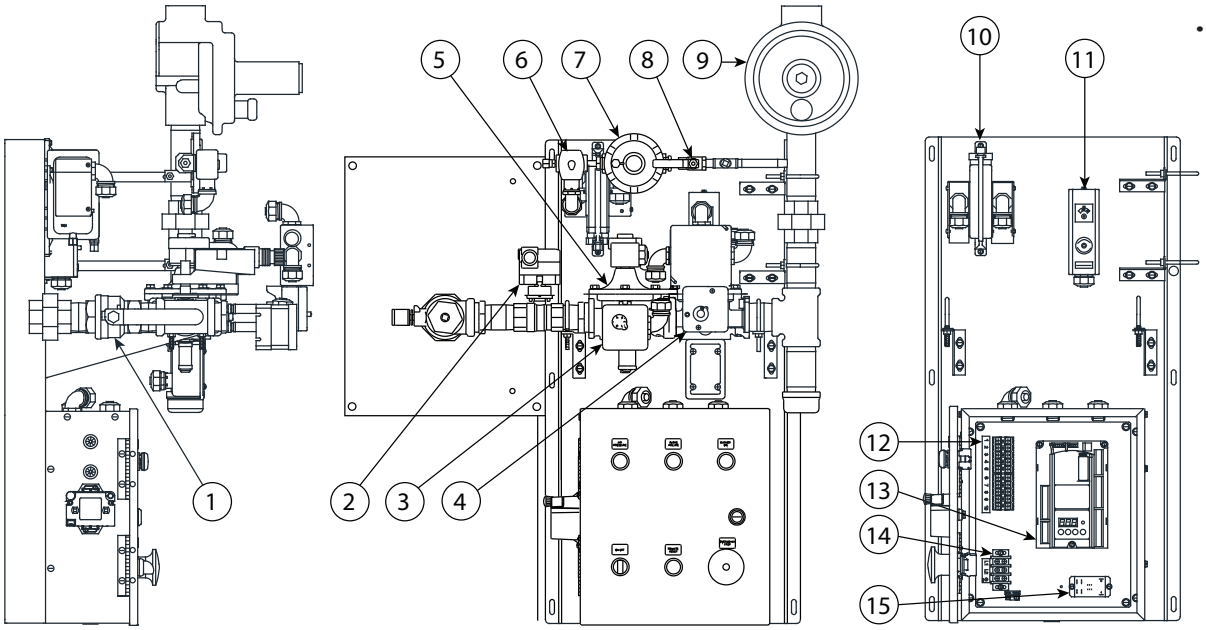


Figure 2: *Schematic of the burner and a list of its components in working position*

Item	Description	Midco Replacement Part Number
1	1-1/2" Manual Valve	8404-65
2	Belimo Actuator	8419-34
3	High Pressure Gas Switch	8425-63
		or 8425-73
		or 2118-06
4	Low Pressure Gas Switch	8425-62
		or 8425-72
		or 2118-07
5	1-1/2" Double Gas Solenoid Valve With Proof of Closure	8418-13

Item	Description	Midco Replacement Part Number
6	1/8" Pilot Solenoid Valve	8402-50
7	1/2" Pilot Regulator	8400-07
8	1/4" Manual Ball Valve	8404-28
9	1-1/2" Regulator	8418-51
10	Air Switch	8425-64
11	High Temperature Switch	8425-48
12	Terminal Strip	8625-05
13	Siemens Control	8429-69
14	3 Terminal Strip	8408-78
15	120V Relay	8406-68

1. Install the Valve Train/Control Panel onto the side of the unit next to the burner panel as seen in Figure 1 and 2.
2. Install natural gas or propane piping from source to inlet manual valve (shipped loose, see Components Parts List at the back of the manual).
3. Install natural gas or propane piping from the valve train/control panel to the burner with the use of the 18" by 1½" NPT pipe nipple shipped loose (see Components Parts List at the back of the manual).

NOTE: A MANUAL SHUTOFF VALVE MUST BE INSTALLED IN AN APPROPRIATE LOCATION SO THAT THE FUEL CAN BE SHUT OFF IN THE CASE OF AN EMERGENCY.

4. High gas pressure supply lines require the proper pressure-reducing regulator. See Table 1 for the maximum inlet supply pressure.
5. Use the punch out on the bottom of the control box to install the modulation control wires and power supply lines as shown in wiring diagram 1843002WD. An electric disconnect switch having adequate ampacity (see rating plate on the heater for voltage and ampacity) shall be installed in accordance with the National Electric Code, ANSI/NFPA 70.

