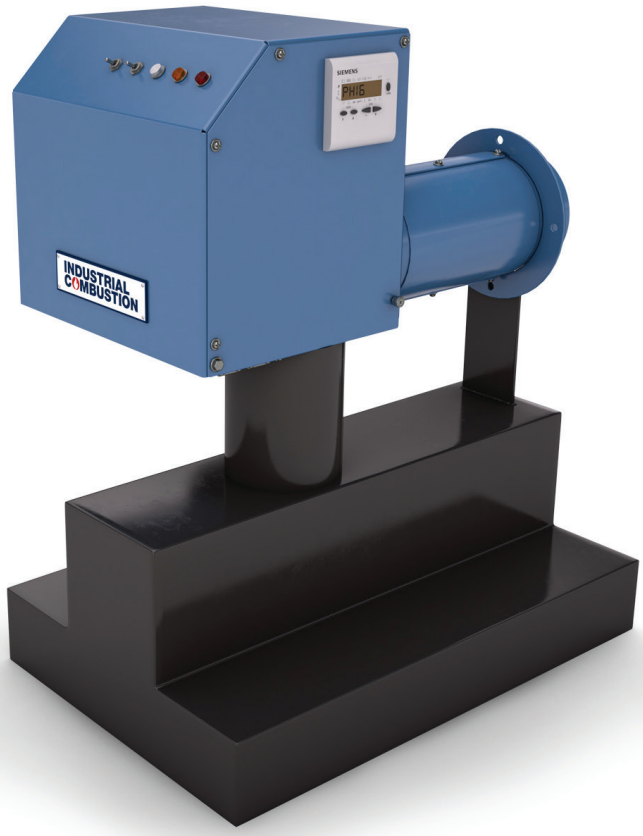
INDUSTRIAL COMBUSTION



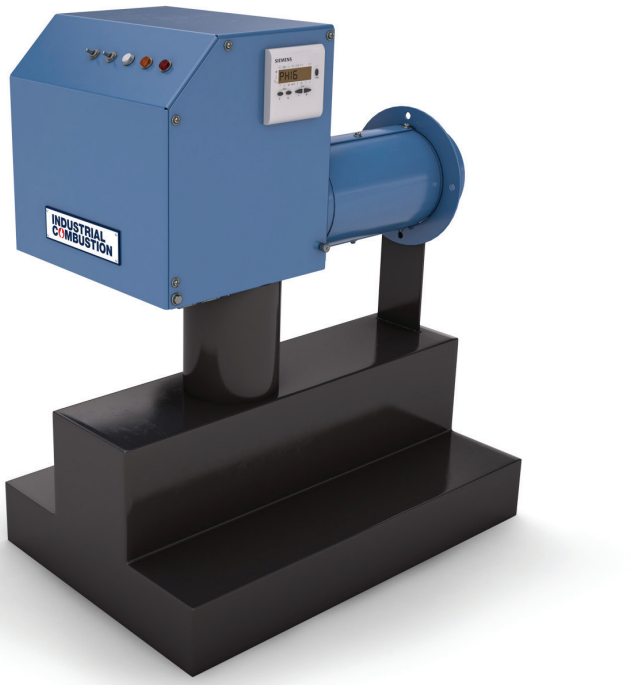
Q SERIES

0.4 to 2.5 MM BTU/HR

Advanced Engineering
Ultra-Quiet Operation

Designed around efficiency and operational simplicity, the Q series is perfect for cast iron sectional boilers, firebox, commercial watertube, firetube, furnace and oven applications. The standard Q series features linkageless operation with DC pulse width modulation and parallel positioning gas actuator control for increased efficiencies and ease of use. The whisper quiet, compact design has a totally enclosed, hinged burner housing and allows provisions for sealed combustion or fresh air intake.

Compact design with SIMPLICITY and *cost savings* in mind.



Modes of Operation
Features on-off, low-high-low, or full modulation utilizing a parallel positioning gas flow ratio control.

Easy Setup/ Commissioning
The parallel positioning gas actuator control with pulse width modulation make setup as easy as setting the main regulator and programming a curve.

Linkageless System
The linkageless system utilizes a DC pulse width modulation blower and gas actuator control to simplify burner setup and operation. The DC pulse width modulation reduces electrical and maintenance costs and produces a quiet operation; while the gas actuator controls the fuel and proportions the gas to a predetermined flow.

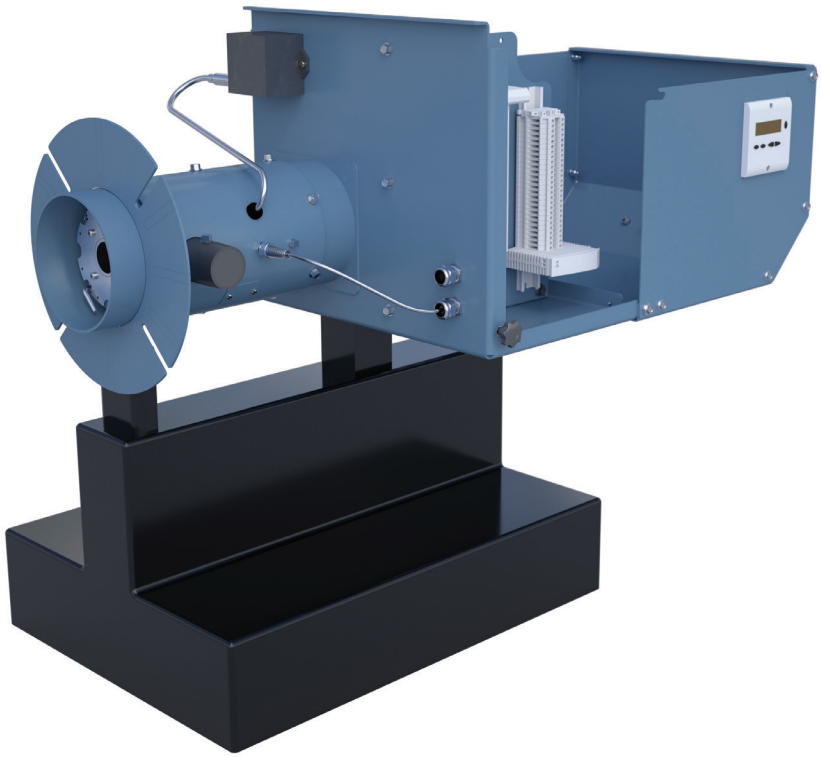
Compact Design
The fully enclosed air housing features a hinged cover which provides easy access to internal components and a whisper quiet operation.

Low Blower Motor HP
Advanced engineering provides increased combustion air fan efficiency requiring lower blower motor horsepower, thus increasing electrical savings.

The Q Burner Explained

The standard Q series includes on/off, low-high-low, or full modulation linkageless operation with DC pulse width modulation and offers natural gas from 0.375 to 2.5 MM BTU per hour. Its totally enclosed, compact design allows provisions for sealed combustion or fresh air intake. Outside air can easily be connected to the blower inlet without any modifications to the burner.

Q Burner



Linkageless System standard for optimal control throughout the firing range

DC Pulse Width Modulation allows full blower speed control without the use of air dampers

Fully Enclosed Air Housing features a hinged cover for easy access to internal components and quiet operation

Combustion Air Fan efficient airfoil blade design smoothly lifts airflow over the entire blade, resulting in less motor horsepower requirements and significant noise reduction when compared to standard force draft fans

Sealed Combustion eliminates the need for outside air dampers and make-up air units typically required in every boiler room

UL and cUL listed

CSA Package listed

Uncontrolled Emissions Configuration

Burner model	Q6-037	Q6-055	Q6-075	Q6-100	Q6-130	Q6-150	Q8-175	Q8-200	Q8-250
Gas input (MBTU/hr)	375	550	750	1,000	1,250	1,500	1,750	2,000	2,500
BHP @ 80% efficiency	9	13	18	24	30	36	42	48	60
Blower motor HP	1/2	1/2	1/2	1/2	1/2	1/2	3/4	3/4	3/4
Furnace pressure (" w.c.)	1.0	1.0	1.0	1.0	1.0	0.75	1.0	1.0	0.75
Standard gas train pipe size (in.)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Min. gas pressure required (" w.c.)	4.0	4.0	4.0	4.0	4.0	6.0	6.0	6.0	10
Low pressure gas train pipe size (in.)	1.5	1.5	1.5	1.5	1.5	2.0	2.0	2.0	2.0
Low gas pressure inlet (" w.c.)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.5
Air inlet orifice size (in.)	1.25	1.50	1.80	2.25	2.95	-	3.45	3.80	-
Fresh air inlet size (in.)	4.0	4.0	4.0	4.0	4.0	4.0	5.75	5.75	5.75
Shipping weight	100	100	100	100	100	100	125	125	125

Input is based on fuel BTU content and altitude of 2,000 feet or less. If altitude > 2,000 feet and < 8,000 feet, derate capacity 4% per 1,000 feet over 2,000. Consult factory for higher altitudes. Gas input is based on natural gas with 1,000 BTU/cu.ft. and 0.60 gravity. Consult factory for 50 Hz. applications.

INDUSTRIAL COMBUSTION

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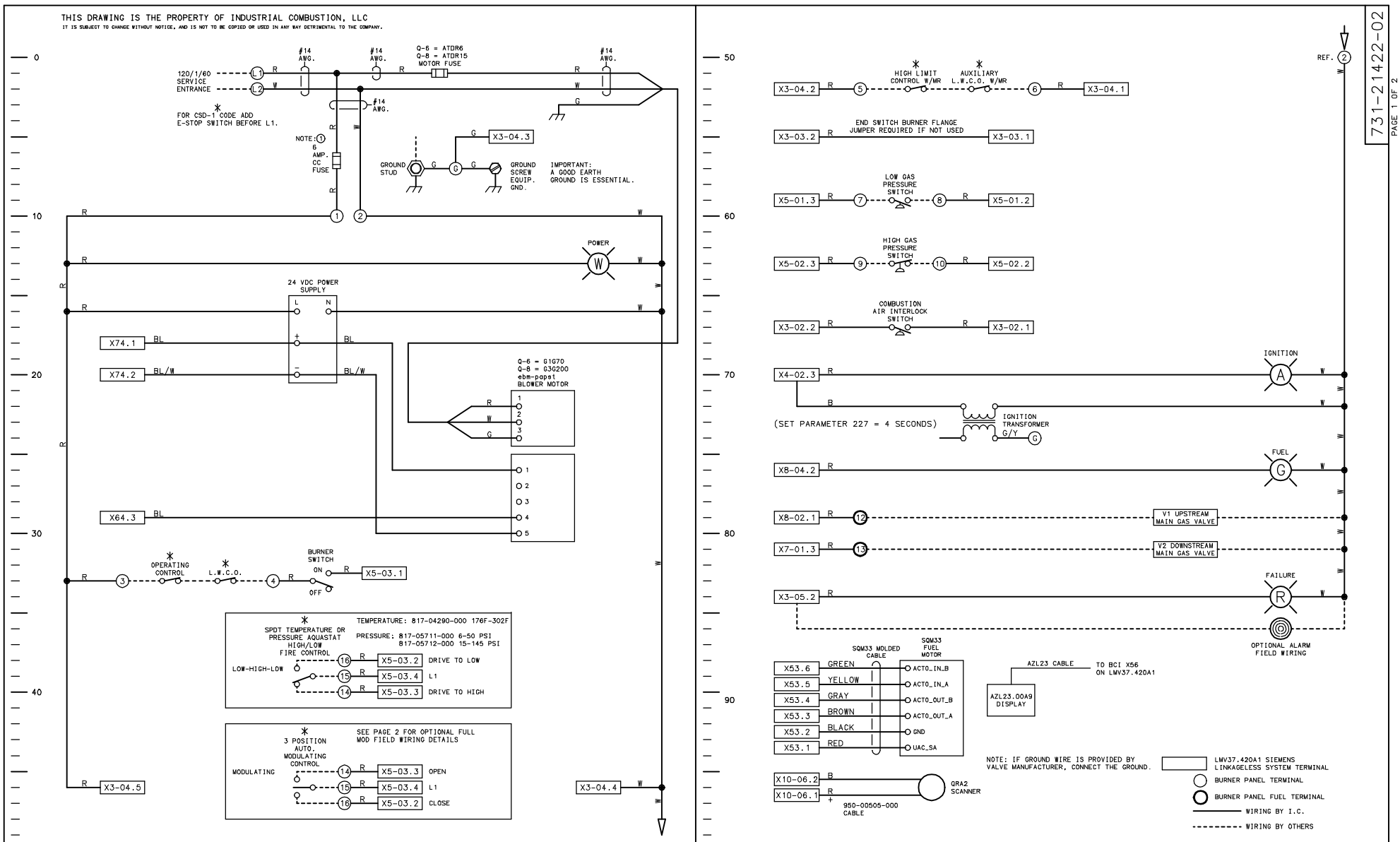


REVISIONS
11/02/12/21 DP ADDED TO SHOW MOD & LOW-HIGH-LOW CONTROLS.
02/25/21 DP ADDED FIELD WIRED ALARM DETAIL. CONTROL PARTS ADDED. RMF50 & RMF55 OPTIONS ADDED. WIRING DETAIL ADDED PAGE 2.

WIRE COLOR	SYMBOL
YELLOW	Y
ORANGE	O
RED	R
BLUE	BL
WHITE	W
BLACK	B

WIRE ALL CIRCUITS N.E.C. CLASS 1. NOT RESPONSIBLE FOR WIRING NOT INSTALLED AT THE FACTORY.

① SUPPLEMENTARY LOW OVERCURRENT PROTECTION ONLY. FUSE NOT LARGER THAN 6 AMPS.

731 21422

SCALE

DATE 01/12/21

DRAWN S.P.P.

* OPTIONAL EQUIPMENT NOT FURNISHED UNLESS SPECIFIED IN CONTRACT.

Q-6,8
LV-120/1/60
CC-120/1/60
UNLIMITED

INDUSTRIAL COMBUSTION

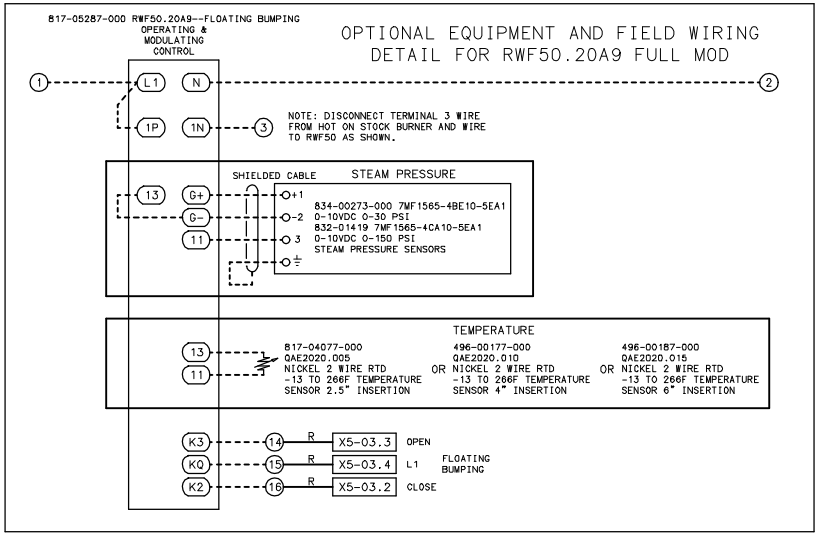
SIZE D | DRWG. NO. 731-21422 | 02

731-21422-02

PAGE 1 OF 2

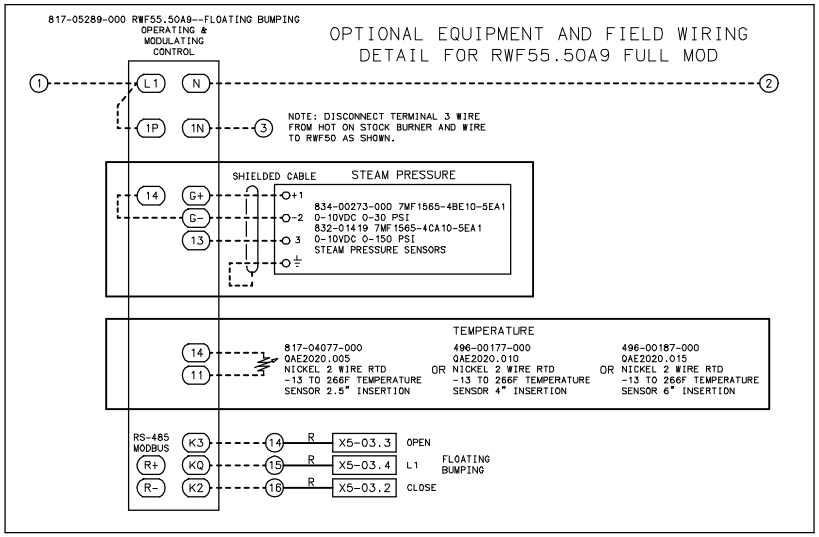
OPTIONAL EQUIPMENT AND FIELD WIRING DETAIL FOR RWF50.20A9 FULL MOD

817-05287-000 RWF50.20A9--FLOATING BUMPING OPERATING & MODULATING CONTROL



OPTIONAL EQUIPMENT AND FIELD WIRING DETAIL FOR RWF55.50A9 FULL MOD

817-05289-000 RWF55.50A9--FLOATING BUMPING OPERATING & MODULATING CONTROL



REVISIONS
11 02/12/21 DP ECN 1530 SHOW MOD & LOW-HIGH-LOW CONTROLS
12 02/25/21 DP ADDED FIELD WIRED ALARM DETAIL. CONTROL PARTS ADDED. RWF50 & RWF55 OPTIONS MAY USE WIRING DETAIL ADDED PAGE 2.

WIRE COLOR	SYMBOL
YELLOW	Y
ORANGE	O
RED	R
BLUE	BL
WHITE	W
BLACK	B

WIRE ALL CIRCUITS N.E.C. CLASS 1. NOT RESPONSIBLE FOR WIRING NOT INSTALLED AT THE FACTORY.

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* OPTIONAL EQUIPMENT NOT FURNISHED UNLESS SPECIFIED IN CONTRACT.

Q-6,8
LV-120/1/60
CC-120/1/60
UNLIMITED

INDUSTRIAL COMBUSTION

SIZE D | DRWG. NO. 731-21422 | 02

731-21422-02

PAGE 2 OF 2

Q SERIES

Installation, Operation, and Service Manual

for

Linkageless Full Modulation Burners

with UV Flame Detection

INDUSTRIAL COMBUSTION

NOTE: Separate modulating load controller required for operation.

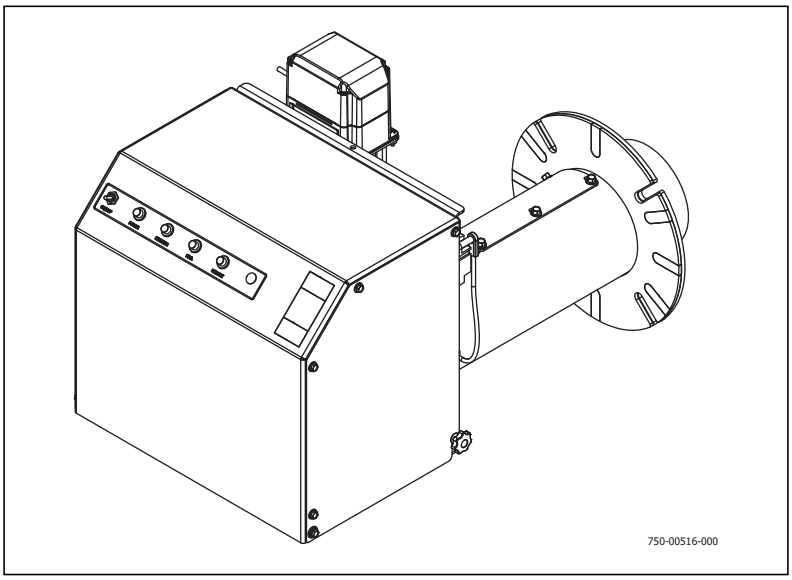
⚠WARNING

ONLY FACTORY AUTHORIZED BURNER SERVICE PERSONNEL SHOULD START UP, ADJUST, OR SERVICE THIS EQUIPMENT

IC-SA-1742
04/2021

Q SERIES

Linkageless Full Modulation Burner with UV Flame Detection



Manual Number: IC-SA-1742
Revision 04/2021-00

Information to be filled out by owner

Unit Serial Number:

Date of Installation:

Distributor Information

Name:

Address:

Phone Number:

Industrial Combustion
351 21st Street
Monroe, WI 53566
608-325-3141
ind-comb.com

INDUSTRIAL COMBUSTION

Q Series Installation, Operation, and Service Manual

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STARTUP/SERVICE REPORT

WARRANTY POLICY

PREFACE

It is the responsibility of the owner of this equipment to post and maintain a legible copy of this Installation, Operation and Maintenance manual while this equipment is in service.

Warning and caution references have been made in this manual and should be adhered to for smooth operation of the burner.

⚠ Warning

This symbol precedes information which, if disregarded, may result in injury to the user of the burner or to others.

⚠ Caution

This symbol precedes information which, if disregarded, may result in damage to the burner.

NOTE: This symbol precedes information which is vital to the operation or maintenance of the burner.

Model designations are based on the type of fuel(s) to be fired and the amount of furnace pressure to be overcome. Burner size is based on firing rate (rated input in Btu/hr).

Model Standards	Fuel
Q	Gas

The equipment must be installed in accordance with applicable local, state, or Provincial Installation Requirements including the National Electrical Code (NEC) and Associated Insurance Underwriters. Where applicable, the equipment shall be installed in accordance with the Provincial Installation Requirements, or in their absence, the Canadian Gas Association (CGA) B149.1 and B149.2 and Canadian Standard Association (CSA) B140 and B139 (for oil burners) Installation Codes shall prevail. Authorities having jurisdiction should be consulted before installations are made. Gas burning equipment shall be connected to flues having sufficient draft at all times to assure safe and proper operation of the burner.

Q Series burners are designed to burn gas only as defined by ASTM D396-2010 specifications.

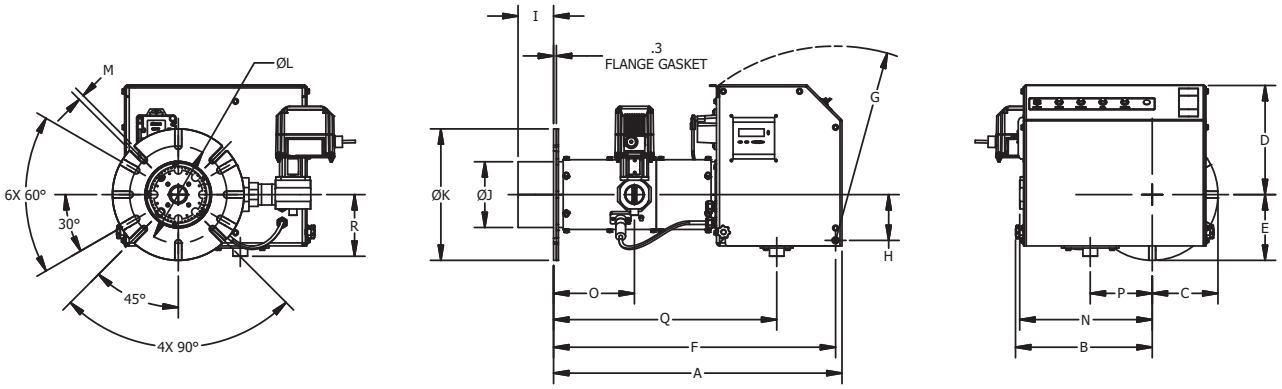
Q Series Full Mod Linkageless - Standard Specifications

Burner Model	Gas Input MBtu/hr	BHP @80% Eff.	Blower Motor HP	Furnace Pressure ("w.c.)	Air Inlet Orifice Size (in.)[7]	Minimum Gas Pressure Required in Inches Water Column, by Gas Train Pressure Rating and Pipe Size					
						1 PSI Inlet Rated UL Trains			10 PSI inlet Rated UL Trains		
						1.00"	1.50"	2.00"	1.00"	1.50"	2.00"
Q6-055	550	13	1/2	1.0	1.50	2.10	-	-	2.10	-	-
Q6-075	750	18	1/2	1.0	1.80	3.60	1.70	-	3.80	2.00	-
Q6-100	1,000	24	1/2	1.0	2.25	6.40	2.90	2.60	6.60	3.40	2.60
Q6-130	1,250	30	1/2	1.0	2.95	10.10	4.20	3.50	10.60	5.20	3.70
Q6-150	1,500	36	1/2	0.75	*	13.60	5.70	4.80	14.20	7.00	5.10
Q8-175	1,750	42	3/4	1.0	3.45	15.50	4.80	3.50	16.30	6.60	3.90
Q8-200	2,000	48	3/4	1.0	3.80	19.80	5.70	4.10	20.80	8.10	4.60
Q8-250	2,500	60	3/4	0.75	*	-	8.60	5.90	32.20	12.20	6.80

*Orifice not required

NOTES:

1. Gas input based on natural gas at 1,000 Btu/cu. ft. and 0.60 gravity.
2. For total pressure at manifold, add furnace pressure.
3. Boiler overall efficiency of 80% estimated.
4. Blower wheel and motor HP is based on altitude up to 2,000 ft. above sea level. For higher altitude or 50 Hz. applications, consult factory.
5. Firing at higher furnace pressures de-rates the burner by approximately 5% per 1/2" of additional pressure. Consult factory.
6. Blower motor power: 115V / single phase / 60 Hz
7. See spare parts list for orifice plate part numbers.



Q Series Full Modulation Linkageless Standard Dimensions

Accompanying dimensions are for layout purposes only.

		Burner Model	
	DIM	Q6	Q8
LENGTH IN INCHES			
Overall burner length	A	26.3	28.9
WIDTH IN INCHES			
Center line to left side	B	12.5	15.3
Center line to right side	C	6.0	7.0
HEIGHT IN INCHES			
Center line to top	D	10.0	11.9
Center line to bottom	E	6.0	7.0
HINGE PIVOT POINT IN INCHES			
Mounting flange to hinge	F	25.7	28.4
Hinge swing radius	G	17.7	20.6
Center line to hinge	H	4.2	3.9
BLAST TUBE DIMENSIONS IN INCHES			
Extension	I	3.3	3.3
Diameter	J	6.0	8.0
MOUNTING FLANGE DIMENSIONS IN INCHES			
Outer diameter of mounting flange	K	12.0	14.0
Bolt circle diameter	L	8.9	10.9
Mounting flange slot width	M	0.5	0.5
GAS INLET DIMENSIONS IN INCHES			
Center line to main gas inlet	N	12.1	13.1
Mounting flange to main gas inlet	O	7.4	7.4
BURNER SUPPORT			
Burner support to center line	P	5.7	5.0
Burner support to mounting flange	Q	20.4	24.8
Center line to support bracket	R	5.6	5.3

Q Series Spare Parts List

PART DESCRIPTION - COMMON PARTS	BURNER SIZE	PART NUMBER
Ignition Transformer	Q6 & Q8	832-04117-000
Light Indicator, White	Q6 & Q8	881-00136
Light Indicator, Red	Q6 & Q8	881-00137
Light Indicator, Green	Q6 & Q8	881-00138
Light Indicator, Amber	Q6 & Q8	881-00139
Air Switch	Q6 & Q8	836-01598-000
Electrode	Q6 & Q8	435-00709-000
Ignition Cable	Q6 & Q8	832-04118-000
Fuse, Blower Motor ATDR 6A	Q6	832-01161
Fuse, Blower Motor ATDR 15A	Q8	832-01168
Fuse, Control Circuit ATQR 6A	Q6 & Q8	832-01210

PART DESCRIPTION - BURNER MODEL PARTS	BURNER SIZE	PART NUMBER
Flange Gasket	Q6	853-02539-000
Flange Gasket	Q8	853-02540-000
Fan/Blower Unit	Q6	894-04076-000
Fan/Blower Unit	Q8	894-04111-000

PART DESCRIPTION - CONTROL COMPONENTS	BURNER SIZE	PART NUMBER
Display, Siemens	Q6 & Q8	833-05071-000
Cable, Display Siemens	Q6 & Q8	826-00315-000
Valve, Butterfly, w/Actuator	Q6	940-07580-000
Valve, Butterfly, w/Actuator	Q8	940-07598-000
UV Scanner	Q6 & Q8	994-15597-000

Q Series Spare Parts List Continued

PART DESCRIPTION - GAS TRAIN COMPONENTS	GAS TRAIN OPTION	PART NUMBER
Regulator, Maxitrol RV 1 1/2”	All Standard Pressure	817-00622
Valve, Gas Diaphragm 1 1/2”	All Standard Pressure	940-01090
Bleed, Used with Gas Diaphragm	Standard on All	940-01373
Valve, Gas Solenoid 1 1/2”	All Standard Pressure	235-00368-000
Ball Valves 1 1/2”	All Standard Pressure	941-00127
Regulator, Maxitrol RV 2”	All Low Pressure	817-00617
Valve, Gas Diaphragm 2”	All Low Pressure	940-01108
Bleed, Used with Gas Diaphragm	Standard on All	940-01373
Valve, Gas Solenoid 2”	All Low Pressure	235-00369-000
Ball Valves 2”	All Low Pressure	941-00128
Regulator, Maxitrol 210 1”	All High Pressure	817-00674
Valve, Gas Diaphragm 1”	All High Pressure	940-01103
Bleed, Used with Gas Diaphragm	Standard on All	940-01373
Valve, Gas Solenoid 1”	All High Pressure	940-01191
Ball Valves 1”	All High Pressure	941-00594
Gas Pressure Switch, High Ventless	Standard on All	817-00977
Gas Pressure Switch, Low Ventless	Standard on All	817-00876

PART DESCRIPTION - AIR INLET ORIFICE PLATE	BURNER SIZE	PART NUMBER
550 MBTU Burner (1.5” diameter)	Q6	059-11448-000
750 MBTU Burner (1.8” diameter)	Q6	059-11449-000
1000 MBTU Burner (2.25” diameter)	Q6	059-11450-000
1300 MBTU Burner (2.95” diameter)	Q6	059-11452-000
1750 MBTU Burner (3.45” diameter)	Q8	059-11457-000
2000 MBTU Burner (3.8” diameter)	Q8	059-11458-000
PART DESCRIPTION - DUCTED AIR INLET PARTS	**BURNER SIZE**	**PART NUMBER**
Instruction Drawing	Q6	880-06261-000
Ducted-Air Adapter, 4" ID	Q6	001-01680-000
Panel Side Plate With Ducted-Air Adapter Cutout	Q6	136-04096-000
Instruction Drawing	Q8	880-06262-000
Ducted-Air Adapter, 6" ID	Q8	001-01681-000
Panel Side Plate With Ducted-Air Adapter Cutout	Q8	136-04097-000

CHAPTER 1 Introduction

Q series burners are completely assembled, wired, and tested at the factory.

> **⚠ Caution**
>
> Only factory authorized burner service personnel should start up, adjust, or service this equipment.

The operator must be familiar with the individual functioning of all controls to understand the operations and procedures described in this manual.

1.1 — Description

Q-series full modulation units are forced-draft, direct-spark ignited, linkage-less burners controlled by an LMV37 programmer. They include safeguard functionality to insure the burner always returns to the ignition light-off position for startup.

The Q-series modulating burners provide 550 to 2,500 MBTU/hr (~13 to 60 boiler horse power) against furnace pressures of 0.75" w.c. or less (refer to burner specifications, page **v**). The Q6 has a 6" diameter firing head and can fire up to 1,500 MBTU/hr (~36 boiler horse power). The Q8 has an 8" diameter firing head and can fire up to 2,500 MBTU/hr (~60 boiler horse power). A field-installed air inlet orifice plate is required on Q6 burners firing below 1500 MBTU/hr and Q8 burners firing below 2500 MBTU/hr. See page **viii** for orifice plate part numbers.

Q series burners are designed for automatic unattended operation except for periodic inspection and maintenance. The control panel components require little attention except for occasional cleaning.

1.2 — Control Panel

The Q burner control panel has the control switch, status indicator lamps and LMV37 remote display mounted on the panel exterior. The LMV37 control base, power supply, fusing and terminal strips are mounted on a subbase inside the panel.

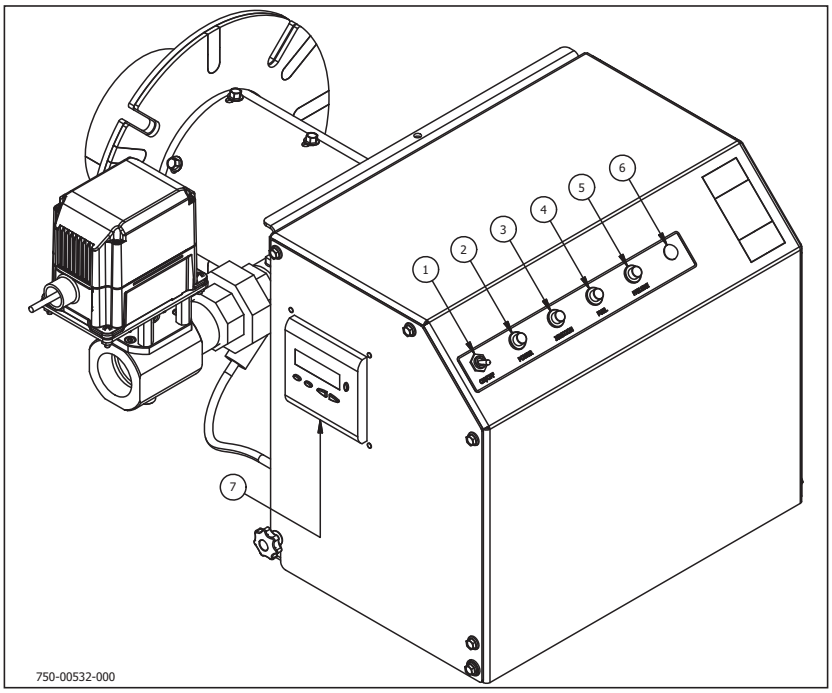


FIGURE 1-1. Control Panel

Item	Component	Details
1	On/Off Control Switch	Burner power switch
2	Power Light	White lamp; illuminates when the control circuit is powered
3	Ignition Light	Amber lamp; illuminates when the ignition transformer is powered
4	Fuel Light	Green lamp; illuminates when the main fuel valves are powered
5	Failure Light	Red lamp; illuminates when an LMV37 lockout fault occurs
6	Blank	Blank lamp port
7	Control Display	Control interface and status indicator

1.3 — Burner Control and Air Delivery

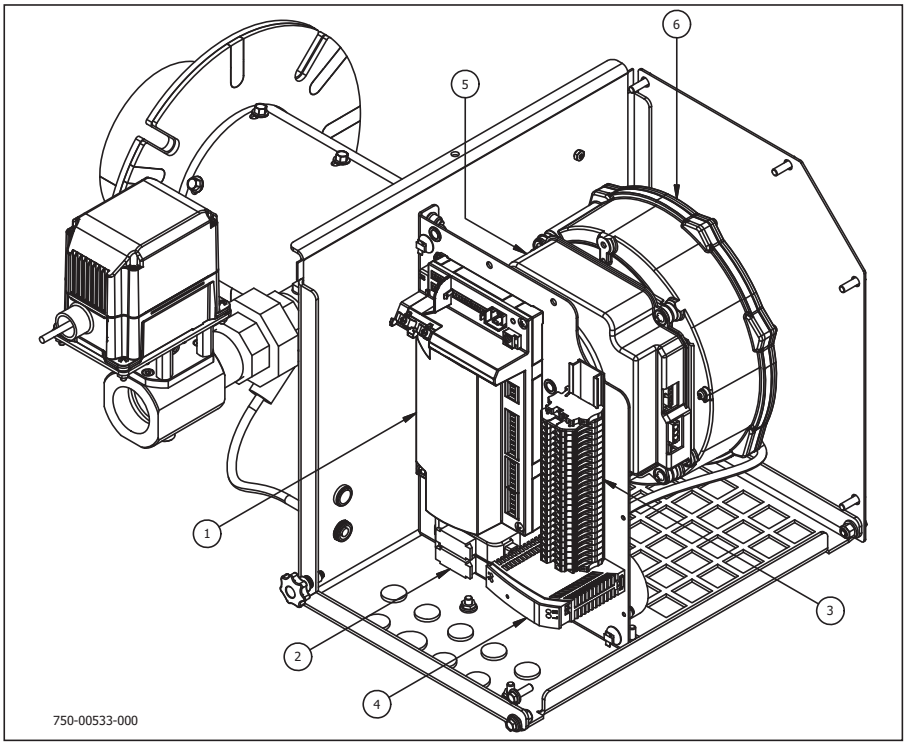


FIGURE 1-2. Burner Control and Air Delivery

Item	Component	Details
1	LMV37 Control	Combined flame-safeguard (FSG) and fuel-air-ratio-controller
2	Fuse holders	Motor and control circuit fusing
3	Terminal Strip	Field wiring interface
4	Power Supply	24Vdc for motor control speed input
5	DC modulation control	The unit is fully modulated in response to the command signal sent from the LMV37.
6	DC (EC*) motor-fan *Electronically Commutated	DC variable speed motor-fan unit with integral electronic controls. The unit is energized by 115VAC power input.

1.3.1 — LMV37 Flame Safeguard and linkage-less fuel-air-ratio controller

The LMV37 incorporates burner sequencing functionality; flame detection; variable speed drive (VSD) control and fuel-air-ratio control. Flame is detected by UV flame scanner. The LMV37 can modulate the burner from low to high fire with servo control of the fuel metering valve and VSD electrical connection to the blower motor to control fan speed (air volume).

⚠ Warning

Read the LMV37 manual and fully understand its contents before attempting to operate this equipment. Failure to do so may result in serious personal injury or death.

1.4 — Direct Spark System

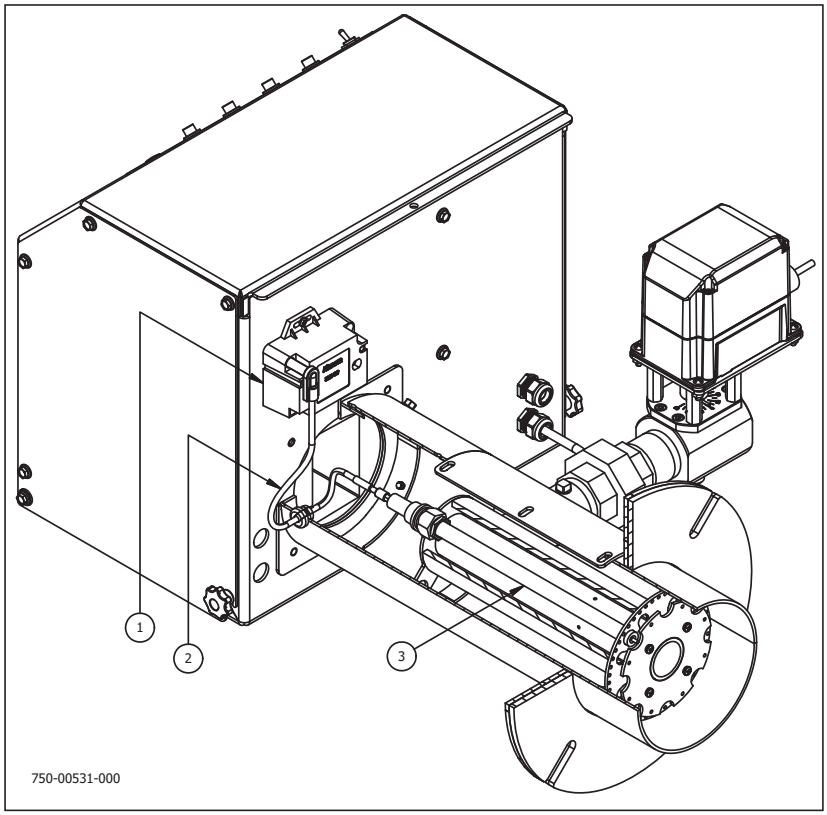


FIGURE 1-3. Direct Spark System

Item	Component	Details
1	Ignition Transformer	Step up secondary high voltage ignition transformer
2	Ignition Cable	25KV high tension ignition wire.
3	Igniter	ø1/8" electrode with quick connect

1.5 — Firing Head

Access to the firing head is provided by the side access panel.