NOTE: INSTALLATION OF THIS HEATER IN AIRPLANE HANGARS MUST BE IN ACCORDANCE WITH THE STANDARD FOR AIRCRAFT HANGARS, ANSI/NFPA 409. INSTALLATION OF THIS HEATER IN PUBLIC GARAGES MUST BE IN ACCORDANCE WITH THE STANDARD FOR PARKING STRUCTURES, ANSI/NFPA 88A OF THE STANDARD FOR REPAIR GARAGES ANSI/ NFPA 30A AND WITH THE NATIONAL GAS AND PROPANE INSTALLATION CODES, CAN/CSA B149.1.

I Installation ...Continued

A Positioning and Securing

Figure 3 shows how to position the burner in the Generator with baffle adjustment. For baffle settings see the Table 2 below.

	Distance between Baffles and GTVs Interior part	
Air flow Rate (cfm)	SIDE A Opening	SIDE B Opening
12,900-16,500	29.5"	39.5"

Table 2: *Baffle Settings*

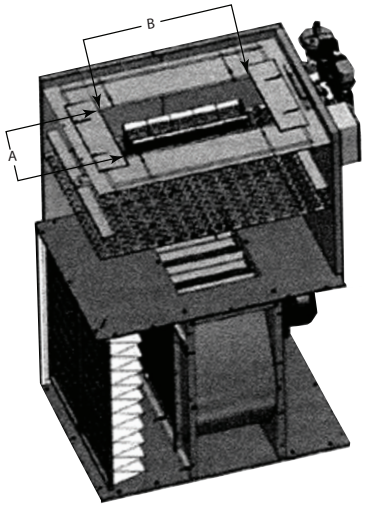


Figure 3: *Schematic of the baffle and necessary baffle settings*

B Reversed Valve Train

The valve train is supplied assembled with the adequate gas seals in the threads of the pipe joints. If the installation direction of the valve train is not suitable to the installation site, please contact your supplier.

C Fuel Connection

It is the responsibility of the customer to prepare the main shut-off valve of the gas supply line and all connections required up to the input of the valve train of the burner. The shut off valve and a 1-1/2" x 5" pipe nipple is supplied (shipped lose) with the burner to be installed upstream of the burner and valve train.

II Burner Startup and Adjustment

Specialized staff must only carry out commissioning and adjustment of the burner. It is essential that before commissioning the maintainer thoroughly studies all the instructions contained in the document delivered together with the burner and strictly follows all the instructions given.

BEFORE OPENING THE GAS SHUT-OFF VALVE MAKE SURE THE SUPPLY PRESSURE IS THAT PROVIDED. A GREATER PRESSURE MAY DAMAGE OR BREAK THE MEMBRANES OF THE EQUIPMENT DOWNSTREAM. BEFORE STARTING THE BURNER CHECK FOR ANY GAS LEAKS FROM FITTINGS AND VALVES.

Before starting the system, make sure that the spring in the regulator provided is suitable to the adjustment pressure desired. Remove the cap of the adjusting filter (component 10 in Figure 2), then turn the adjusting screw to the lowest setting (completely unscrewed). Then turn the adjusting screw to the highest setting (completely screwed down). After the adjustment, turn the adjusting screw to the lowest setting and re-position the cap.

A Startup

A. Startup

1. Close the inlet manual valve and outlet valve on the valve train.
2. Before the supply line is to be put into service, it must be tested to insure that it is gas tight. Pressurize the line with air or inert gas and test with soap and water or other appropriate liquid to locate leaks. The valve to the burner (component 1 in Figure 2) must be closed during this test.
3. Before gas is introduced to the system, a check must be made to see that there are no open fittings and to make sure the burner main manual and pilot manual valves are closed. After the check has been made, purge the gas line of air up to the valve train control panel.

⚠ **WARNING: PURGE OUTSIDE OF THE BUILDING. DO NOT PURGE INTO THE COMBUSTION CHAMBER.**

4. Remove the hex screw plug located behind the pilot regulator on the pilot valve train for the pilot pressure tap and install necessary fittings to connect a manometer or pressure gauge.
5. Turn on the blowers and set the spray control to the “Spray” mode.
6. Turn the pilot manual valve to the open position. Observe that the pilot ignites.

II Burner Startup and Adjustment ...Continued

7. Due to the possibility of air trapped in the piping, it may be necessary to reset the burner controller multiple times until the pilot ignites.
8. Adjust the pilot gas pressure with the pilot regulator to achieve a pressure of 3.0" W.C. Reset the burner controller to check that the unit re-establishes the pilot.
9. Ensure that the system shuts off properly by turning off the switch on the spray booth control panel.

B Setting the Firing Rate

B. Setting the firing rate:

1. Turn off the power to the control box.
2. Disconnect the 0-10V signal to the Belimo actuator by removing the connector from #4 on the relay (component 16 on Figure 2) and switch the dial on the front of the Belimo actuator to the opposite of what it is set at, either 1 to 0 or 0 to 1.
3. Remove the ¼" plug from the 1-1/2" tee for the manifold pressure tap and install necessary fittings to connect a manometer or pressure gauge.
4. Turn on the power to the control box.
5. Open the 1-1/2" gas outlet manual valve to the fully open position.
6. Use a 5/16" hex head wrench to loosen the nuts on the U-bolt that holds the Belimo actuator onto the ball valve shaft. This will allow you to open the valve manually with a wrench on the ball valve shaft. Turn it clockwise until you see the main flame turn on. Continue opening the valve until it is all the way open.
7. Allow the burner to run to the maximum firing rate. Adjust the main regulator to achieve the manifold pressure specified on the rating plate. If you do not have enough pressure to get to the rated pressure, set it as high as possible. The burner will still operate correctly but you may not be able to reach the rated temperature rise.
8. While the burner is at its maximum firing rate, recheck for gas leaks.
9. Observe the high-fire flame. It should be blue with some yellow/orange tips.
10. Turn off the power to the control box.
11. Re-connect the 0-10V signal to the Belimo actuator by replacing the connector from #4 on the relay (component 16 on Figure 2) and switch the dial on the front of the Belimo actuator back to what it was set at, either 1 to 0 or 0 to 1.

C Adjusting the Low Firing Setting

C. Adjusting the low fire setting:

1. Turn off the power to the control box.
2. Disconnect the 0-10V signal to the Belimo actuator by removing the connector from #4 on the relay (component 16 on Figure 2).
3. Turn on the power to the control box.
4. Use a 5/16" hex head wrench to loosen the nuts on the U-bolt that holds the Belimo actuator onto the ball valve shaft. Use a wrench to open the actuated ball valve until you start to see a flame in the throat of the burner. Adjust until the flame is as small as it can be without having any sections of the burner without flame. To put it another way, as low as possible while still having flame propagation across the entire burner.
5. When you have found this spot, use a 5/16", hex head wrench to tighten the nuts on the U-bolt that holds the Belimo actuator onto the ball valve shaft.
6. Turn off the power to the control box.
7. Re-connect the 0-10V signal to the Belimo actuator by replacing the connector from #4 on the relay (component 16 on Figure 2).
8. Turn on the power to the control box.
9. Let the burner start-up to make sure that it lights and stays lit. If the burner does not stay lit run through the steps in “Adjusting the Low Fire Setting” again and set the low fire slightly higher

D Checking the Modulation

D. Check the modulation:

1. Turn on the power to the control box.
2. Recycle the ignition sequence on the heater control panel by turning the burner on and off and on again. Allow the burner to ignite.
3. Use the control panel to adjust the temperature set point. Check that the burner modulates properly and the booth achieves the desired temperature. Do this for several different temperatures, including maximum and minimum.
4. Shut the system off at the control panel. Close the 1-1/2" inlet manual valve.
5. Remove all temporary manometer fittings. Re-install all plugs.
6. Fully open the 1-1/2" inlet manual valve.

II Burner Startup and Adjustment ...Continued

E Display Controls

Inside the electrical box of the burner is a Siemens LME71 controller. The controller is equipped with a small display screen that displays operation stage codes, flame signal strength (during typical operation), and errors codes (See Table 5).

During the start-up process of the burner, the current operating phase is displayed on the Siemens LME71 burner controller display. See Table 3 below for the operating phase codes.