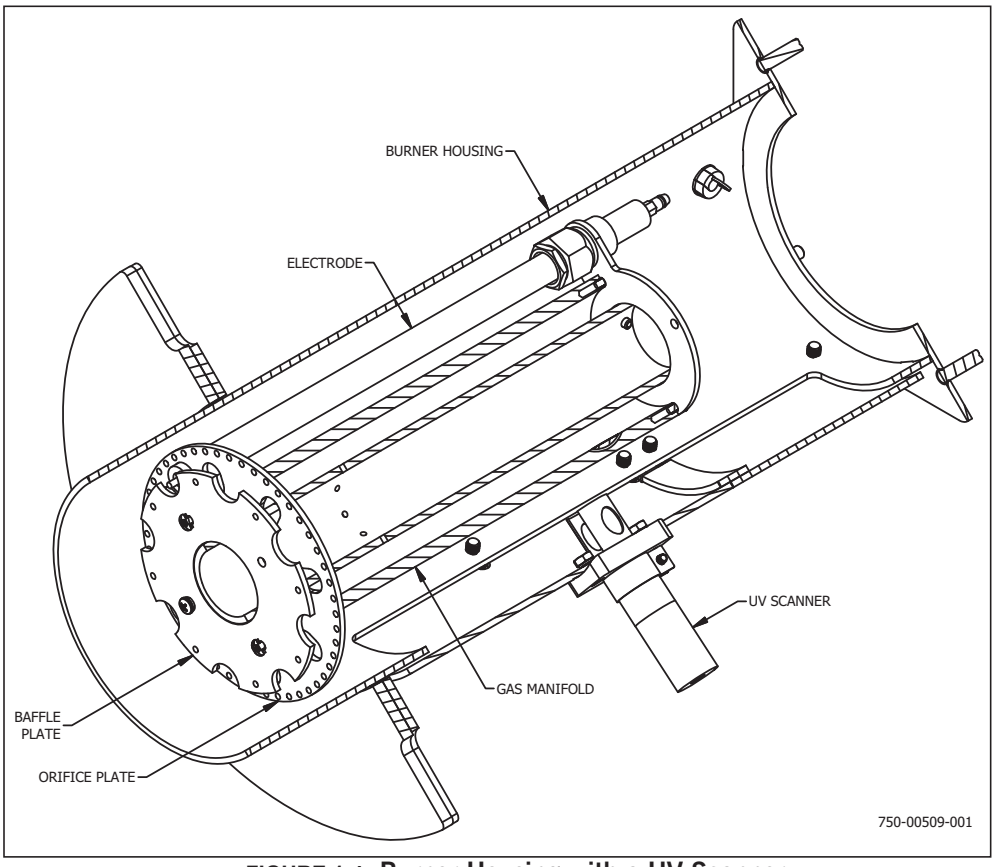


FIGURE 1-4. Burner Housing with a UV Scanner

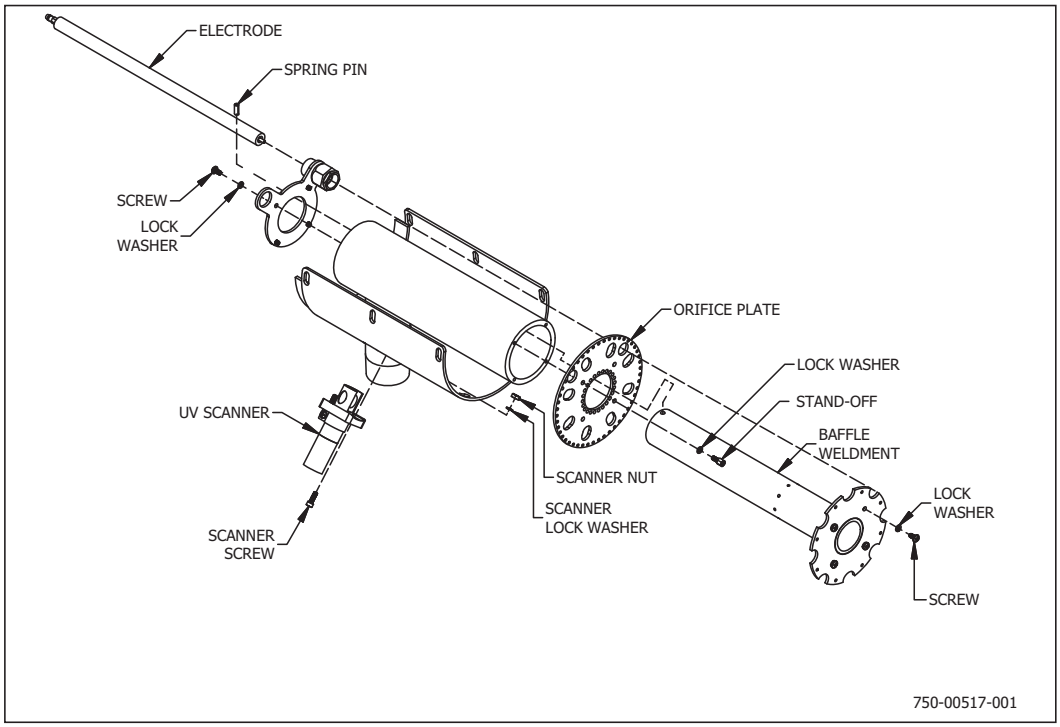


FIGURE 1-5. Burner Housing, Exploded View

INDUSTRIAL COMBUSTION

1.6 — Gas System

Gas is introduced into the combustion zone through multiple ports in the circular manifold. The full modulation burner's LMV37 controls both the combustion air and fuel metering: it meters the fuel in proportion to fan speed by adjusting the servo-driven gas metering butterfly valve.

Safety shutoff main gas valves are installed upstream of the gas-metering-butterfly valve and are controlled by the LMV37 to open and close at the proper time in the operating sequence. The Safety shutoff valve models may vary depending upon specific requirements.

1.6.1 — Main Gas Train Components

Depending upon the requirements of the regulating authority, the gas control system and gas train may consist of some, or all, of the following items:

Component	Description
Gas Metering Butterfly Valve	A servo-driven butterfly valve that controls the gas flow rate.
Gas Automatic Safety Shutoff Valves (SSOV(s))	Electrically operated safety shutoff valve(s) that open to admit gas to the burner. Standard U.L. burners include one diaphragm gas valve and one solenoid gas valve.
Gas Regulator	Regulates gas train pressure to specified pressure required at the inlet of the gas train. Input is set by the main gas pressure regulator adjustment.
Main Manual Gas Shutoff Valve	A manual gas shutoff valve located at the gas train inlet (upstream of the regulator).
Main Manual Leak Test Valve	A second manual gas shutoff valve located between the SSOV(s) and metering butterfly valve. It provides a means of testing for leakage through the SSOV(s).

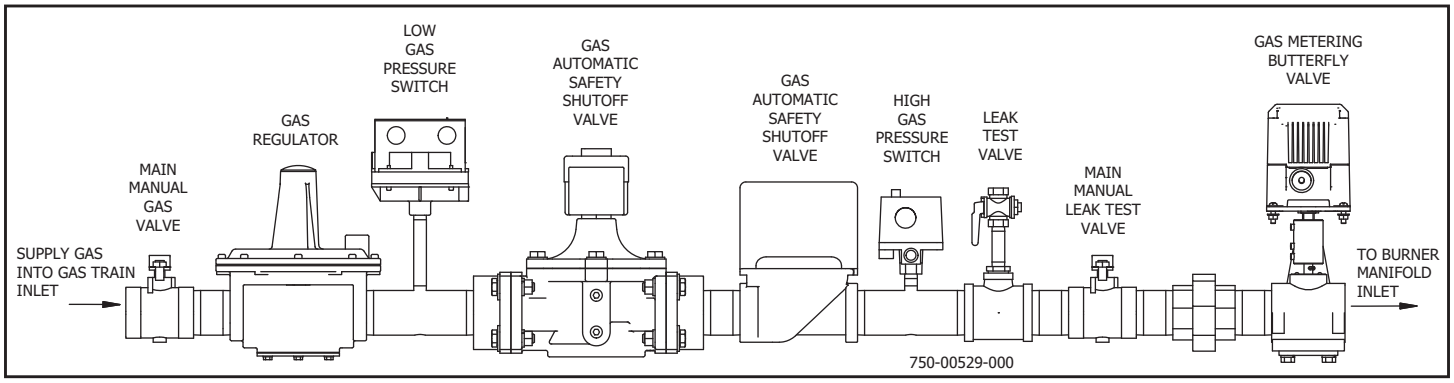


FIGURE 1-6. Main Gas Train for Full Modulation (Q6-055 to Q8-250)

1.6.2 — Typical Gas Operation

Upon a call for heat and before flame ignition, the LMV37 flame safeguard starts the combustion air fan and confirms the gas metering butterfly valve is in the low-fire position. When the combustion air switch proves sufficient air, the control opens the gas safety shutoff valves. Provided the gas supply is connected and manual cocks are open, gas then flows through the main gas train and gas metering butterfly valve into the burner gas manifold. The gas streams out of the manifold through the multiple ports of the orifice plate (see Figure 1-5) and mixes with the fan-fed combustion air.

The control then powers the ignition electrode and initiates flame. The UV scanner and control confirms flame presence and the burner progresses to main-flame operation. Main flame continues while flame is proven; the external limit switches confirm good operating conditions, and a call for heat exists.

During main flame, the LMV37 receives a modulation input signal from a separate modulating controller that directs the LMV37 to provide more or less heat. When the call for heat is satisfied, the LMV37 moves the gas metering valve to the low-fire position and deenergizes the safety shutoff valves thereby shutting down the combustion process. A post-purge period follows, and the heat exchanger is purged with air. After post-purge, the burner returns to standby mode.

CHAPTER 2 Installation

2.1 — Burner Requirements

Warning

Proper installation requires the following:

- **Sufficient air supply** - allow enough clearance at the bottom of the burner to allow the burner's fan to draw the high-fire air volume without difficulty.
- **A gas-tight seal** - for maximum safety, the burner/boiler mounting must be sealed to prevent the escape of combustion products into the boiler room. When properly installed, the burner mounting flange and flange gasket will provide this seal. Make sure the flange gasket is installed uniformly flat between the burner flange and the boiler front plate. When the burner flange is tightened to the boiler, the gasket should be consistently flat around the entire flange circumference; an improperly installed gasket will not provide a seal.
- **Proper burner support where needed** - the front plates on many boilers, including some Scotch Marine types, are not strong enough to support the burner's weight. The burner has provision for vertical support as detailed in Section 2.7.

2.2 — Factory and Field Wiring Overview

Electrical motor power and control circuit power are 115 volt, single phase, 60 cycle. Refer to the electrical schematic diagram shipped with the burner. The schematic is also attached to the inside of the control panel cover. Installer power connections are made at the control panel. Wiring from the panel to burner mounted components is completed at the factory. Field wiring from the burner panel to boiler controls, low water controls, and remotely located fuel valves is completed by the installer.

Caution

It is important to provide support for the panel cover when in the open position to prevent damage to the burner and enclosed components.

2.3 — Draft Conditions

Automatic over-fire draft control or barometric draft regulators are not usually required except where the system has a tall chimney. The exact height of a chimney requiring draft control is indeterminate, but draft regulation is seldom needed for chimneys less than 50 feet high, especially with Scotch Marine or sealed firebox boilers.

2.4 — Combustion Air Supply

The space in which a burner operates must be supplied with adequate fresh air for combustion and ventilation purposes. Fresh air supply must meet or exceed all code requirements. Consult with insurance carrier and/or local authorities for specific regulations.

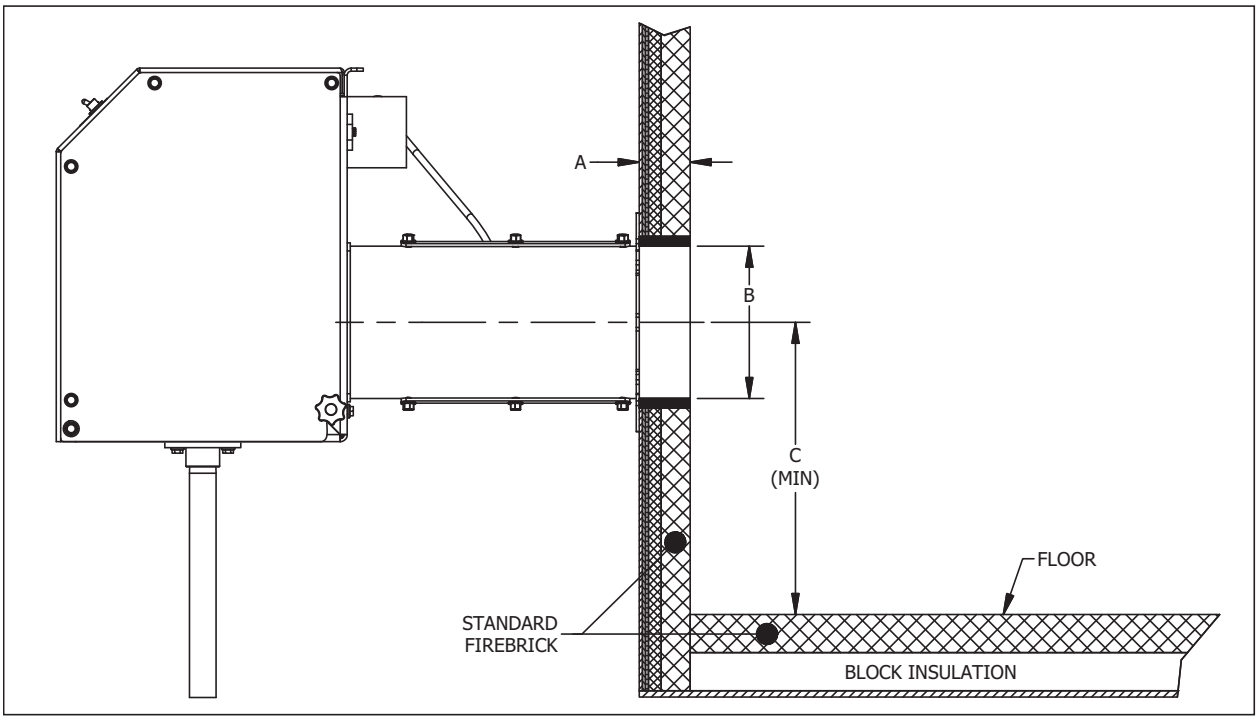
⚠ Warning

The boiler room pressure must be at least equal to the outdoor atmospheric pressure. Where fan ventilation is used, air must be forced into the boiler room. Never exhaust air from the boiler room. Adjoining areas having exhaust fans must be positively isolated from the boiler room.

2.5 — Combustion Chamber Recommendations

The combustion chamber dimensions should be adequately sized to prevent flame impingements.

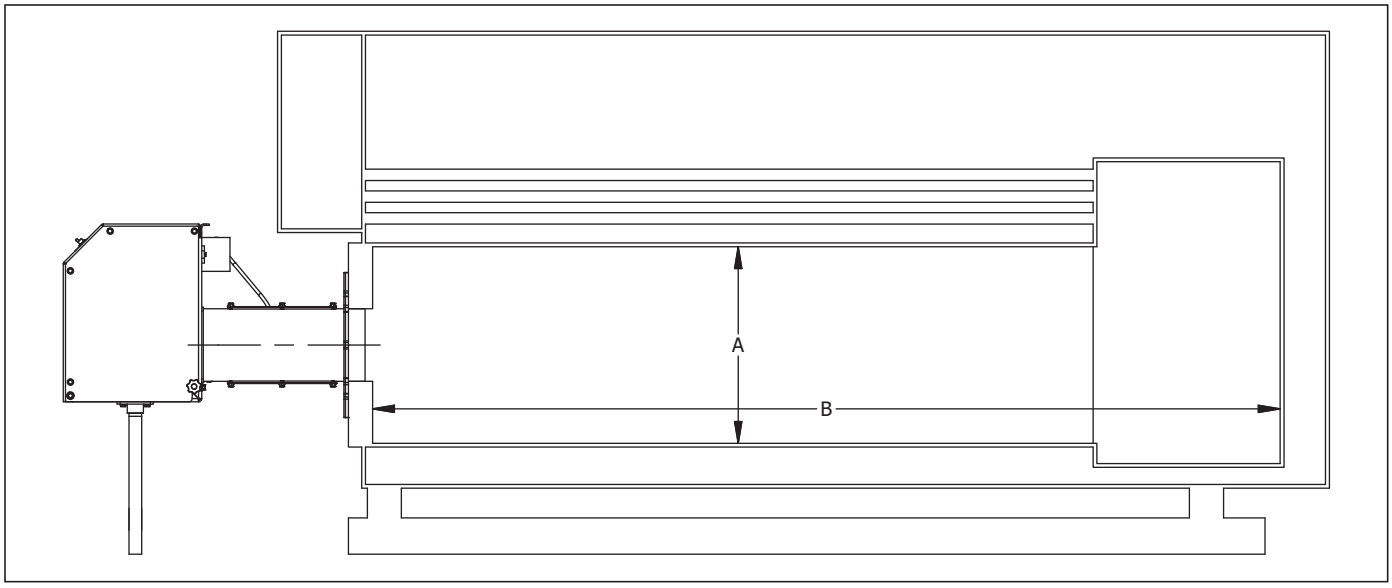
2.5.1 — Non-Firetube Applications



Burner Size	A (in.)	B (in.)	C (in.)	Combustion Chamber Min. Width (in.)	Combustion Chamber Min. Length (in.)
Q6-055	3.5	6	10	8	24
Q6-075	3.5	6	10	10	24
Q6-100	3.5	6	10	12	24
Q6-130	3.5	6	10	12	36
Q6-150	3.5	6	10	14	36
Q8-175	3.5	8	12	14	48
Q8-200	3.5	8	12	16	48
Q8-250	3.5	8	12	16	48

FIGURE 2-1. **Non-Firetube Combustion Chamber Dimensions**

2.5.2 — Firetube Applications



Burner Model	Boiler HP	A (in.)	B (in.)
Q6-055	13	8	24
Q6-075	18	10	24
Q6-100	25	12	24
Q6-130	30	12	36
Q6-150	36	14	36
Q8-175	42	14	48
Q8-200	50	16	48
Q8-250	60	16	48

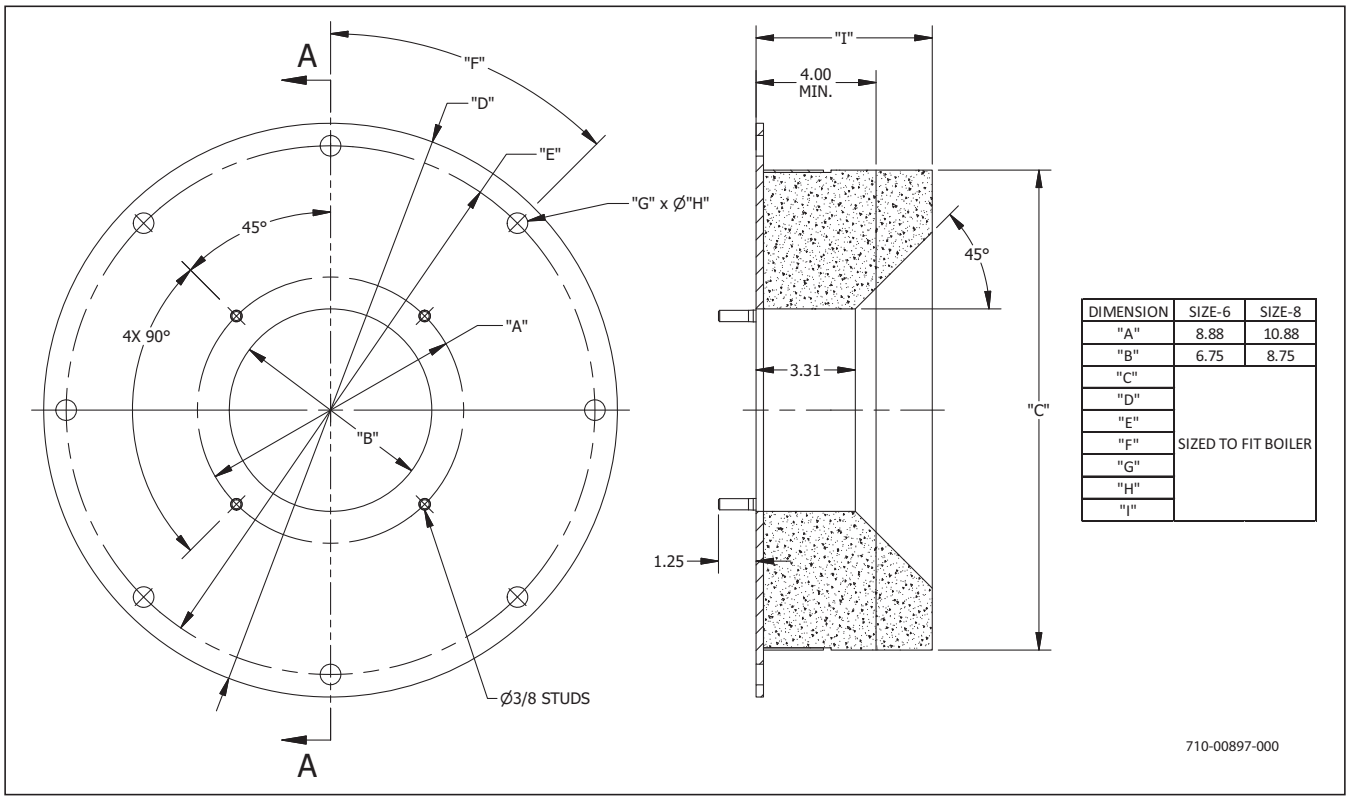
FIGURE 2-2. **Firetube Combustion Chamber Dimensions**

2.6 — Refractory Front Plate Requirements

A dry oven refractory is required only to protect surfaces not adequately protected by free circulating water. Basic objectives of refractory installation include:

- Provide adequate combustion space
- Avoid flame impingement
- Protect surfaces not adequately water cooled
- Seal openings

Insulation should be provided between the refractory and the boiler base. Mineral wool or other material not likely to settle is preferred. Insulation should be used between the refractory and front plate. Firebrick or insulating firebrick should be set in high temperature bonding mortar with provision for expansion. ***Refer to Figure 2-3 for refractory construction guidelines.***



DIMENSION	SIZE-6	SIZE-8
"A"	8.88	10.88
"B"	6.75	8.75
"C"	SIZED TO FIT BOILER	
"D"		
"E"		
"F"		
"G"		
"H"		
"I"		

FIGURE 2-3. Q Series Refractory Dimensions

⚠ Caution

To prevent leakage of combustion gases, the gasket must be resilient enough to seal any uneven areas between the burner and the front plate.