Phase	*Description*
Off	Standby
oP	Operate
P04	Improper flame signal
P21	POC made; Combustion air switch off
P22	Combustion air switch on
P24	Actuator to pre-purge position
P30	Pre-purge
P36	Actuator to ignition position
P40	Trial for ignition
P44	Pilot stabilize (ignition off)
P50	Main stabilize
P72	Actuator to post-purge position
P74	Post-purge

Table 3: *Controller Start-up Display Codes - Phase Descriptions*

F Installation of Process Air Pressure Switch

The air pressure switch (component 11 in Figure 2) located on the valve train panel, will need to be tubed with the provided ¼" SS tubing to the holes in the unit's burner panel. The two low-pressure ports (as seen in Figure 4) on the pressure switch should be tubed together with the provided pre-cut tubes and the provided brass compression teee.

The low pressure and high-pressure tubes will then be tubed to their respective places on the burner cover plate as shown in Figure 5 and will be inserted to a depth of 5 inches.

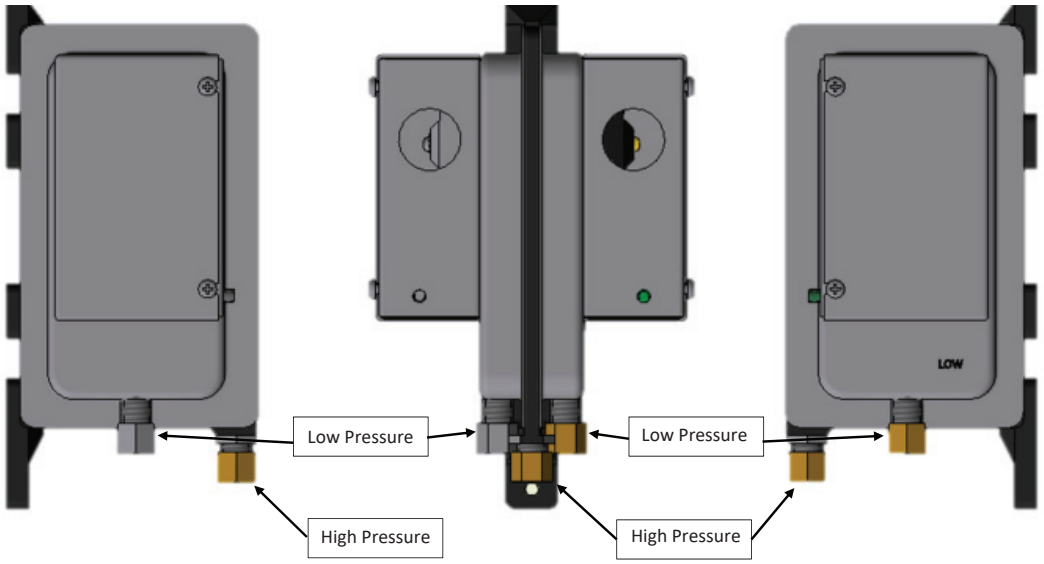


Figure 4: *Air pressure switch high and low port locations*

II Burner Startup and Adjustment ...Continued

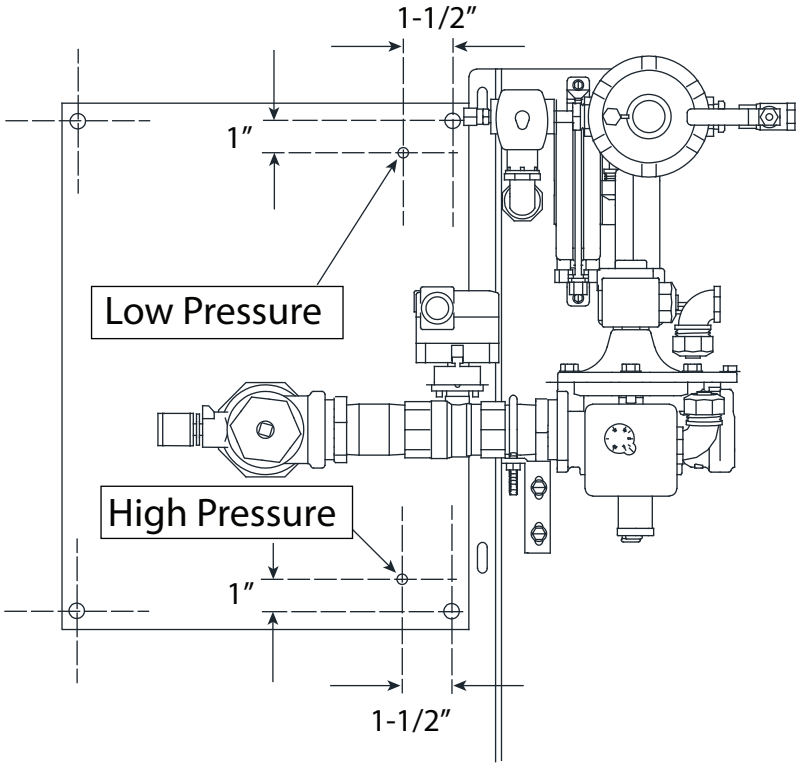


Figure 5: *Air- Visual representation of pressure switch measuring locations (Belimo actuator hidden for clarity)*