Prepare the boiler front plate and burner insertion as follows:

1. Determine burner mounting height. Locate and scribe a level horizontal centerline across the mounting face.
2. Locate and scribe a vertical centerline. Be sure stud locations line up where studs will have full support. If they don't, or if the opening is too large, a steel adapter plate, 3/8" minimum, may be welded or bolted in place. Suitable anchors should be provided to hold the refractory in place. The adapter plate must be properly sealed (using insulating rope gasket) to prevent leakage of combustion gases.
3. Insulate burner insertion as shown in Figure 2-4
   - Apply tack spray on the insert portion of the firing head that will be wrapped.
   - Wrap the insertion part of firing head with ceramic fiber blanket (Kaowool). The wrap should be installed such that it fills the 3/8" gap between the burner head outside diameter (OD) and the refractory internal diameter (ID).
   - Wrap the Kaowool with masking tape-this makes the assembly easier to insert into the refractory. The wrapped Kaowool must provide a snug fit between the refractory and burner head. Rework if there are gaps.
   - Trim off excess Kaowool.
   - Apply ceramic-fiber rigidizer to the exposed Kaowool lip (see figure 2-5). Protect/mask off the burner head so the rigidizer only contacts the Kaowool lip; do not allow rigidizer to contact any other part of the burner head.

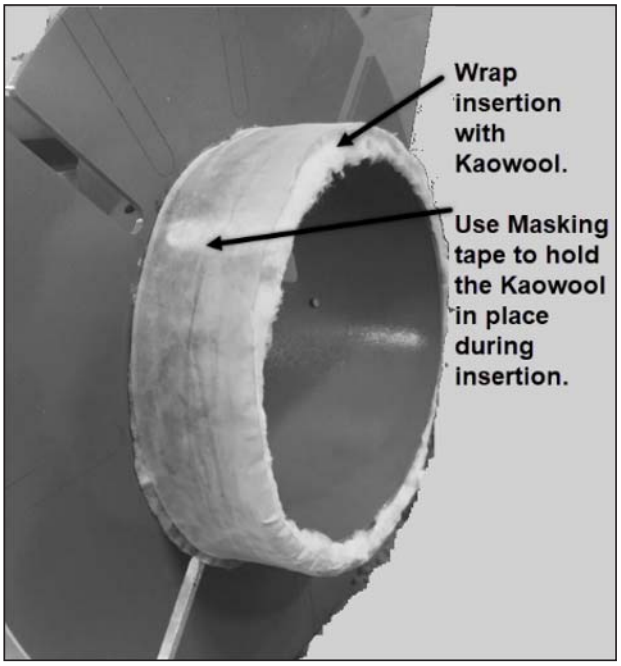


FIGURE 2-4. **Insulate Insertion**

Note: the tack spray and masking tape hold material in place while the burner is installed into the refractory. Following installation, heat exposure will burn away the tacking spray and masking tape.

4. Using insulating rope gasket, wrap the rope on the inside of the bolt circle, looping the rope around the mounting studs.Set the burner into position for mounting and tighten into place. Standard burners are equipped with a four-hole mounting flange.
5. Permanently support the burner using the pipe support connections.

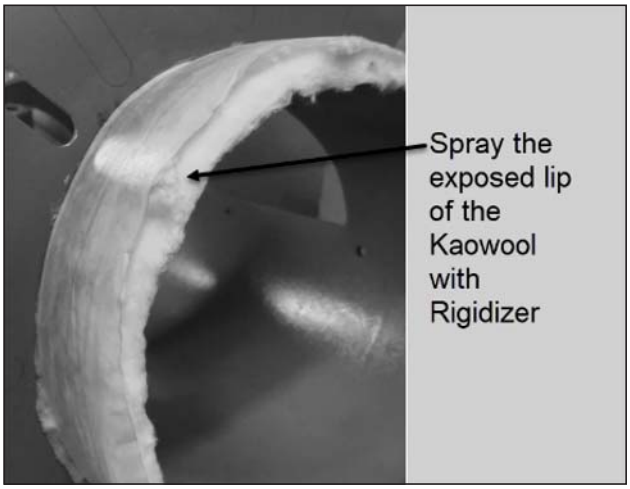


FIGURE 2-5. **Rigidize Exposed Lip**

2.7 — Support Bracket Installation

Once the burner is installed, it must be supported by a suitable weight bearing surface. The burner is designed to use the supplied support bracket kit number 880-06384-000. The bracket should be mounted to the burner with the kit-supplied hardware.

A 3/4” NPS pipe, supplied by others, may then be cut to length and mounted so as to provide vertical support to the burner.

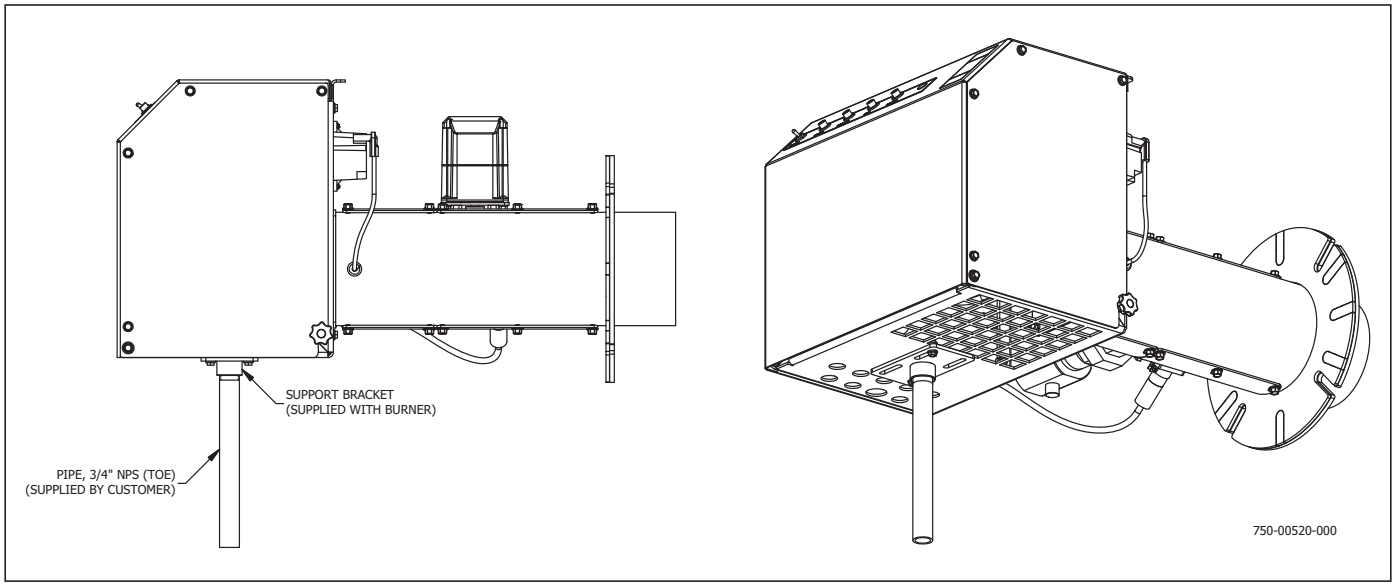


FIGURE 2-6. Support Bracket Installation

2.8 — Gas Piping

Gas service and house piping must supply the burner-required gas volume and pressure to the burner gas train inlet. All piping must be in strict accordance with applicable codes, ordinances, and regulations of the supplying utility. In the absence of other codes, piping should be in accordance with the following standards: “National Fuel Gas Code” NFPA No. 54, ANSI No. Z 223.1 (for Canada, the Canadian Gas Association (CGA) B149 and Canadian Standards Association (CSA) B140 codes shall prevail).

Full modulation gas train components upstream of the butterfly valve that are shipped loose should be mounted by the installer as close to the burner as practical. Normally, the gas train is ordered to suit a particular code or insurance regulation, such as Underwriters Laboratories Inc., CGA, or Factory Mutual.

Arrange gas piping to the burner so that the burner is accessible for servicing without requiring train disassembly.

The gas piping must be internally clean and free of foreign material. Before using in service, a leak test must be performed.

2.9 — Optional Ducted Combustion Air

An optional adapter port and slotted side panel allow combustion air to be ducted into the burner. The Q6 arrangement is a 4" OD inlet while the Q8 is a 6" OD inlet setup.

To equip the burner for ducted combustion air (item numbers refer to Figure 2-7):

- **Change the side cover**

1. Remove the cover lock-down thumb screw (Item 3).
2. Open the control cover (keep cover supported to prevent damage to it).
3. Remove the control panel side cover but retain the fasteners as they will be reused.
4. Install the slotted side cover (Item 2).
5. Replace the thumb screw (Item 3) to the position shown in Figure 2-7.

- **Install the air inlet adapter**

NOTE: If orifice plate required (Section 2.10) install between the blower and air inlet adapter.

1. Remove the (6) bolts from the fan-assembly inlet collar and air-pressure sensing line
2. Align the adapter (Item 1) and air-pressure sensing line bracket then replace and secure the 6 bolts. Use a medium thread locker such as Loctite Blue to assure secure retention.

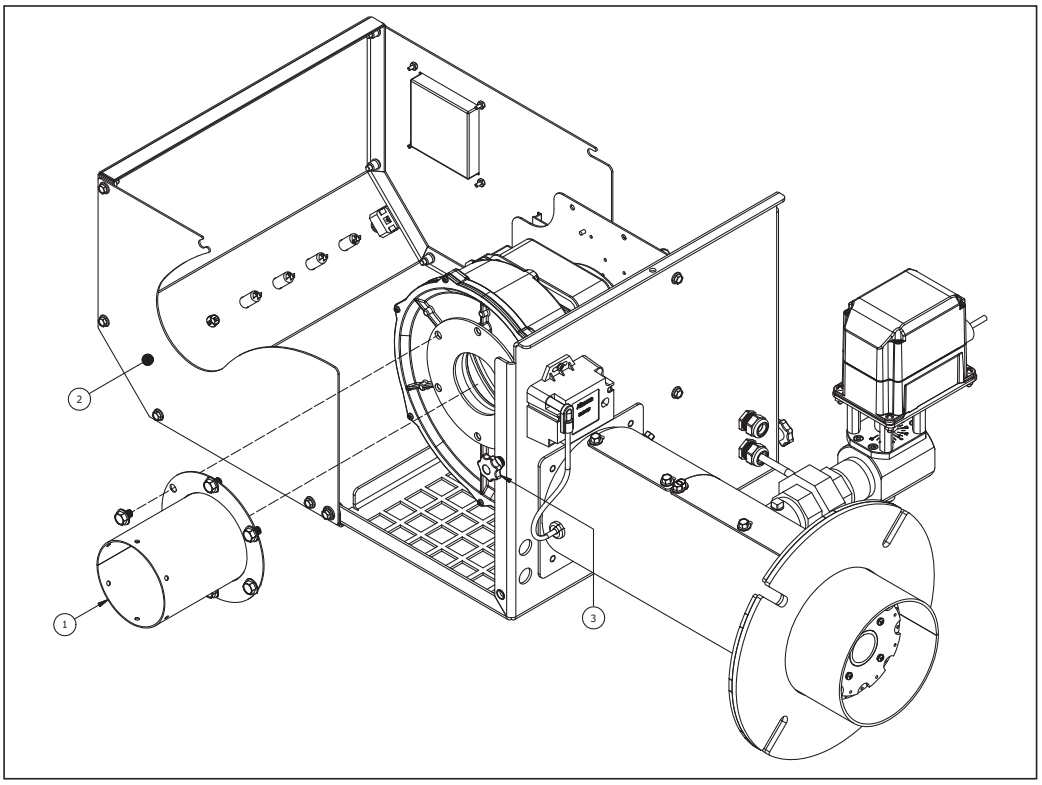


FIGURE 2-7. **Ducted Combustion Air**

INDUSTRIAL COMBUSTION

2.10 — Combustion Air Inlet Orifice Plate Installation

The Q burner size 6 and 8 use air-inlet-orifice plates to limit combustion air to the maximum firing rate needed with respect to an application. The Q6 has a maximum rating of 1,500,000 BTU/HR. When used for the maximum rate an air-inlet-orifice plate is not used. The same is true of the Q8 when used at its maximum rating of 2,500,000 BTU/HR. For other firing rates, the chart below identifies the air-inlet orifice plate required:

TABLE 2- 1. Air Inlet Orifice Plate Application

Model	Burner BTU/HR rating	Air inlet Plate Part Number	Orifice Diameter (in)
Q6	550,000	059-11448-000	1.50
	750,000	059-11449-000	1.80
	1,000,000	059-11450-000	2.25
	1,300,000	059-11452-000	2.95
	1,500,000	no orifice plate used	-
Q8	1,750,000	059-11457-000	3.45
	2,000,000	059-11458-000	3.80
	2,500,000	no orifice plate used	-

If an orifice plate is required, Install the provided plate to the blower assembly as shown in Figure 2-8 below. Remove the existing (6) bolts from the fan-assembly inlet collar and air-pressure sensing line. Align the plate and air-inlet sensing line then replace the (6) bolts. Use a medium thread locker such as Loctite Blue to assure secure retention.

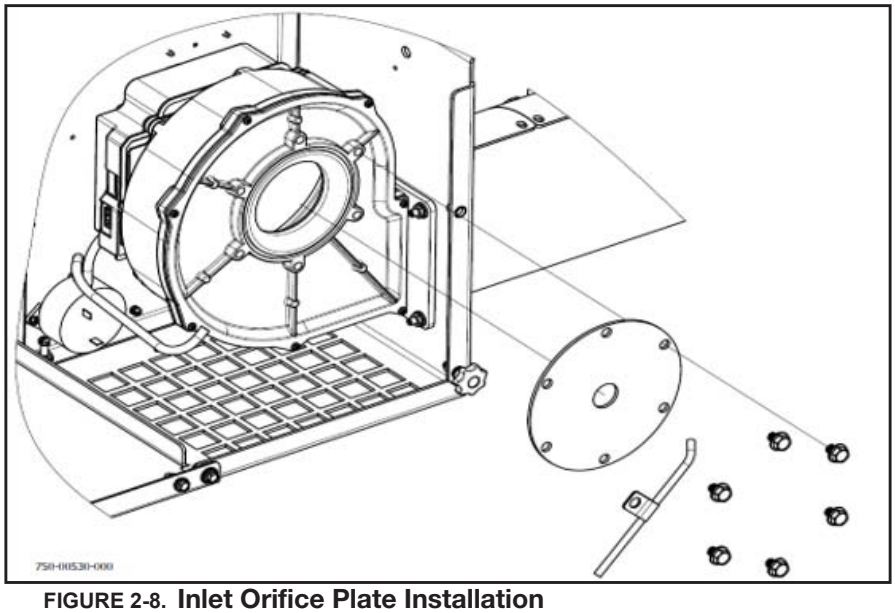


FIGURE 2-8. Inlet Orifice Plate Installation

2.11 — Installation Checklist

All burners are carefully assembled and tested at the factory, but before being placed in service, all connectors should again be checked for looseness caused during shipment.

Check:

- Electrical terminals in the control panel and on all electrical components.
- Pipe fittings, unions and tube connections.
- Nuts, bolts, screws.

Before connecting electrical power to any component, be sure the supply voltage is the same as that specified on component nameplates.

Before firing, make sure that the burner mounting flange is properly sealed to the boiler front plate.

It is the installer's responsibility to identify the main electrical power disconnect and the manual shut-off valve on the gas supply drop-line to the burner.

Make certain that the operator in charge is properly instructed in the operation and maintenance procedures.

⚠ Caution

Before opening the gas shutoff valves, read the regulator instructions carefully. Open the shutoff valve slowly to allow inlet pressure to build up slowly in the regulator until it is fully pressurized. Opening the shutoff valve quickly will damage the regulator.

Do not exceed the regulator pressure ratings.

CHAPTER 3 Operation

NOTE: ***Separate modulating load controller required for operation.***

3.1 — Preparations for Starting

The following items must be satisfied before any attempt is made to operate the burner:

- Electric, fuel, water, and vent stack connections are complete and all connections are confirmed tight.
- The operator is familiar with the boiler components and controls.
- The operator is familiar with the burner and understands: the burner components and controls (Chapter 1); the LMV3 sequence of operation; and the burner wiring to the boiler controls per the burner wiring diagram.

In addition, the following checks must be made:

Item	Check
Boiler	Boiler water level. Be sure all boiler valves are installed correctly and positioned properly. Set the high limit control slightly above the desired temperature. Set the operating control to the desired temperature or pressure. Set modulating controls at the desired temperature or pressure.
Burner	Check the electrical power supply to the burner in accordance with the nameplate voltage. Check the fuel control actuator for proper movement of the fuel metering valve. *Refer to the Siemens LMV3 manual for additional information.*

3.1.1 — Gas Supply

A representative of the gas utility should turn on the gas. Confirm sufficient pressure exists at the entrance to the gas train (use test gauge upstream of the burner regulator). The gas pressure regulator must be adjusted to the pressure required.

3.1.2 — Burner Settings

To ensure reliable and safe burner performance, the fan speed and gas settings must be checked and adjusted prior to placing the burner into initial service, or after conducting any service work that may have altered the settings. The modulating firing rate is controlled by a temperature or pressure sensor in conjunction with a controller capable of generating a 4-20 mA output signal (minimum 500-ohm impedance) or a floating bumping

circuit. For optimal efficiency, the controller used should be capable of PID load control. The purge rate, ignition position, minimum firing rate, maximum firing rate and fuel-air ratio throughout the firing range is determined by settings made in the Siemens LMV37 display. Refer to the Siemens LMV37 operation manual for further information.

3.1.3 — Combustion Settings

Fuel and air flow rates are individually adjusted at low fire and at high fire to achieve rated heat input, firing rate turndown, optimum efficiency, and safe operation. Refer to the nameplate inside the control panel for fuel input ratings and corresponding manifold pressures.

3.1.4 — Test Equipment

Combustion tests and pressure readings should be conducted on-site and typically requires equipment such as:

- Combustion analyzer with O2, CO2, and stack temperature indication.
- U-Tube manometer, or pressure gauge, to measure gas pressure.
- Manometer to measure draft pressures.
- Voltmeter/Ammeter.

⚠ Warning

Read the LMV37 manual and fully understand its contents before attempting to operate this equipment. Failure to observe this warning may result in serious personal injury or death.

3.2 — Burner Sequence Overview

Basic overview of the control's normal sequence of operation is provided herein. Refer to the LMV37 manual for additional sequence-of-operation detail and the burner-wiring diagram to a better understanding of how the boiler and burner limit devices impact sequence of operation.

3.2.1 — Normal Automatic Sequence of Operation

In automatic operation, the burner cycle proceeds through standby, pre-purge, ignition, main flame operation (released to modulate and load controller is driving the firing rate), post-purge and return to standby.

During main-flame operation, the burner firing rate is modulated by a load controller in response to the heat exchanger's pressure or temperature until the operating control* contacts open and end the call for heat.

*operating control contacts may be either an individual operating control device or in a controller which incorporates load controller capability.

The LMV3 operation should be tested when:

- the burner is initially placed into service;
- a control is replaced; or
- the scheduled maintenance program so indicates.

Normal automatic operation is detailed in Table 3.1 and the corresponding AZL indications are shown in Fig 3-1.

TABLE 3- 1. Normal Automatic Sequence Of Operation

Sequence	LMV37								Note
	Phase	Action	AZL DISPLAY						
			TEXT	INDICATOR					
				C	M	I	V	F	
Standby	12	Standby	OFF						No call for heat exists
Call for heat made	22	Fan motor on	Ph 22						Gas press. switches must be made to progress to ph24
	24	Air volume increased for pre-purge	Ph 24						
Pre-purge	30	Pre-purge	Ph 30 _XX						where XX = countdown timer in seconds
	36	Air volume adjusted for ignition	Ph 36						
Ignition	38	Ignition transformer energized	Ph 38						
Main fuel	40	Fuel valve	Ph 40						Ignition/main flame
	42	Ignition	Ph 42						
Delay before modulating	44	Interval 1 pilot stabilization	Ph44 _XX						where XX = countdown timer in seconds
Released to modulate	60	Operation (LMV37 responding to modulating control input)	oP: YY.Y						where YY.Y = % firing rate
Call for heat ends	62	Fuel and air adjust to the low-fire rate	Ph 62						
	70	After-burn time (confirms no flame)	Ph 70						
	72	Air volume is adjusted to the post-purge rate	Ph 72						
Post-purge	74	Mandatory post-purge time	Ph 74 _XX						where XX = countdown timer in seconds
	78	Optional post-purge time	Ph 78						User added time (via parameter)
Low-fire position	10	Home run (fuel actuator referencing)	Ph 10						Actuator self-check

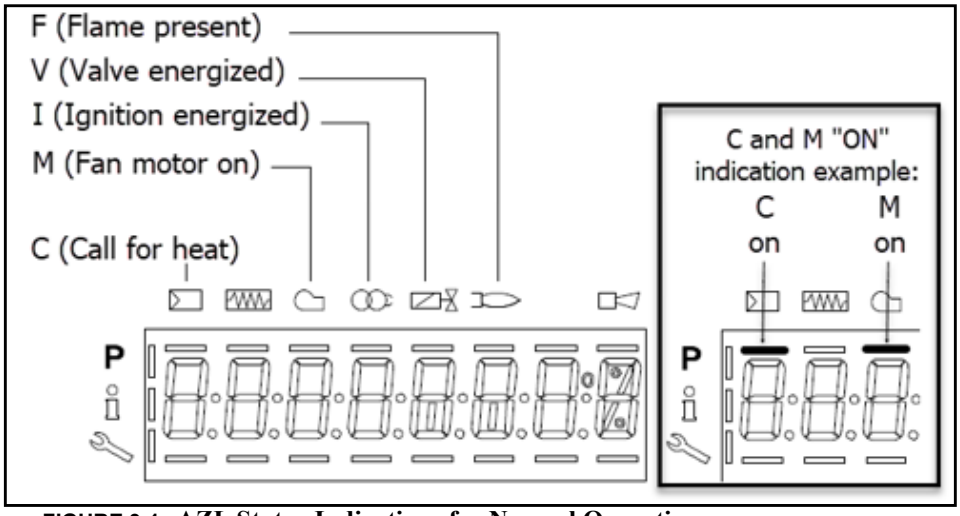


FIGURE 3-1. AZL Status Indications for Normal Operation

Note: In this manual, AZL display text is shown in brackets, e.g. “{OFF}.”

INDUSTRIAL COMBUSTION

3.2.2 — Standby

The burner is in standby and ready to respond to a call for heat when

- All power supply switches are closed and power is present at the control panel as indicated by the burner's illuminated white “power” light.
- The high limit control contacts are made. If the high limit has tripped (contacts open), it must be manually reset.
- The burner's On/Off control switch is in the “ON” position.
- The AZL displays {OFF}.

3.2.3 — Startup

While burner is standby/{OFF}, and when the operating pressure/temperature falls below the operating control set point the operating control contacts make/close. If all other devices in the limit string are made and the burner switch is ON, the control sees a “call for heat” and then sequences through startup as follows (commentary in italics)

{Ph22} = Fan motor on - *The burner energizes the fan*

{Ph24} = Traveling to pre-purge position - *Airspeed ramps up to high-fire air delivery rate*

{Ph30} = Pre-purge countdown timer (30 sec) - *Control confirms combustion air pressure is proven and then pre-purges the heat exchanger to rid it of any possible accrued flammable vapors. The control displays {Ph30 XX.X} where “XX.X” is the countdown in seconds.*

{Ph36} = Traveling to ignition position - *Airspeed and gas valve opening are positioned for ignition at the LMV's P0 position.*

{Ph38} = Pre-ignition Time - (ignition transformer ON) - *Direct spark transformer energizes the electrode*

{Ph40} = 1st Safety Time - (safety shutoff valves ON) - *Gas delivered to the combustion zone.*

{Ph42} = 1st Safety Time (ignition transformer OFF) - *Direct spark period terminates and flame presence confirmed.*

{Ph44} = Interval 1 - Flame stabilization

3.2.4 — Operation - Automatic Modulation

- The Control is in phase 60 and burner modulation is released to the load controller. The AZL presents {oP: YY.Y} where “YY.Y” indicates the percent firing rate.
- The “YY.Y” firing rate is typically proportional to the difference between the load controller's set point and the currently measured temperature or pressure value: large differences result in high firing rates with the firing rate diminishing as the measured value approaches the setpoint value.

3.2.5 — Automatic Shutdown

- When the call for heat is satisfied, the operating control contacts open and the LMV3 control enters phase 62 where it commands the airspeed and fuel valve position to the P1 low-fire position.

{Ph70} = The safety shutoff valves are de-energized/closed and the burner's "Fuel" lamp turns off.

{Ph72} = Traveling to post-purge position - Airspeed ramps up to high-fire air delivery rate

{Ph74} = Mandatory-post-purge time - High-fire air post-purges the heat-exchanger for the minimum-time requirement. The display shows {Ph74 XX.X} where “XX.X” is the post-purge countdown timer in seconds.

{Ph78} = Optional-post-purge time - Additional post-purge time can be added via parameter adjustment.

{Ph10} = Home Run Position. Following post-purge, the burner motor stops. The gas actuator positions to home which is the actuator's self-check of its optic position sensors.

- Burner returns to standby Phase 12, the AZL displays {OFF} and is ready for startup on the next call for heat.

Note: LOW WATER - If a low-water condition occurs, the burner shuts down as in “Automatic Shutdown**”** and the AZL displays {OFF}. When the water level is restored and the low-water safety device resets. Provided all other recycling limits are made and the burner switch is on, the burner will fire again when the operating control contacts make (receives a new “call for heat”).

3.2.6 — Manual Shutdown

To manually shut off the burner:

- Turn the burner switch to OFF. The burner shuts down as in “Automatic Shutdown.”
- When the burner displays {OFF}, close the gas train's shutoff and main leak-test manual valves.

Automatic operation can not resume until the operator has determined it is safe to operate the system and returns the gas valves to their open position and turns the burner switch to ON.

3.2.7 — Safety Shutdown

A **safety-loop failure** presents as an LMV3 error code 22 where the display alternates {Loc.c: 22} and {Loc.d: X} (“x” being a diagnostic code value). A flame failure (loss of flame signal) presents as an LMV3 error code 93 where the display alternates {Loc.c: 93} and {Loc.d: X}. Either open safety-loop or loss-of-flame-signal condition will cause the LMV3 to rapidly de-energize the safety-shutoff-fuel valves and the blower motor.

Shutdowns may result from motor overloading; low water; interruptions in either fuel or power supply; insufficient combustion-air-pressure; tripped circuit breakers; blown fuses; or other interlock devices.

A safety shutdown will illuminate the burner's red “FAILURE” light and (if so equipped) energize an audible alarm.

The failure's root cause must be determined and corrected before any attempt is made to restart the burner.

Gas pressure fault - If a high or low gas pressure condition occurs during burner operation, the burner shuts down as in “Automatic Shutdown.” The AZL presents a fault indication and error code 20 condition by alternating {Loc.c: 20} and {Loc.d: X} in the display. The pressure condition must be corrected and the respective gas pressure switch is manually reset before attempting a burner restart.

Reference the “LMV Troubleshooting” section duplicated in this manual for additional “{Loc. C}” error code and “{Loc.d}” diagnostic information.

3.3 — Gas Pressure Regulator Setup

To determine the initial pressure setting of the gas pressure regulator (for gas trains consisting of a regulator and two safety shut off valves) a good rule of thumb is to adjust the regulator set point to twice the high fire manifold pressure. If using a Siemens gas train, with the regulator being the last component before the gas metering butterfly valve, set the regulator set point to 1.5 times the high fire manifold pressure. Fuel/air ratio curve setup may then proceed.

TABLE 3- 2. Burner Manifold Pressure*

Burner	MBH	Manifold Pressure (“WC)*
Q6	550	0.65
	750	1.00
	1,000	1.70
	1,300	2.25
	1,500	3.10
Q8	1,750	2.30
	2,000	2.50
	2,500	3.50

*Excludes furnace pressure. Add furnace pressure to determine total manifold pressure for your specific application.

3.3.1 — Regulator Spring Selection

After determining the pressure setting as described above, use Table 3.3 to select the appropriate regulator spring.

TABLE 3- 3. Regulator Spring Selection

SPRING COLOR	PRESSURE RANGE (“WC)
Brown	1.0 - 3.5
Plated	3.0 - 6.0
Pink	3.0 - 8.0
Blue	5.0 - 12
Red	10 - 22

Where possible, spring selection should be made so that the pressure setpoint falls within the upper 50% of the spring range. For example, for a setpoint of 5.0”, the Plated spring (3-6” range) is preferable to the Pink spring (3-8” range).

3.4 — Gas Train Leak Test

Note: In this section, AZL display text is shown in brackets, e.g. “{OFF}.”

A gas safety shutoff valve leak test (Bubble Test) must be performed prior to any initial commissioning or subsequent maintenance of the burner and gas train system. This test should be performed periodically to ensure no leakage of valves in their closed or de-energized position (refer to the valve manufacturer's procedures). The unit should be taken out of service if the unit fails any part of the gas valve leak test. Any defective part must be replaced prior to putting the equipment back into service.

Refer to Figure 3-2 when following this procedure:

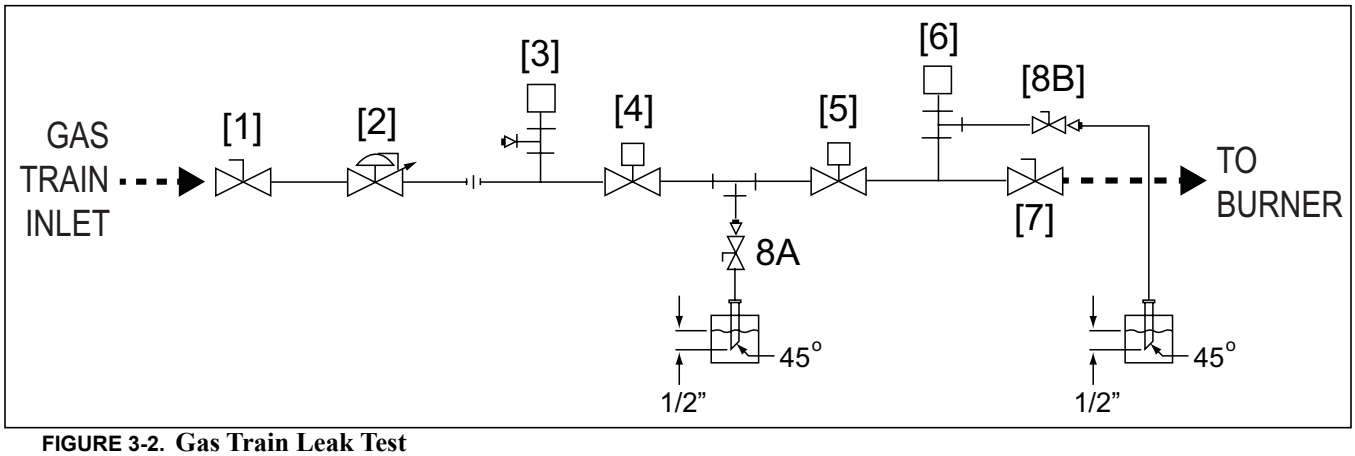


FIGURE 3-2. Gas Train Leak Test

⚠ Caution

Before opening the manual gas shutoff valves, read the regulator instructions carefully. Open the shutoff valve slowly to allow inlet pressure to build up slowly in the regulator until it is fully pressurized. Opening the shutoff valve too quickly will damage the regulator.

Do not exceed the regulator pressure ratings.

NOTE: for V48A equipped gas trains see 4.2.1 for additional information.

3.4.1 — Leak Test Procedure

Fill the gas train for leak testing (burner will go through startup with the blower running, but the burner is not intended to be fired at this time as the closed leak-test valve blocks gas to the burner).

1. CONFIRM BURNER IS READY FOR LEAK-TESTING THE GAS TRAIN:

- Set burner control switch to OFF position.
- The AZL displays {OFF}
- CLOSE the main leak test valve [7] entirely.
- Minimize the chance that gas pressure switches will interfere with the initial setup:
  Set the low gas pressure switch [3] to the lowest setting.
  Set the high gas pressure switch [6] to its highest setting and press its reset.

NOTE: gas pressure switches will be tested and set following the LMV37 commissioning and tuning.

- Set the operating control so burner will run when the burner switch is turned ON.
- Partially open the manual shutoff cock [1].
- Reset the low gas pressure switch if required

2. TURN THE BURNER SWITCH ON.

If the burner blower does not start:

If the display continues to show {OFF} with the burner switch ON, then close the manual shutoff cock [1]. Troubleshoot the limit circuit and correct the situation so that the AZL “Heat request from controllers” LCD bar beneath the icon turns solid with when the burner switch is turned ON. Repeat from Step 1.

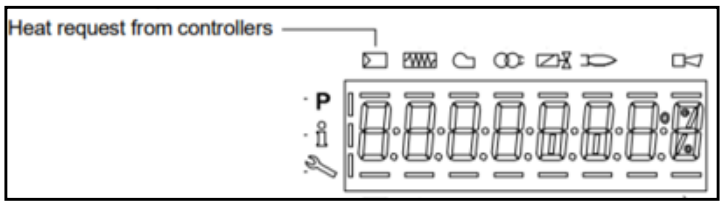


FIGURE 3-3. **Request for Heat**

If the burner blower starts:

The burner will progress and display the following stages:

{Ph22} = Fan motor on
{Ph24} = Traveling to pre-purge position
{Ph30} = Pre-purge countdown timer (30 sec)
{**Ph36}** = Traveling to ignition position
{Ph38} = Pre ignition Time
Burner light off attempt at factory P0 setting
{Ph40} = 1st Safety Time (ignition transformer ON)
{Ph42} = 1st Safety Time (ignition transformer OFF)
{Ph44} = Interval 1

As the closed leak test valve [7] is blocking fuel delivery, the LMV37 will not detect flame during its trial for main flame and will safety shutdown with the burner panel's red failure light illuminated. The LMV3 safety shutdown should de-energize/close both safety shutoff valves [4] and [5]. If a safety-shutoff valve fails to close, close the manual shutoff valve [1]. Do not proceed further until you correct the problem. If [4] and [5] closed, pressurized gas should be trapped between [4] and [7] and you may proceed to the next step.

3. LEAK TEST THE DOWNSTREAM SAFETY SHUTOFF VALVE [5].

Release the gas trapped between and main gas safety shutoff valve [5] and manual cock [7] by opening the leak test cock [8B]. After the trapped gas has been vented, continue to perform a bubble test for any leakage through the safety shutoff valve [5]. Bubbles will appear if gas is leaking past [5]. If bubbles continue, close the main shutoff valve [1], correct the valve [5] problem and retest 10 times before proceeding. If no leak, close test cock [8B] and continue to the next step.

4. LEAK TEST THE UPSTREAM SAFETY SHUTOFF VALVE [4].

Release gas pressure at test cock [8A] and bubble test for any leaking through auxiliary safety shutoff valve [4]. If you do not observe a leak, close test cock [8A] and go to the next step. If safety shutoff valve [4] leaks, correct the problem and retest 10 times before proceeding.

Procede only when it is established there are no gas leaks.

5. RESET MANUAL VALVE OPEN/CLOSE POSITIONS BEFORE RESUMING NORMAL OPERATION.

Confirm:

- Manual-leak test valves [8A] and [8B] are closed.
- All safety shutoff valves are operating normally.
- Confirm manual cocks [1] and [7] are open.

3.5 — Combustion Emissions and Efficiency

The Q burner should be tuned so combustion results match the respective firing rate range in Table 3- 4:

TABLE 3- 4. Emissions Guidelines

Firing Rate	O_2	Excess Air	CO_2 Natural Gas	CO_2 Propane
HIGH FIRE	3.0	15.0	10.0	11.7
	3.5	18.0	9.6	11.5
	4.0	21.0	9.4	11.2
MID FIRE	4.5	24.5	9.1	10.8
	5.0	28.1	8.8	10.4
	5.5	31.9	8.5	10.0
LOW FIRE	6.0	35.9	8.3	9.8
	6.5	40.3	8.0	9.5
	7.0	44.9	7.7	9.2
	8.0	55.6	7.5	8.5

3.5.1 — Carbon Monoxide

⚠ Warning

Carbon Monoxide is a colorless, odorless toxic gas resulting from incomplete combustion of gas. It can kill quickly with no warning.

Know the signs: *headaches, nausea, dizziness, breathlessness, collapse, loss of consciousness.*

Carbon Monoxide Parts per Million (PPM) values should be kept to a minimum; it is reasonable to expect attainable levels below 50 PPM. Certain heat exchanger characteristics such as furnace dimensions, vessel construction, etc., can make low CO difficult to achieve; consequently, continued attention to levels is advised. Most codes limit permissible CO amounts to below 400 PPM.

3.5.2 — Efficiency and Stack Temperature

A high net stack temperature indicates wasted heat. Net stack temperature is obtained by subtracting the ambient air temperature from the flue gas temperature. Stack temperature should be as low as possible without causing flue gas condensation.

Stack heat loss can be reduced by (a) decreasing stack temperature through improved heat transfer or (b), decreasing the flue gas volume by decreasing excess combustion air. A certain amount of excess air is necessary to complete combustion. See Table 3- 4 for excess air guidance.

Stack temperatures vary by system type but in clean, well-tuned vessels you may expect the following:

Hot Water Vessels: Stack temperature is typically 75-100° F above the water temperature.

Steam Pressure Vessels: Consult saturated steam tables to determine approximate stack temperature. Stack temperature is normally 75 to 100°F over the saturated steam temperature. As an example, a 10 psig low-pressure steam system at 80° F ambient air, can indicate a stack temperature of approximately 320°F. A 125 psig system under the same conditions increases the stack temperature to approximately 453°F.

3.6 — LMV3 Settings

This section guides you through adjustment of the fan speed and gas valve setting for the LMV3's ignition point, P0, and the low to high-fire points P1 through P9. A combustion analyzer is required. A pen and paper should be on hand to keep a written record of the settings. Final setting values should be recorded in the startup service report found at the back of this manual.

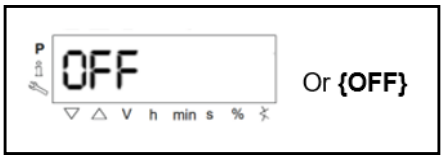
Warning

The Q burner LMV3 has ignition point P0 and fuel-curve points P1 through P9 entered in the control. These points, however, must be adjusted to the specific application the burner is being installed on. If reasonable care is not taken to tune combustion points to the application, hazardous combustion conditions may result.

Note:
Read Section 3.6 in its entirety before making any adjustments.

The burner status is presented via the AZL and burner panel indication lights. Figure 3-4 shows how certain AZL indications are also indicated by the burner panel lights:

Display Representation - In this section, text on the AZL display is shown either graphically OR as text enclosed in French brackets (example below).



Or **{OFF}**

Button References - The AZL panel has five buttons. This section uses parentheses to reference their single and combinational use as follows:

(F), (A), (-), (+), (↵ enter), (reset)
(ESC / - & +) = pressing **(-)** and **(+)** buttons simultaneously and,
(VSD / F & A) = pressing **(F)** and **(A)** buttons simultaneously.

Manual Lockout - In the case of an emergency, the installer can manually lockout the LMV3 by simultaneously pressing **(↵ enter)** in combination with any other button. Following lockout, the AZL will display **{Loc:c: 167} {Loc:d: 2}**. Press **(reset)** until **{rESET}** appears.

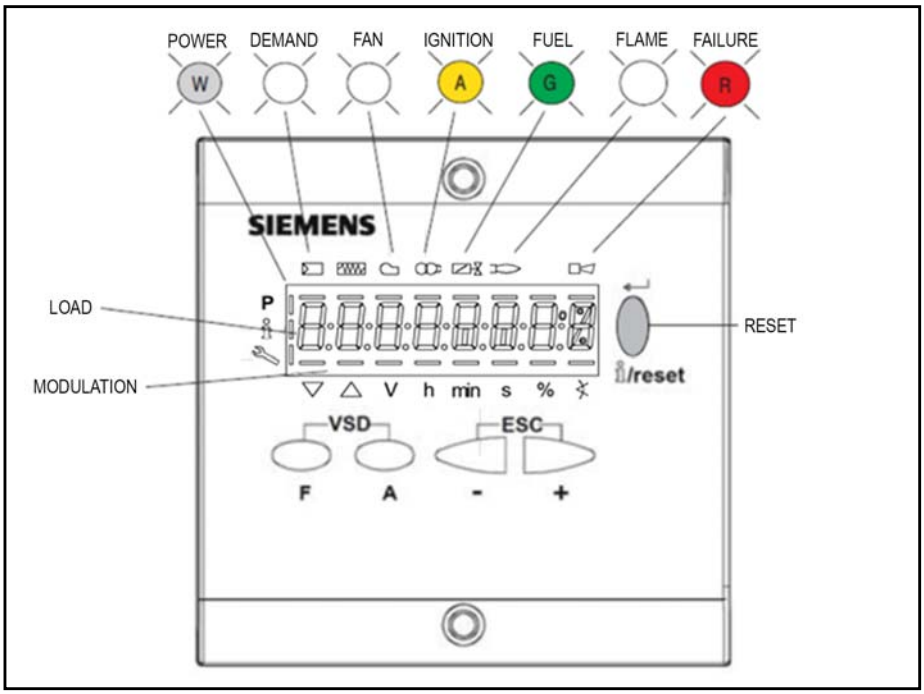


FIGURE 3-4. AZL Display

3.6.1 — Password Entry / Login

With power on (panel's white indicator is illuminated) and Burner switch in the OFF position, the control displays:

{OFF}

Reset any errors by holding the (reset) button for 1 to 3 seconds. To access LMV3 parameters, you'll need to enter the password “YYYYY”.

Press and hold (VSD / F & A) until the control displays:

{CodE}

The display then changes and appears with a flashing bar at the bottom left and is ready to accept password entry:

The **(-)** and **(+)** buttons will scroll the AZL through its character set. To enter the first “Y” of the password, press **(-)** once; a blinking Y should appear:

Press **(↵ enter)** to accept the value. The display cursor position advances to accept the second character:

Press **(-)** then **(↵ enter)** four more times to enter "Y" five times; the sixth underscore will be flashing following entry of the fifth "Y":

Press **(↵ enter)** to enter the password. A successful login will briefly display

{PArA}

followed by:

{400: SEt} "400" flashing

An incorrect entry attempt will display:

{Error} then **{OFF}**

If the attempt fails, repeat the steps from the beginning of this section.

Note: The following conditions will exit you from AZL parameter entry (log out):

- Power to the LMV3 is disconnected or cycled.
- The AZL is unplugged from the LMV3.
- Timeout (AZL inactive for a time period greater than parameter 127 setting).
- While in a parameter group with **{X00: SEt}** (X = 1,2,3 etc.), hold **(ESC / - & +)** until **{CLr CodE}** displays.