G Gas Pressure Gauge Installation

The maximum gas pressure switch detects the pressure of the gas downstream of the main valve; in the case of excessive gas pressure, it turns the burner off. The switch will need to be set at 15" W.C. by removing the clear cover with a screwdriver and turning the dial.

The minimum gas pressure switch detects the pressure of the gas downstream of the main valve; in the case of very low gas pressure, it turns the burner off. The switch will need to be set at 0.5" W.C. by removing the clear cover with a screwdriver and turning the dial.

H Positioning & Installation of High Temperature Switch

The high temperature switch detects the temperature of the air heated by the burner; in the case that the temperature of the air is too high, the burner is turned off and will not be turned back on until both the switch and the burner controller has be reset. The switch will need to be set at 240 by turning the dial with a small flat head screwdriver.

The brass element must be installed in the connecting duct between the hot air generator and the area to be heated not in direct contact or view of the burner flame.

I Control and Command

Inside the electrical box of the burner is a Siemens LME71 controller. The controller is equipped with a small display screen that displays operation stage codes, flame signal strength (during typical operation), and errors codes (Loc #).

III Safety

A Control & Monitoring

To start the burner, operate the selector switch on/off on the control panel to “ON” and the power on light will turn on. Once the burner safety start-up time is passed, and flame established, the warning light indicating flame detection (Flame Activation, Light 3 in Figure 6) will turn on and remain on as long as there is flame detection.

Item #	Description
1	Pressure Alarm
2	Safety Alarm
3	Flame Activation
4	Burner Power Switch
5	Burner Alarm Reset
6	Emergency Push Button

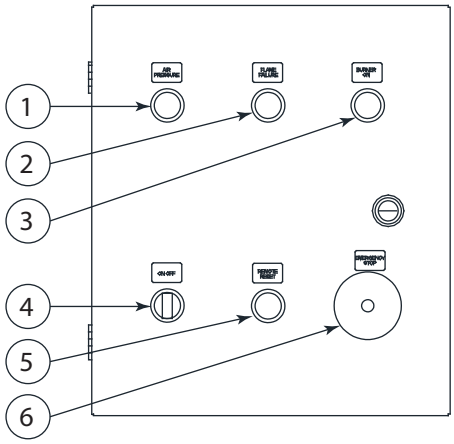


Figure 6: *Warning lights*

B Control & Safety

This burner is equipped with the following control and safety devices:

- Flame Rod: An ionization probe that detects the presence of flame through the constant monitoring of the ionization current.
- Process air and combustion air switch: by differential pressure switch (set at 0.5" - 1.1" W.C.). Below the set calibration value, the switch is enabled and locks the burner.
- Maximum and Minimum Gas Pressure Switches: prevents the burner from starting or turns off in safety conditions, after exceeding the pre-set max pressure or measuring under then pre-set minimum pressure. If the maximum pressure switch detects an exceeding value, the equipment locks, the valves lock while closing and the cycle stops. If the minimum pressure switch detects a smaller value, the equipment locks, the valves lock while closing and the cycle stops.
- High Air Temperature Switch: prevents the temperature of the air heated by the burner from exceeding too high values; it shuts down the burner in safety conditions after exceeding a pre-set temperature value. Above the set value it is enabled and locks the burner.

WHEN THE SYSTEM IS OFF IT IS ADVISABLE TO TURN OFF THE SHUT-OFF VALVE PLACED UPSTREAM.

HIGH VOLTAGE: operations on the electrical system must be performed only by authorized and qualified personnel, as it may cause serious damage to both components and people.

BEFORE CARRYING OUT ANY MAINTENANCE OPERATIONS YOU SHOULD CUT OFF THE POWER SUPPLY TO THE BURNER THROUGH THE MAIN POWER BOARD.