To regain access after a log out, repeat the password entry steps.

3.6.2 — Initial Fuel-Curve Point Adjustments

Notes:

- You must be password entered to make changes to curve point values.
- The gas and air set values presented in this instruction are for example only.
- Air-fan speed is adjusted with the (VSD / F & A) buttons.
- Gas-valve actuator position is adjusted with the (A) button.
- Confirm curve-point emissions are within expected ranges per emission table 3.3 in section 3.6

⚠ Warning

Although the burner was fire tested at the factory, be certain to check fuel valve actuator coupling for tightness before making any adjustments to fuel or air. Be certain the valve is fully closed when the control indicates “0” degrees open.

⚠ Caution

- The installer is responsible to ensure that safe fuel-to-air ratios are being maintained.
- If an AZL (+) or (-) button is held continuously when adjusting an actuator position value, the value will change at a progressively faster rate.
- When increasing a setting, increase air and follow with fuel.
- When decreasing a setting, lower fuel first and then air.

⚠ Warning

Rapid temperature changes to the heat exchanger can cause major damage due to thermal shock.
It is imperative when starting a cold vessel for the first time the vessel be warmed slowly, either by allowing the burner to cycle for intermittent periods or leaving at low fire. This should be done until the vessel is up to normal operating conditions.

A) Access parameter set 400

If the control displays

{400: SEt} **“**400**”** flashing

then go to **B**. Otherwise: Press **(ESC / - & +)** repeatedly until the display shows:

{OFF}

Press **(VSD / F & A)** until the control displays:

{400: SEt} “400” flashing

B) Advance control to standby PH12

From the **{400: Set}** screen, press **(↵enter)** and the control displays:

{run}

Press **(↵enter)** again and the control displays:

{Ph12} = Standby

Test P0 Ignition Point

NOTE:

The fan speed is measured in percentage. The gas metering valve is measured in degrees open. At P0 light off:
The Q-burner-fan speed should be approximately 20-30%
The gas-metering-valve angle should be between 2 - 12° open.

Tuning the P0 point may require repeated efforts to ignite the flame and find the required gas/air mix for consistent, stable ignition. If the burner fails to light, turn the burner switch off before resetting the control so you have the opportunity to adjust the P0 setting.

In the sequence below, the burner executes trial for ignition/main flame during PH42 and PH44.

Turn the burner switch ON. The burner progresses through pre-ignition phases and trial for flame:

{Ph22} = Fan motor on
{Ph24} = Traveling to pre-purge position
{Ph30} = Pre-purge countdown timer (30 sec)
{Ph36} = Traveling to ignition position
{Ph38} = Pre ignition Time
Burner light off attempt at factory P0 setting
{Ph40} = 1st Safety Time (ignition transformer ON)
{Ph42} = 1st Safety Time (ignition transformer OFF)
{Ph44} = Pilot stabilization

If light off is successful, go to step **e**. Otherwise, continue to **c**.

C) Failed ignition - Reset LMV

Following a failed light off attempt, the burner locks out and displays alternating error/fault messages:

{Loc:c: X} and **{Loc:d: Y}**

Turn burner switch **OFF**

Press **(reset)** until display shows **{rESET}**

The control sequences to **{Ph 10}** home run, then

{OFF}

D) Access the P0 parameter

With the display showing **{OFF}**

Press **(VSD / F & A)** to enter parameters and the display shows:

{400: SEt} (**"**400**"** flashing)

press (↵ **enter**) and control displays: **{run}**

Press **(ESC / - & +)** and the control prompts you with the P0 setting:

{P0: : GG.c}

where "GG.c" = current fuel-valve open angle in degrees.

E) Adjust P0 setting:

AIR- Airspeed setting is typically between 20 and 30%. If airspeed needs adjusted, press and hold (VSD / F & A) and the display shows:

{0n: : SS.x} with "SS.x" value flashing

where "SS.x" = airspeed %. While holding (VSD / F & A), press (+) or (-) to adjust the setting. When the intended value is reached, release all buttons.

GAS- The gas valve opening is typically between 2 - 12° open. If the gas valve position needs adjustment, hold down **(A)** -the display shows:

{0A: : GG.c} with "GG.c" value flashing

Increase the gas value by an increment of 2.0 until clean ignition is achieved.
While holding **(A)**, press **(+)** or **(-)** to adjust the setting. When the intended value is reached, release all buttons and the display shows:

{P0: : GG.r}

where "GG.r" = revised fuel-valve setting in degrees.
Note: If the burner does not ignite by the value of 12, check regulator inlet and outlet pressure, valve wiring, shut off valve positions and bleed gas line before continuing with additional adjustment.
Press **(ESC / - & +)** twice and the control prompts you with:

{OFF UPr}

Note: "OFF UPr" indicates the control will not start until the revised P0 is proven.

F) Test revised P0 ignition point by burner trial for ignition

With the display showing

{OFF UPr}

Press **(VSD / F & A)** to enter parameters and have control display:

{400: SEt} "400" flashing

press (↵ **enter**) display shows:

{run}

press (↵ **enter**) display shows:

{PH 12} = stand by

Turn the burner switch ON, and the burner progresses through pre-ignition phases and trial for flame:

{Ph22} = Fan motor on
{Ph24} = Traveling to pre-purge position
{Ph30} = Pre-purge countdown timer (30 sec)
{Ph36} = Traveling to ignition position
{Ph38} = Pre ignition Time

Progression stops at P0 setting: **{P0: : GG.r}** with "P0" blinking.

Press **(+)** to continue light off sequence:

{Ph40} = 1st Safety Time (ignition transformer ON)
{Ph42} = 1st Safety Time (ignition transformer OFF)
{Ph44} = Interval 1

If light off fails return and repeat from step **d**.

If light off is successful, the controller halts the sequence and displays:

{P0: : GG.G} "P0" is blinking

P0 may be adjusted further if desired. When satisfied with the P0 setting, press (+) to advance to P1.

G) Adjusting P1 through P9 points.

{P1: : GG.G} **"**P1**"** is blinking

Using the combustion analyzer, verify combustion for low-fire P1.

If adjustment is needed,

AIR- Press and hold (VSD / F & A) and the display shows:

{1n: : SS.S} with "SS.S" value flashing

Use (+) or (-) to adjust the setting. When the intended value is reached, release the keys.

GAS- Press and hold (A) and the display shows:

{1A: : GG.G} with "GG.G" value flashing

Use **(+)** or **(-)** to adjust the setting. When the intended value is reached, release the keys.

When the setting is satisfactory, wait for the setting value to **flash**: flashing verifies the LMV3 has entered and saved the setting values.

Press **(+)** to advance to P2. Repeat this step for points P2 through P9- adjusting the air and gas at each point so that combustion-analyzer results agree with table 3.3 in section 3.5.

Each point must be adjusted, combustion verified, and the point values internally saved by the LMV3 (point values displayed until the "Px" flashed). Each point should also be recorded/written down. When completed continue to **i**.

H) High and Low-fire Load Limit optional limit settings

With the burner still running, the high and low fire limit parameters may be set in the following sequence. Press **(ESC / - & +)** and the display shows the high-fire rate limit parameter:

{546: XXX} where "546" is flashing

This value is typically 100. To change it, press **(↵ enter)**) and adjust with **(+)** or **(-)**. Press **(↵ enter)** to save the new value and press **(ESC / - & +)** to return to

{546: XXX} "546" is flashing

Press **(+)** to advance to the low fire limit: **{545: YYY}** "545" is flashing

This value is typically blank. To adjust it, press **(↵ enter)** and adjust **(+)** and **(-)**. Press **(↵enter)** to save the new value and press **(ESC / - & +)** to return to

{545: YYY} "545" is flashing

Press **(ESC / - & +)** to return to the 400 parameter group.

I) Back up the LMV3 parameter settings to the AZL

With the display showing **{400: Set}** "400" flashing,

press **(-)** until the backup 000 parameter group displays as:

{000: Int} "000" flashing

Press **(↵ enter)** to select this parameter set.

Press **(+)** to advance to parameter 050 where display shows:

{050.00: 0} "050" blinking

Press **(↵ enter)** to select the parameter and the display shows:

{bAC_uP}

Press **(↵ enter)** to select the backup process and the display shows:

{ 0 }

Press **(+)** to enter backup mode. The display shows

{ 1 } with "1" flashing

Press **(↵ enter)** to perform the backup and the "1" shifts to the right edge and stops flashing:

{ 1}

Wait approximately 8 seconds and display changes to a non-flashing "0".

{ 0}

Backup is complete.

Press **(ESC / - & +)**: **{bAC_uP}**

Press **(ESC / - & +)**: **{050.00: 0}** "050" blinking

Press **(ESC / - & +)**: **{000: Int }** "000" flashing

Press **(+)** until control displays: **{400: Set}** "400" flashing

Commissioning and backup are complete.

J) Logout/exit Parameter Settings.

With the display showing: **{400: Set}** "400" flashing

Press and hold **(ESC / - & +)** until control displays:

{CLr CodE}

Password-parameter access is now off. The running burner returns to automatic operation and displays:

{oP XX.X} where XX.X is the firing rate value.

When the burner cycle is complete, the burner returns to standby and displays:

{OFF}

3.6.3 — Video Tutorial

A YouTube video, *Industrial Combustion Q Burner Siemens LMV3 Commissioning Startup*, is available here:

https://www.youtube.com/watch?v=aJAaV0K_U1o

3.7 — Test and Set Gas Pressure Switches

Refer to the diagram below when following this procedure.

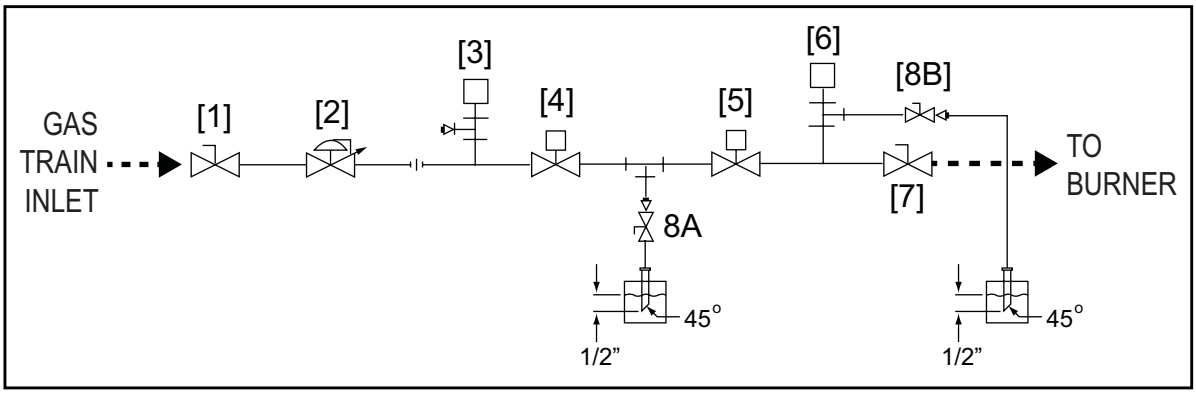


FIGURE 3-5. Gas Train

3.7.1 — Test the low-gas pressure switch [3].

Note: The low-gas pressure switch is typically set to 50% of the regulator set point.

LGPS SETTING =
0.5 x REGULATOR SETPOINT

Open manual valve [7] and light the burner. While the burner is firing, gradually close manual shutoff cock [1]. This simulates a low gas pressure condition. The low gas pressure switch should trip causing the LMV to go into a safety shutdown closing the safety shutoff valves and progressing the burner through a post-purge and shutdown with burner's red FAILURE lamp illuminated. Turn the burner switch to “OFF”, reopen the main shutoff cock [1], reset the low-gas pressure switch [3] and reset the LMV via the AZL reset button in preparation for the next step.

3.7.2 — Test the high-gas pressure switch [6].

Note: The high-gas pressure switch is typically set to 1.5 times the manifold pressure.

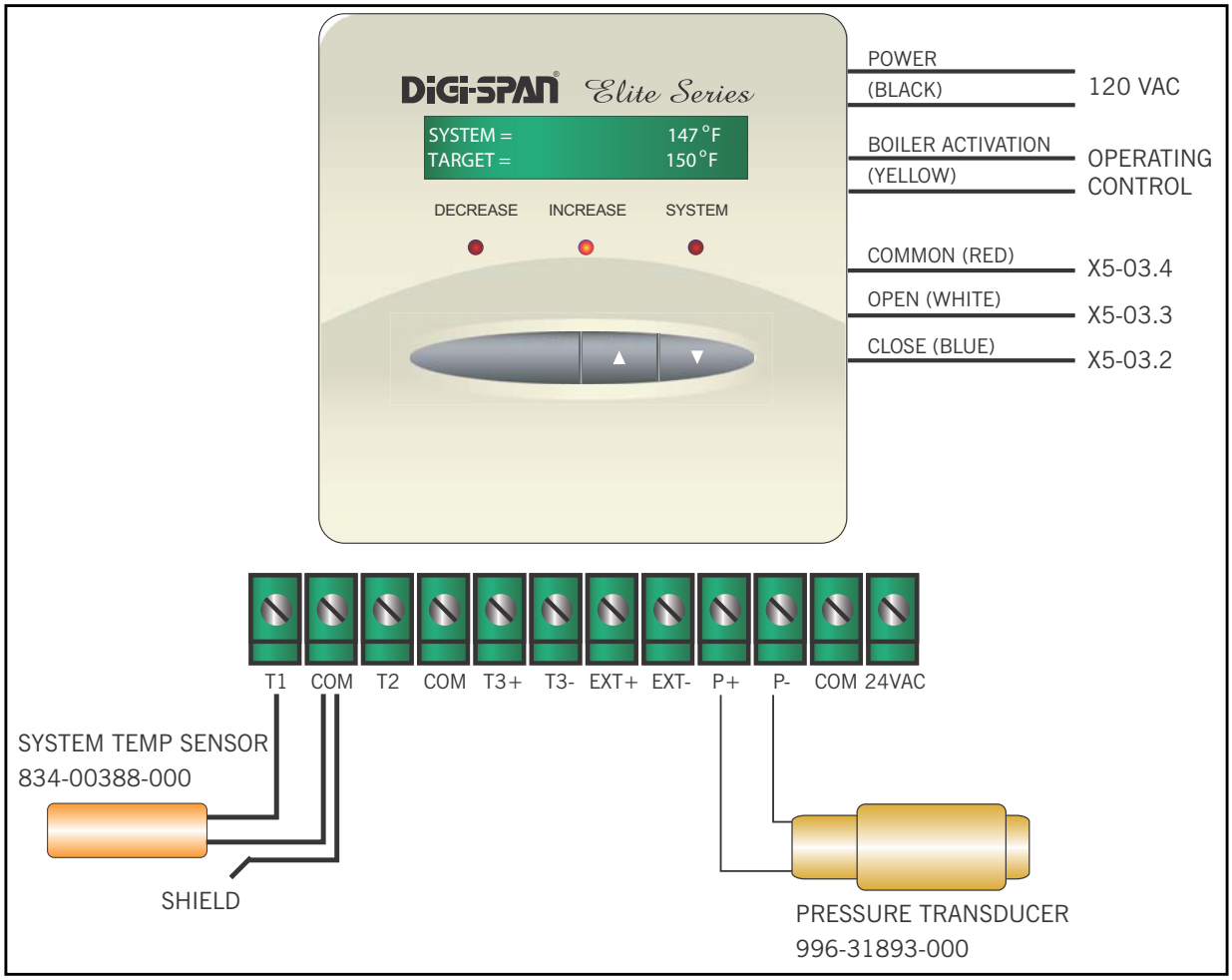
HGPS SETTING =
1.5 x MANIFOLD PRESSURE

Relight the burner. Reduce the high gas pressure switch [6] setting until it reaches the operating gas pressure. This simulates a high gas pressure condition which should put the LMV into a safety shutdown that closes the safety shutoff valves and progressing the burner through a post-purge and shutdown with burner's red FAILURE lamp illuminated. Return the high-pressure switch set point to 1.5 times the manifold pressure setting. Record the setting.

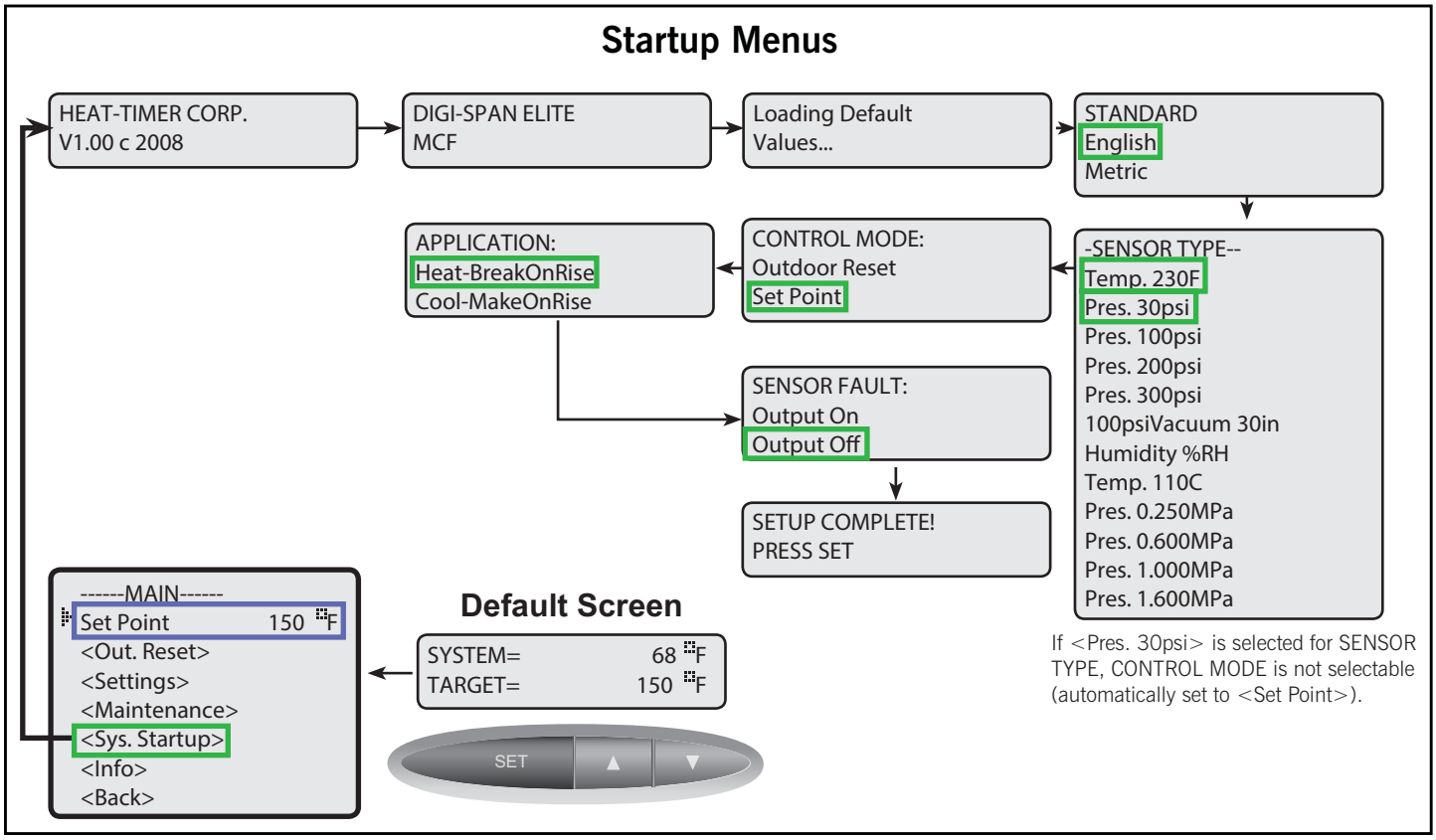
INDUSTRIAL COMBUSTION

3.8 — Optional Heat Timer MCF Load Control

3.8.1 — Electrical Connections:



3.8.2 — Initial Setup and Setpoint Adjustment



CHAPTER 4 Adjustments

4.1 — Overview

While each burner is tested at the factory for correct operation before shipment, variable conditions such as burning characteristics of the fuel used and operating load conditions may require further adjustment after installation to assure maximum operating efficiency.

Prior to placing the burner and heat exchanger into initial service, a complete inspection should be made of all controls, connecting piping, wiring and all fastenings such as nuts, bolts and setscrews to be sure that no damage or misadjustments occurred during shipping and installation.

A combustion efficiency analysis made during the initial start-up will help to determine what additional adjustments are required in a particular installation.

4.2 — Gas System

4.2.1 — Honeywell V48A Gas Valve Adjustment

NOTE: If The gas train components ship loose, the bleed valve will need to be installed and adjusted in the field.

1. The bleed valve screw should be open one (1) turn counterclockwise from the fully closed position as a starting point.
2. Adjust the bleed valve in 1/4 turn counterclockwise increments until the V48A gas valve opens at the desired opening speed for a smooth main flame ignition.
3. The burner should be cycled between adjustments.

4.2.2 — Gas Pressure

Gas must be supplied at a pressure high enough to overcome the pressure loss in the burner gas train and furnace pressure while running at full input. Refer to nameplate inside control panel for gas pressure requirements at train inlet and manifold. The pressures listed are based on nominal 1000 Btu/cu ft. natural gas at elevations up to 2000 feet above sea level.