C Long Downtime Periods

In the case that the burner is not used for a long period of time, the following are necessary:

- If the burner is not assembled, it should be stored in a dry place and protected from weathering
- If the burner is already assembled, electrical power to the burner control box should be switched off and the gas supply to the burn should be shut off through the manual shut-off valve

Part 2 - Maintenance

IV Maintenance

Annual maintenance of HMA 2 & HMA 2A burner is recommended to ensure trouble free operation.

Proper burner maintenance consists of four tasks:

1. Clean the burner plates
2. Clear the burner gas and airports
3. Change the spark rod igniter
4. Insure the flame sensor is in good condition

Use a stiff wire brush to clean the burner plates. Scrub both sides of the stainless steel burner plates to remove any soot or other crud, which may be on the burner. All of the burner plate holes must be clear so air can pass through them unrestricted. The holes in the burner plate allow air to mix with the gas in increasing amounts, as the flame gets longer. Scrub the rust, soot and other foreign material from the burner orifice area. After cleaning the burner plates, inspect them for cracking.

Cracks occurring between one or two holes are normal and should be of no concern. If the cracking is more extensive, replace the affected plates. Clean the burner gas and airports using a drill or piece of wire of the appropriate size. See the Table 4 for drill size. After drilling the orifices to the correct size and using compressed air or a vacuum, remove any debris from the manifold. Debris left in the manifold will prematurely clog the orifices in the future.

Burner Section	Fuel Type	Gas Port Drill Size Wire Gauge	Decimal	Air Port Drill Size Wire	Decimal
HMA-2A	Natural/LP	1/8″	0.125	42	0.093

Table 4: *Drill Sizes*

With burner plates and orifices cleaned, inspect the spark rod. The tip should be clean and free of dirt and carbon. The porcelain must be intact. If it is cracked, replace it. Pull the flame rod as well. The flame rod's metal rod should be clean and free of dirt and carbon. Like the spark rod igniter, the porcelain on the flame rod must be intact as well. Replace it if it is cracked.

Part 3 - Trouble Shooting

V Faults and Solutions

A Burner Failure

⚠ WARNING: THE INSTRUCTIONS GIVEN IN THIS SECTION MAY ONLY BE CARRIED OUT BY A QUALIFIED TECHNICIAN.

In the event that the burner is locked cut off the power supply by switching off the main switch on the power board of the burner and close the supply of fuel acting on the manual shut-off valve. Then call a qualified technician.

V Faults & Solutions ...Continued

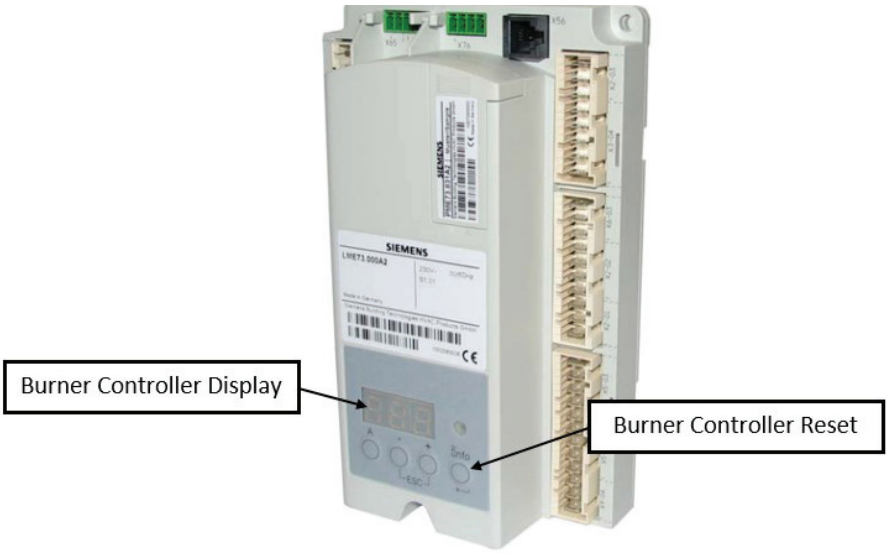


Figure 7: *Siemens Control*

B Causes and Solutions

In case of problems with the burner, see the burner controller display for error code and compare with the codes in Table 5 below.

Please note, in the following descriptions, reference is made to the components described in Figure 2.

Fault	*Description*	*Possible Solution*
Loc2	NO flame at start-up	Check that the pilot gas valve (7) is opening.
Loc3	Air switch open	Check that there are no holes in the air switch (11) tubing. Check that the air switch (11) is wired correctly. Check that system blower is operating properly.
Loc7	Loss of flame signal	Make sure that the main valves (4) are opening. Make sure low fire is not set too low.
Loc14	POC switch failure	Check that the proof of closure visual indicator matches what stage the valves are in.
Loc20	Gas pressure fault	Make sure gas pressure is not higher than the high gas switch is set Make sure gas pressure is not lower than the low gas switch is set
Loc22	Safety loop open	Make sure high temp limit switch is reset
Loc60	4-20mA input lost	Check for any wire breakage

Table 5: *Loc Codes*

For other faults, please see the Siemens LME71.111 manual. To restore the normal operating conditions, press the restart button on the Siemens LME71.111 burner controller.

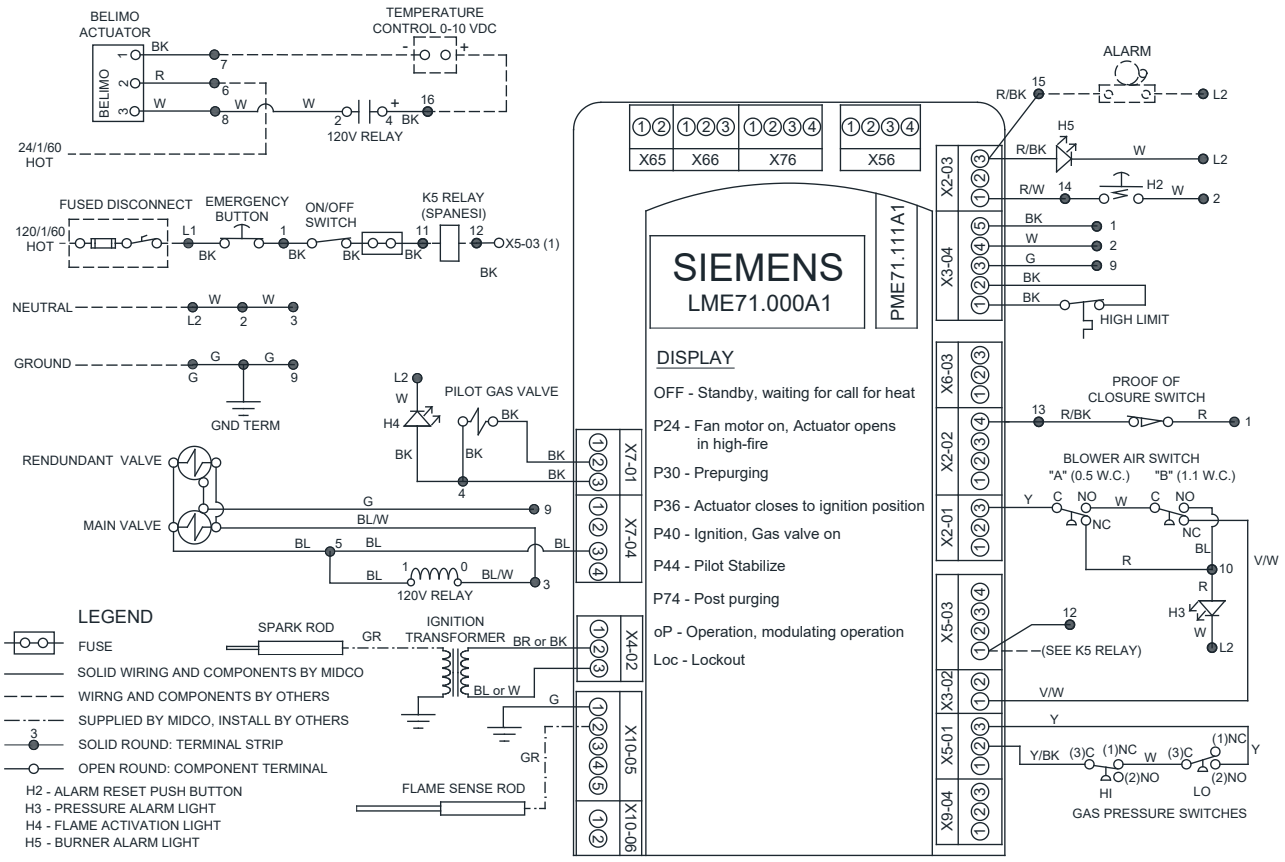


Figure 8: *Wiring Diagram -500 ohm Register Optional with a 4-20 mA System*

V Faults & Solutions ...Continued

D Flow Switch