INDUSTRIAL COMBUSTION

4.2.3 — Gas Flow

The volume of gas is measured in cubic feet as determined by a meter reading. The gas flow rate required depends on the heating value (Btu/cu ft.). The supplying utility can provide this information as well as pressure correction factors. To determine the required number of cubic feet per hour of gas, divide burner input (Btu/hr) by the heating value (Btu/cu ft).

Example:

Burner gas input = 1,000,000 Btu/hr

Natural gas heating value = 1,000 Btu/cu ft

$$\frac{1{,}000{,}000 \text{ Btu/hr}}{1{,}000 \text{ Btu/cu ft}} = \frac{1{,}000 \text{ cu ft}}{\text{hr}}$$

NOTE: When checking the input rate, Make sure no other equipment is operating on the same meter.

CHAPTER 5 Maintenance

5.1 — Overview

⚠ Warning

Any cover plates, enclosures, or guards anchored to the burner, or any burner related equipment, must remain in position at all times. Only during maintenance and service shutdown can these cover plates, enclosures, or guards be removed. They must be replaced, and securely anchored before testing, adjusting, or running the burner or burner related equipment.

⚠ Caution

It is important to provide support for the panel cover when in the open position to prevent damage to the hinges and other components.

⚠ Warning

When doing refractory service or repair work, observe the following precautions:

- Ensure the area is well ventilated.
- Wear a respirator approved by the National Institute for Occupational Safety and Health (NIOSH).
- Wear gloves, eye protection, and long-sleeved, loose-fitting clothing.

Dispose of refractory waste material in an airtight plastic bag.
Vacuum clothing before leaving the work site. Wash work clothes separately from other laundry.
Wash all exposed body areas with soap and water.

A maintenance program avoids unnecessary down time, costly repairs, and promotes safety. It is recommended that a record be maintained of daily, weekly, monthly, and yearly maintenance activities.

Electrical and mechanical devices require systematic and periodic inspection and maintenance. Any “automatic” features do not relieve the operator from responsibility, but rather allow freedom from certain repetitive chores, providing time for upkeep and maintenance.

Unusual noise, improper gauge reading, leak, sign of overheating, etc., can indicate a developing malfunction, requiring corrective action.

5.2 — Control System

Most operating controls require very little maintenance beyond regular inspection. Examine electrical connections. Keep the controls clean. Remove any dust from the interior of the control. Covers should be left on controls at all times. Keep the control cabinet doors closed. Dust and dirt can damage motor starters and relay contacts. Starter contacts are plated with silver and are not harmed by discoloration. Never use files or abrasive materials such as sandpaper on contact points.

5.2.1 — LMV3 Control

This control requires no adjustment, nor should any attempt be made to alter contact settings or timing logic. The flame detector lens should be cleaned as often as conditions demand. A periodic safety check procedure should be established to test the complete safeguard system. Tests should verify safety shutdown with a safety lock out upon failure to ignite the pilot or the main flame, and upon loss of flame. Each of these conditions should be checked on a scheduled basis. The safety check procedures are contained in the manufacturer's bulletin.

5.3 — Impeller

The impeller is enclosed in a die cast aluminum housing and requires no adjustment.

5.4 — Firing Head Inspection

Release the side cover and pull the firing head out of the burner housing. Inspect the flame scanner lens to be sure it is clean. Inspect the lead wire to the ignition electrode. It must be firmly attached and the insulation should be clean and free of cracks.

5.5 — Ignition Electrode

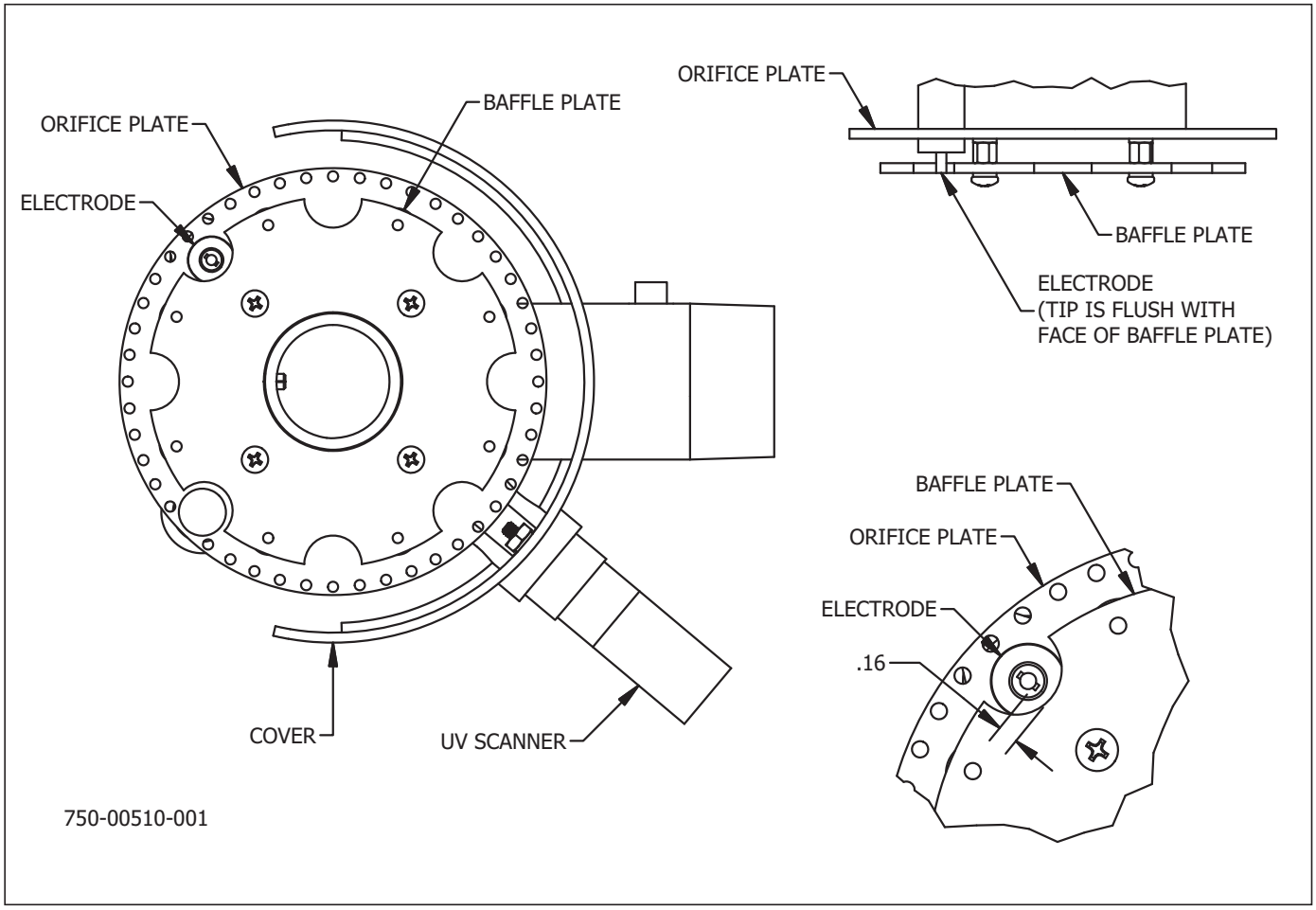


FIGURE 5-1. Ignition Electrode Gap

The ignition transformer requires little attention other than making sure the ignition wire is firmly attached to the transformer and the electrode. Be sure the wire insulation is in good condition and not grounded. Failure to keep the ignition electrode clean and properly set can cause faulty operation. The electrode assembly is supported by a socket in the diffuser and gas inlet tube. No adjustment is required except proper positioning of the electrode wire.

5.6 — Flame Scanner

The scanner must be clean. Even a small amount of contamination will reduce the flame signal. Wipe the scanner lens with a clean soft cloth.

5.7 — Firing Rate Controls

Make sure all connections are tight. Adjust if necessary. Perform a combustion test as explained in Chapter 4, and readjust the burner if necessary.

5.8 — Burner Mounting Inspection

The seal between the burner flange and furnace front plate must not permit combustion gases to escape. Periodic inspection is important. Replace the gasket if necessary. Inspect the burner head for signs of discoloration. A change in the head color paint might indicate gas leakage between the burner flange and the boiler refractory. If leakage occurs, refer to Chapter 2 for proper sealing procedure.

5.9 — Gas System

⚠Caution

Disconnect all power before servicing the valves.

5.9.1 — Motorized Main Gas Valves

Should the motorized valve fail to operate, check for voltage at the valve. Make certain that the fuel supply is off by closing the manual shutoff cock at the gas train inlet prior to testing. The motorized valve is not field repairable nor should it be disassembled. Replace the motorized valve if it fails to operate. After replacement and with the fuel supply off, cycle the motorized valve and confirm that it opens and closes. If the valve has a visual indicator, observe its position for correct operation.

5.9.2 — Solenoid Valves

A slight hum from the solenoid is normal when the coil is energized. Should the valve fail to operate, check that there is voltage at the valve coil. If there is no voltage at coil, check for loose wiring connections. If there is proper voltage at the valve coil and the valve still fails to open, replace the coil. Refer to manufacturer's bulletin for correct procedure in coil replacement.

Should it become necessary to replace the complete valve, be sure that the flow is in the direction of the arrow on the body.

Test for gas leaks and check valve action several times to ensure proper operation before attempting to relight the burner.

5.10 — Electrical System

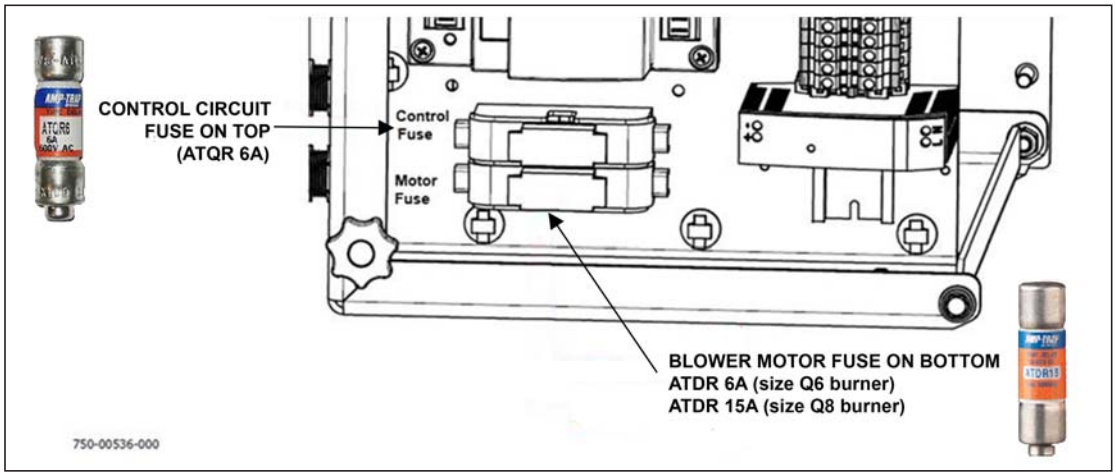
An individual electrical schematic drawing is shipped with each burner.

Troubleshooting instructions for the LMV3 control are included in this manual. See the manufacturer’s manual for additional information on the LMV3.

5.10.1 — Blower Motor Amp Draw Check

Motor supply voltage must not vary more than 10 percent from nameplate ratings. At initial startup and at least once a year thereafter, check the motor current with an ammeter while the burner is in high fire position. If the reading exceeds the nameplate rating, determine the cause and correct it immediately. In dusty locations, clean the motor regularly to assure adequate cooling.

5.10.2 — Fuse Replacement



5.11 — Extended Shutdown

When shutting down the burner for an extended period of time, the operator should use the following general guidelines to protect the burner from its surrounding elements. This will add to the operating life of the burner.

1. Turn the main electrical disconnect switch to the burner to “OFF.”
2. Close all main manual fuel valves.
3. If the burner operates in a damp environment, enclose it with plastic to protect all electrical components from moisture.

To prevent the accumulation of condensation, the control may be left powered if desired during long off periods.

INDUSTRIAL COMBUSTION

5.12 — Recommended Maintenance Schedule

TABLE 5-1. Maintenance Schedule

Item	Service By	Remarks
DAILY		
Gauges, Monitors, Indicators	Operator	Make visual inspection and record readings in log.
Instrument & Equipment Settings	Operator	Make visual check against recommended specifications.
Low Water, Fuel Cutoff & Alarms	Operator	Refer to instructions.
WEEKLY		
Firing Rate Control	Operator	Verify factory settings.
Igniter	Operator	Make visual inspection. Check flame signal strength.
Main Fuel Valves	Operator	Open limit switch. Make audible and visual check. Check valve position indicators, and check fuel meters.
Flame Failure Controls	Operator	Close manual fuel supply valve(s). Check safety shutdown timing. Record in log.
Flame Signal Strength Controls	Operator	Read and log the flame signal for main flame (Parameter 954). Notify Service if readings are very high, very low, or fluctuating.
MONTHLY		
Low Fan Pressure Interlock	Operator	Manually adjust until switch opens.
High & Low Gas Pressure Interlocks	Operator	Refer to instructions. Manually adjust until switch opens.
Scanner	Operator	Check, inspect, and clean for soot buildup.
ANNUALLY		
Combustion Test	Service Tech	Perform a complete combustion test. Adjust burner if necessary. Read and log data.
Operating Controls	Service Tech	Refer to instructions.

CHAPTER 6 Troubleshooting

Warning

Troubleshooting should be performed only by personnel who are familiar with the equipment and who have read and understood the contents of this manual. Failure to follow these instructions could result in serious personal injury or death.

Warning

Disconnect and lockout the main power supply in order to avoid the hazard of electrical shock. Failure to follow these instructions could result in serious personal injury or death.

6.1 — Awareness

Chapter 6 assumes that:

- The unit in question has been properly installed and that it has been running for some time.
- The operator has become thoroughly familiar with both the burner and the manual by this time.

If the burner will not start or operate properly, the Troubleshooting section should be referred to for assistance in pinpointing problems that may not be readily apparent.

The table below lists some possible causes, suggestions or clues to simplify locating the source of the trouble. Methods of correcting the trouble, once it has been identified, may be found elsewhere in this manual.

The control system has self-diagnostic capabilities and will display a code indicating the failure condition. Refer to the LMV3 troubleshooting section included here for details.

A thorough knowledge of the system and its controls will facilitate the troubleshooting process. Costly downtime or delays can be prevented by systematic checks of actual operation against the normal sequence to determine the stage at which performance deviates from normal. Following a set routine may help to detect obvious conditions, often ones that are relatively simple to correct.

If an obvious condition is not apparent, check the continuity of each circuit with a voltmeter or test lamp. Each circuit can be checked and the fault isolated and corrected. In most cases, circuit-checking can be accomplished between appropriate terminal on the terminal boards in the control cabinet or entrance box. Refer to the wiring schematic supplied for terminal identification.

Never attempt to circumvent any of the safety features.

⚠ Warning

The cause for loss of flame or any other unusual condition should be investigated and corrected before attempting to restart. Failure to do so may result in serious personal injury or death.

⚠ Warning

Do not repeat unsuccessful lighting attempts without rechecking the burner adjustments. Damage to the boiler or serious personal injury or death may result.

⚠ Warning

Do not attempt to start the main burner if the combustion chamber is hot and/or if gas is present in the furnace or flue passages. Promptly correct any conditions causing leakage. Failure to follow these instructions could result in serious personal injury or death.

6.2 — Emergency Shutdown

In case of emergency, shut down the burner by turning the ON-OFF switch to the “OFF” position. Shut off the gas train’s main manual shut off valves. The unit can also be shut down with the main electrical power disconnect. Inspect the burner carefully and troubleshoot before re-starting the unit. Follow instructions in Chapter 3 for starting and operating.

6.3 — Troubleshooting - General

TABLE 6- 1. Troubleshooting

Problem	Possible Causes
Burner Does Not Start	1. No voltage at the LMV3 power input terminals. a. Main disconnect switch open. b. Blown control circuit fuse. c. Loose or broken electrical connection.
	2. LMV3 requires resetting.
	3. Limit circuit not completed - no voltage at end of limit circuit program relay terminal. a. Pressure or temperature is above setting of operation control b. Water below required level. Low-water light (and alarm horn) should indicate this condition. Check manual reset button, if provided, on low-water control. c. Fuel pressure must be within settings of low pressure and high pressure switches. d. Check burner air proving switch and high-fire limit switch.
	4. Fuel valve interlock circuit not completed. a. Fuel valve auxiliary switch not closed.
	5. Blower motor not operating. a. Blower motor fuse is blown.
No Ignition	1. Lack of spark. a. Electrode grounded or porcelain cracked. b. Improper electrode setting. c. Loose terminal on ignition cable, cable shorted. d. Inoperative ignition transformer. e. Insufficient or no voltage at ignition circuit terminal.
	2. Spark but no flame. a. Lack of fuel - no gas pressure, closed valve, broken line, etc. b. V48A valve is closed due to closed vent valve. The bleed valve screw should be open one (1) turn counterclockwise from the fully closed position as a starting point. See 4.2.1.
	3. Running interlock circuit not completed. a. Combustion air proving switch defective or not properly set.

Problem	Possible Causes
No Main Flame	1. Gas train: a. Manual gas cock closed. b. Safety shutoff valve inoperative. c. Gas pressure regulator inoperative.
	2. Flame detector defective, sight tube obstructed or lens dirty.
	3. Insufficient or no voltage at main fuel valve circuit terminal.

Problem	Possible Causes
Burner Stays in Low Fire	1. Pressure or temperature above modulating control setting.
	2. Defective modulating control.
Shutdown Occurs During Firing	1. Loss or stoppage of fuel supply.
	2. Defective fuel valve, loose electrical connection.
	3. Flame detector weak or defective.
	4. Scanner lens dirty or sight tube obstructed.
	5. If the LMV3 does not show a fault code, check the limit circuit for an opened safety control.
	6. If the LMV3 shows a safety lockout (fault code): a. Check fuel line and valves. b. Check flame detector. c. Check for open circuit in running interlock circuit. d. The flame failure light is energized by ignition failure, main flame failure, inadequate flame signal, or open control in the running interlock circuit.
	7. Improper air/fuel ratio (lean fire). a. Fluctuating fuel supply. Temporary obstruction in the fuel line. Temporary drop in gas pressure.
	8. Interlock device inoperative or defective.
AZL display is blank	The AZL connection to the controller requires both the RJ11 crossover adapter and RJ11 cable. The AZL display remains blank if the crossover adapter is not used.

6.4 — LMV3 Diagnostics

he LMV3 has an extensive list of fault codes to help clarify the nature of any fault. This section describes every fault code in detail and gives guidance on how to correct it.

When a lockout occurs, the AZL will alternate between displaying “Loc:c” and “Loc:d”. The number listed after “Loc:c” is the error code, and the number listed after “Loc:d” is the diagnostic code. For example, an error code 3, diagnostic code 0 will alternate between displaying “Loc:c: 3” and “Loc:d: 0”.

If a fault occurs that does not cause a lockout, the AZL will alternate between displaying “InF:c” and “InF:d”. The number listed after “InF:c” is the error code, and the number listed after “InF:d” is the diagnostic code. These faults are intended to provide the user information even though a lockout did not occur.

The fault history is stored in the 700 set of parameters. The LMV3 stores the last 25 fault codes:

Parameter 701 displays information about the current status of the LMV3.
Parameter 702 displays information about the most recent fault.
Parameter 703 displays information about the second most recent fault.
…
Parameter 725 displays information about the 24th most recent fault.

Each fault code listed has indexes that provide additional information about the fault:

Index 01 = Error code
Index 02 = Diagnostic code
Index 03 = Error class (not used in North America)
Index 04 = Phase
Index 05 = Start number
Index 06 = Load
Index 07 = Fuel (LMV36 only)

Often index 05 and index 06 will display a value of "._._". This means that the AZL display ran out of room to display the start number or load. When this happens, hold down the info button to display the value.