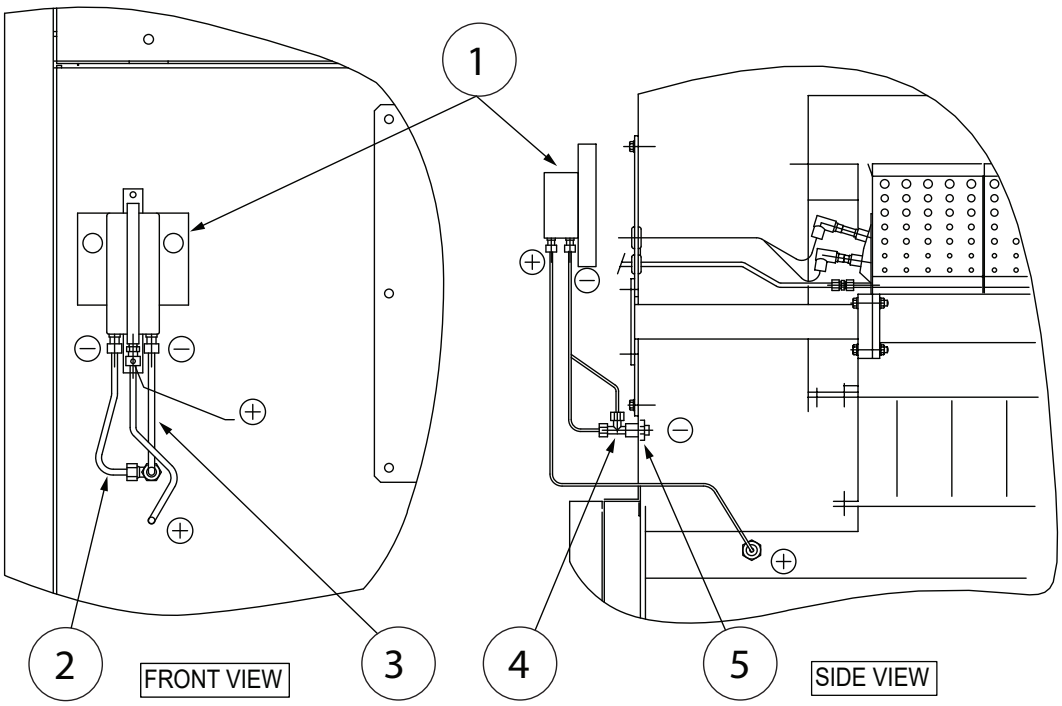


Figure 9: *HMA 2A Flow Switch Device*

Item #	*Part #*	*Description*	*Qty*
1	8425-64	Air Switch DDP	1
2	1346-62	Air Switch Low Pressure LEFT	1
3	1346-61	Air Switch Low Pressure RIGHT	1
4	8483-39	1/4" x 1/8" Comp Tee	1
5	8485-00	1/8" Closed Nipple	1

Summary of the components of the Midco direct fire system burner:

Description	*Qty*
Parts Shipped Assembled	
2.5 ft HMA-2A Midco Burner	1
1.5" Valve Train Mounted onto Panel	1
Parts Shipped Loose	
Air Switch Low Pressure Tube – Right	1
Air Switch Low Pressure Tube – Left	1
1 ½" Ball Valve	1
1/8" x ¼" Straight Connector	2
1/4T x 1/8F x 1/4T Compression Fitting Tee	1
5/16T x 1/4T Compression Fitting Union	1
14 AWG Wire (15ft long)	2
Ring Terminal	1
1 ½" x 2 ½" Pipe Nipple	2
1 ½" x 5" Pipe Nipple	1
1 ½" x 18" Pipe Nipple	1
5/16 OD Aluminum Tubing (15ft long)	1
¼" OD Aluminum Tubing (15ft long)	1

Table 6: *Shipping Components*

Midco® International Inc. - 4140 West Victoria Street - Chicago, Illinois 60646 - toll free: 866 705 0514
tel: 773.604.8700 - fax: 866.580.8700 - web: www.midcointernational.com - e-mail: sales@midcointernational.com

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