An example of how the AZL displays a fault code in the fault history is shown below:

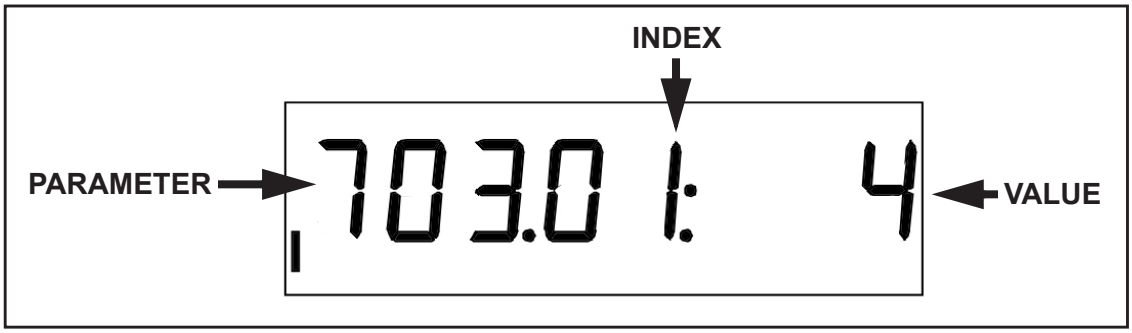


FIGURE 6-1. LMV3 Fault History Example with Indexes

INDUSTRIAL COMBUSTION

6.4.1 — LMV3 Complete Error Code List *(from Siemens LMV3 Technical Instruction 7/19/17; used by permission)*

TABLE 6- 2. LMV3 Error Codes

Error Code	Diag. Code	Description	Corrective Action
Note: Diagnostic codes are additive. If a diagnostic code appears that is not on this list, it is a combination of multiple diagnostic codes.			
no Comm	-	No communication between the LMV3 and the AZL23	Check for a loose connection between the LMV3 and AZL23. If the connection is good, replace the cable connecting the LMV3 to the AZL23. If that does not fix the issue, replace the AZL23.
2	Any #	No flame at the end of safety time (TSA)	A flame failure occurred during lightoff. 1. Check the wiring of the ignition transformer, pilot valve, and main valve(s). 2. Check manual shutoff valves for the pilot gas and main gas. 3. Check the position of the air damper and close it further if necessary. The pilot flame might be getting blown out. 4. Check the flame detector signal in the presence of a known flame source. Replace the flame detector if it does not produce the anticipated signal.
	1	No flame at the end of safety time 1 (TSA1)	
	2	No flame at the end of safety time 2 (TSA2)	
	4	No flame at end of safety time 1 (TSA1) (software version V02.00)	
3	Any #	Air pressure failure	A fault occurred related to the air pressure switch input X3-02.1. See diagnostic codes for more information.
	0	Air pressure off	The air pressure switch input was de-energized when it should have been energized. Make sure the blower starts in phase 22 and the switch setpoint is set appropriately.
	1	Air pressure on	The air pressure switch input was energized when it should have been de- energized. Make sure the blower turns off in phase 78 and the switch setpoint is set appropriately. If necessary, increase the setting of parameter 213.
	2	Evaluation of air pressure	Check the setting of parameter 235/335. This can only be set to 2 on pneumatic fuel train options.
	4	Air pressure on - prevention of startup	The air pressure switch input is energized, preventing the LMV3 from starting up. If other inputs besides the air pressure switch input are in the wrong state, causing a start prevention, the diagnostic code calls out what other inputs are in the wrong state.
	20	Air pressure, combustion pressure - start prevention	
	68	Air pressure, POC - start prevention	
	84	Air pressure, combustion pressure, POC - start prevention	
4	Any #	Extraneous light	An extraneous light (flame signal present when input should be de- energized) fault occurred. 1) Ensure that the source of light is not a flame. If it is, take corrective action immediately. 2) Ambient light can cause an extraneous light fault. Ensure the flame scanner is viewing a dark area such as the inside of a boiler. 3) UV scanners typically fail on (give a false flame signal). Remove UV flame scanner and cover the bulb to ensure it is not seeing any light. Check parameter 954 to see if the LMV3 is registering a flame signal. If it is, replace the UV scanner. Diagnostic code 2 - A call for heat was received, but the LMV3 will not start up due to an extraneous light fault. Diagnostic codes 6 and higher - A call for heat was received, but the LMV3 will not start up due to an extraneous light fault. Other inputs besides the flame signal input are in the wrong state as well. The diagnostic code calls out what other inputs are in the wrong state.
	0	Extraneous light during startup	
	1	Extraneous light during shutdown	
	2	Extraneous light during startup - prevention of startup	
	6	Extraneous light during startup, air pressure - start prevention	
	18	Extraneous light during startup, combustion pressure - start prevention	
	24	Extraneous light during startup, air pressure, combustion pressure - start prevention	
	66	Extraneous light during startup, POC - start prevention	
	70	Extraneous light during startup, air pressure, POC - start prevention	
	82	Extraneous light during startup, combustion pressure, POC - start prevention	
	86	Extraneous light during startup, air pressure, combustion pressure, POC - start prevention	

Error Code	Diag. Code	Description	Corrective Action
Note: Diagnostic codes are additive. If a diagnostic code appears that is not on this list, it is a combination of multiple diagnostic codes.			
7	Any #	Loss of flame	1) Increase the setting of parameter 186:01 (fuel 0) or 187:01 (fuel 1). This increases the FFRT. A maximum setting of 30 equals a 4 second FFRT. 2) Check the flame detector signal in the presence of a known flame source. Replace the flame detector if it does not produce the anticipated signal.
	0	Loss of flame	
	3	Loss of flame (software version V02.00)	
	3-255	Loss of flame due to TUV test (loss of flame test)	
12	Any #	Valve proving	A fault occurred related to valve proving. See diagnostic codes for more information.
	0	Fuel valve 2 (V2) leaking	The downstream gas valve failed valve proving with the low gas switch doubling as the valve proving switch (parameter 236 = 2). See diagnostic code 83 for corrective action.
	1	Fuel valve 1 (V1) leaking	The upstream gas valve failed valve proving with the low gas switch doubling as the valve proving switch (parameter 236 = 2). See diagnostic code 81 for corrective action.
	2	Valve proving not possible	Valve proving is activated, but no input is assigned for the valve proving switch.
	3	Valve proving not possible	
	4	Valve proving not possible	Valve proving is activated, but multiple inputs are assigned for the valve proving pressure switch (parameter 236/336 = 2 and parameter 237/337 = 3). Change parameter 236/336 to a 1.
	5	Valve proving not possible	
	81	Fuel valve 1 (V1) leaking	The upstream gas valve failed valve proving: 1) Bubble test the gas valve to ensure the valve is not leaking. If the valve is leaking, replace the valve. 2) Ensure that the setpoint of the valve proving pressure switch is set to 50% of the inlet pressure to the upstream valve.
	83	Fuel valve 2 (V2) leaking	The downstream gas valve failed valve proving: 1) Bubble test the gas valve to ensure the valve is not leaking. If the valve is leaking, replace the valve. 2) Ensure that the setpoint of the valve proving pressure switch is set to 50% of the inlet pressure to the upstream valve.
14	Any #	POC	A fault occurred related to a proof-of-closure (POC) switch. See diagnostic codes for more information.
	0	POC open	The POC input X5-02.2 is open when it should be closed: 1) If no POC switches are being used, change setting of parameter 237. 2) Check wiring to the fuel valves. Ensure fuel valves are wired to the correct terminal (see Section 2 for wiring diagrams). With the manual shutoff valves closed, ensure that the fuel valves are closing in the proper phase (see Section 3 for sequence diagrams). 3) Ensure POC switches are closing when the valve closes. If this does not happen, check
	1	POC closed	The POC input X5-02.2 is closed when it should be open: 1) If no POC switches are being used, change setting of parameter 237. 2) Check wiring to the fuel valves. Ensure fuel valves are wired to the correct terminal (see Section 2 for wiring diagrams). With the manual shutoff valves closed, ensure that the fuel valves are opening in the proper phase (see Section 3 for sequence diagrams). 3) Ensure POC switches are opening when the valve opens. If this does not happen, check
	64	POC open - prevention of startup	The POC input X5-02.2 was open when a call for heat was received, preventing the LMV3 from starting up. See diagnostic code 0 for corrective actions.

Error Code	Diag. Code	Description	Corrective Action
Note: Diagnostic codes are additive. If a diagnostic code appears that is not on this list, it is a combination of multiple diagnostic codes.			
18	Any #	Air pressure failure (speed-dependent air pressure switch)	A fault occurred related to the speed-dependent air pressure switch. See diagnostic codes for more information.
	0	Air pressure switch off	When using a speed-dependent air pressure switch, the switch must be closed anytime the VSD speed is greater than the setting of parameter 671.
	1	Air pressure switch on	When using a speed-dependent air pressure switch, the switch must be open anytime the VSD speed is less than the setting of parameter 670.
	128	Invalid parameterization	Check the settings of parameters 670 and 671. Parameter 671 must be set to a higher value than parameter 670.
19	80	Combustion pressure, POC - start prevention	Check wiring and operation of combustion pressure switch.
20	Any #	Pressure switch-min (Pmin)	A fault occurred related to the low gas pressure switch. See diagnostic codes for more information.
	0	No minimum gas pressure	The low gas pressure switch (input X5-01.2) opened, causing a fault. Check gas supply and open any manual shutoff valves. Check the setpoint and wiring of the low gas pressure switch.
	1	Gas shortage / prevention of startup	The low gas pressure switch was not made by the end of phase 22, preventing the startup of the LMV3. See diagnostic code 0 for more corrective actions.
21	Any #	Pressure switch-max (Pmax) / POC	A fault occurred related to the high gas or oil pressure switch (or POC if using an LMV3 with a software version V02.00). See diagnostic codes for more information.
	0	Pressure switch-max (Pmax): Maximum gas / oil pressure exceeded. POC: POC open (software version V02.00)	The high gas / oil pressure switch (input X5-02.2) opened, causing a fault. Check the setpoint and wiring of the high gas / oil pressure switch. Check pressure regulators for ruptured diaphragms. If using an LMV3 with a software version V02.00, this could be a POC fault if parameter 237 is set for 2. If so, see corrective action of error code 14, diagnostic 0.
	1	POC closed (software version V02.00)	Only appears if using an LMV3 with a software version V02.00: See corrective action of error code 14, diagnostic 1.
	64	POC open - start prevention (software version V02.00)	Only appears if using an LMV3 with a software version V02.00: See corrective action of error code 14, diagnostic 64.

Error Code	Diag. Code	Description	Corrective Action
Note: Diagnostic codes are additive. If a diagnostic code appears that is not on this list, it is a combination of multiple diagnostic codes.			
22 OFF S	Any #	Safety loop / burner flange	A safety loop / burner flange fault occurred. Check all of the switches wired into the safety loop (between terminals X3-04.1 and X3-04.2). This also includes the burner flange circuit (between terminals X3-03.1 and X3-03.2). One of the switches must have opened, causing the fault. Fix the condition that caused the switch to open and reset the fault. Diagnostic code 1 - A call for heat was received, but the LMV3 will not start up due to a safety loop / burner flange fault. Diagnostic codes 3 and larger - A call for heat was received, but the LMV3 will not start up due to a safety loop / burner flange fault. Other inputs besides the safety loop and burner flange inputs are in the wrong state as well. The diagnostic code calls out what other inputs are in the wrong state.
	0	Safety loop / burner flange open	
	1	Safety loop / burner flange open / prevention of startup	
	3	Safety loop / burner flange open, extraneous light - start prevention	
	5	Safety loop / burner flange open, air pressure - start prevention	
	7	Safety loop / burner flange open, extraneous light, air pressure - start prevention	
	17	Safety loop / burner flange open, combustion pressure - start prevention	
	19	Safety loop / burner flange open, extraneous light, combustion pressure - start prevention	
	21	Safety loop / burner flange open, air pressure, combustion pressure - start prevention	
	23	Safety loop / burner flange open, extraneous light, air pressure, combustion pressure - start prevention	
	65	Safety loop / burner flange open, POC - start prevention	
	67	Safety loop / burner flange open, extraneous light, POC - start prevention	
	69	Safety loop / burner flange open, air pressure, POC - start prevention	
	71	Safety loop / burner flange open, extraneous light, air pressure, POC - start prevention	
	81	Safety loop / burner flange open, combustion pressure, POC - start prevention	
	83	Safety loop / burner flange open, extraneous light, combustion pressure, POC - start prevention	
	85	Safety loop / burner flange open, air pressure, combustion pressure, POC - start prevention	
	87	Safety loop / burner flange open, extraneous light, air pressure, combustion pressure, POC - start prevention	
23	Any #	Gas pressure switch-min (Pmin) / heavy oil direct start	A low gas pressure or heavy oil direct start fault occurred. See diagnostic codes for more information.
	0	No minimum gas pressure	The low gas pressure switch (input X5-01.2) opened, causing a fault. Check gas supply and open any manual shutoff valves. Check the setpoint and wiring of the low gas pressure switch. Check the setting of parameter 285/385.
	1	Gas shortage - start prevention	The low gas pressure switch was not made by the end of phase 38, preventing the startup of the LMV3. See diagnostic code 0 for more corrective actions.
	2	Heavy oil direct start	When firing heavy oil, the heavy oil direct start input (X9-04.2) was de-energized, causing the fault. Check the setting of parameter 286, and verify the wiring of the heavy oil direct start is correct.

Error Code	Diag. Code	Description	Corrective Action
Note: Diagnostic codes are additive. If a diagnostic code appears that is not on this list, it is a combination of multiple diagnostic codes.			
50	Any #	Internal error	If the fault occurs continuously, replace the LMV3.
51	Any #	Internal error	
55	Any #	Internal error	
56	Any #	Internal error	
57	Any #	Internal error	
58	Any #	Internal error	
60	Any #	Internal error: No valid load controller source	No valid 4-20 mA signal is present on terminal X64. This could be done on purpose to create a low fire hold. Otherwise, check wiring of 4-20 mA signal and ensure 4-20 mA source is valid. See diagnostic codes for more information.
	0	Internal error: No valid load controller source	Reset the fault. If the fault occurs continuously, replace the LMV3.
	1	Analog output preset valid - prevention of startup	No valid 4-20 mA signal is present on terminal X64 and parameter 204 is set to 1, causing the lockout. Re-establish a valid 4-20 mA signal and reset the fault.
	2	Analog output preset valid - default output low-fire	No fault: No valid 4-20 mA signal is present on terminal X64 and parameter 204 is set to 0, so the LMV3 is operating at low fire. The fault message appears to alert the user that a low fire hold is enabled. To enable modulation, re-establish a valid 4-20 mA signal.
61 Fuel Chg	Any #	Fuel changeover	No fault: The LMV36 is currently in the process of changing fuels. See diagnostic codes for more information.
	0	Fuel 0	No fault: The LMV36 is currently in the process of changing from fuel 1 to fuel 0.
	1	Fuel 1	No fault: The LMV36 is currently in the process of changing from fuel 0 to fuel 1.
62 Fuel Err	Any #	Invalid fuel signals / fuel information	On an LMV36, either fuel 0 must be selected via line voltage on terminal X5-03.2 or fuel 1 must be selected via line voltage on terminal X5-03.3. If neither or both of these terminals are energized at the same time, a fault will occur. See diagnostic codes for more information.
	0	Invalid fuel selection (Fuel 0 + 1 = 0)	On an LMV36, neither fuel is selected. Either select fuel 0 (apply voltage to terminal X5-03.2) or fuel 1 (apply voltage to terminal X5-03.3).
	1	Different fuel choice between the μCs	If the fault occurs continuously, replace the LMV3.
	2	Different fuel signals between the μCs	
	3	Invalid fuel selection (Fuel 0 + 1 = 1)	On an LMV36, both fuels are selected. Remove voltage from either terminal X5-03.2 (fuel 0) or terminal X5-03.3 (fuel 1).
65	Any #	Internal error	If the fault occurs continuously, replace the LMV3.
66	Any #	Internal error	
67	Any #	Internal error	
70	Any #	Internal error fuel-air ratio control: Position calculation modulating	Check curve points to see if correct values have been entered for all actuators and the VSD. Readjust the ratio curve if required.
	23	Output invalid	
	26	Curvepoints undefined	

Error Code	Diag. Code	Description	Corrective Action
Note: Diagnostic codes are additive. If a diagnostic code appears that is not on this list, it is a combination of multiple diagnostic codes.			
71	Any #	Special position undefined	A special position (home, prepurge, ignition, or postpurge) is undefined for one of the actuators / VSD See diagnostic codes for more information.
	0	Home position	The home position for one of the actuators / VSD is undefined. Check the settings of index 00 for parameters 501 through 506. Change any settings that are undefined and reset the fault.
	1	Prepurge position	The prepurge position for one of the actuators / VSD is undefined. Check the settings of index 01 for parameters 501 through 506. Change any settings that are undefined and reset the fault.
	2	Postpurge position	The postpurge position for one of the actuators / VSD is undefined. Check the settings of index 02 for parameters 501 through 506. Change any settings that are undefined and reset the fault.
	3	Ignition position	The ignition position for one of the actuators / VSD is undefined. Enter commissioning mode (parameter 400) and check the settings of P0. Change any settings that are undefined and reset the fault.
72	Any #	Internal error fuel-air ratio control	If the fault occurs continuously, replace the LMV3.
73	Any #	Internal error fuel-air ratio control: Position calculation multistep	Check curve points to see if correct values have been entered for all actuators and the VSD. Readjust the ratio curve if required.
	23	Output invalid	
	26	Curvepoints undefined	
75	Any #	Internal error fuel-air ratio control: Data clocking check	1) Set both parameter 123:00 and 123:01 to a 1 and reset the fault. 2) If the fault persists, and a VSD is present, restandardize the VSD and reset the fault. 3) If the fault occurs continuously, replace the LMV3.
	1	Current output different	
	2	Target output different	
	4	Target positions different	
	6	Target output and target positions different	
	16	Different positions reached	
76	Any #	Internal error fuel-air ratio control	If the fault occurs continuously, replace the LMV3.
80	Any #	Control range limitation of VSD	A VSD speed error occurred. See diagnostics codes for more information.
	1	Control range limitation at the bottom	This indicates that the LMV3 has decreased its signal to the VSD as much as possible and the motor RPM is still too high. 1) Increase VSD / LMV3 ramp times. 2) Increase VSD braking if possible. 3) Ensure that the VSD and LMV3 are configured for the same analog signal (0-10 VDC). 4) Re-standardize the speed. Be sure to check combustion after the re- standardization.
	2	Control range limitation at the top	This indicates that the LMV3 has increased its signal to the VSD as much as possible and the motor RPM is still too low. 1) Increase VSD / LMV3 ramp times. 2) Check for filters, damping, or delays on the input signal to the VSD. The VSD should respond to the input signal in a linear fashion. 3) Check speed sensor on motor for correct installation, especially the gap between the
81	1	Interrupt limitation speed input	The LMV3 has detected an interruption on the speed input. Decrease the electrical noise on the speed sensor wires. If the fault occurs continuously, replace the LMV3.

Error Code	Diag. Code	Description	Corrective Action
Note: Diagnostic codes are additive. If a diagnostic code appears that is not on this list, it is a combination of multiple diagnostic codes.			
82	Any #	Error during VSD's speed standardization	An error occurred while attempting to standardize the speed of the VSD. See diagnostic codes for more information.
	1	Timeout of standardization (VSD ramp down time too long)	Standardization timed out because the VSD took too long to ramp down at the end of the standardization. Either decrease the ramp down time in the VSD or increase the setting of parameter 523.
	2	Storage of standardized speed not successful	Press the info button with any other button to cause a manual lockout, then reset the fault and attempt to standardize again.
82	3	Line interruption speed sensor	No pulses from the speed sensor were detected during standardization. 1) Verify that the motor is rotating. 2) Check the wiring between the speed sensor and the LMV3. 3) Check and / or adjust the gap between the speed wheel and the sensor. The gap should be about 1/16" (2mm), or about two turns away from the speed wheel.
	4	Speed variation / VSD ramp up time too long / speed below minimum limit for standardization	A stable speed was not reached after ramping up the VSD, so a standardized speed could not be determined. 1) Either decrease the ramp up time in the VSD or increase the setting of parameter 522. 2) Check for filters, damping, or delays on the input signal to the VSD. The VSD should respond to the input signal in a linear fashion. 3) Ensure that the VSD and LMV3 are configured for the same analog signal (0-10 VDC).
	5	Wrong direction of rotation	1) Check to see if the motor's direction of rotation is correct. Reverse if necesssary. 2) Check to see if the arrow on the speed wheel points in the correct direction of rotation. Reverse if necessary.
	6	Unplausible sensor signals	1) Check the setting of parameter 643 and ensure it is set correctly. For VSD + 3-phase motor, this should be a 0. For most brushless DC blowers, this should be a 1. 2) Check and / or adjust the gap between the speed wheel and the sensor. The gap should be about 1/16" (2mm), or about two turns away from the speed wheel. 3) Check the wiring of the speed sensor. Ensure the reference ground is properly connected. 4) Ensure that other metal parts besides the speed wheel are not being picked up by the sensor when the motor rotates.
	7	Invalid standardized speed	The standardized speed measured does not lie in the permissible range (650-14,000 RPM).
	15	Speed deviation μC1 + μC2	Reset the fault and repeat the standardization.
82	20	Wrong phase of phase manager	Standardization must be performed in standby (phase 12).
	21	Safety loop / burner flange open	Fix any conditions causing a limit in the safety loop / burner flange circuit to be open, then attempt to standardize again.
	22	Air actuator not referenced	Typically caused by trying to standardize while the air actuator is currently referencing. Wait for the actuator to finish referencing and try to standardize again. If the fault persists, see error code 85, diagnostic code 1 for additional troubleshooting.
	23	VSD deactivated	The VSD must be activated before standardization can be performed. Set parameter 542 to a 1 and attempt to standardize again.
	24	No valid operation mode	A fuel train must be selected before standardization can be performed. Select a fuel train via parameter 201 (fuel 0) or 301 (fuel 1), then attempt to standardize again.
	25	Pneumatic air-fuel ratio control	Standardization cannot be performed when using a pneumatic fuel train. Select a different fuel train via parameter 201 (fuel 0) or 301 (fuel 1), then attempt to standardize again.
	128	Running command with no preceding standardization	A call for heat was received and the VSD is activated (parameter 542 = 1), but no standardization has been performed. Perform a standardization by setting parameter 641 to a 1 while in standby phase 12, or deactivate the VSD by setting parameter 542 to 0.
	255	No standardized speed available	Perform a standardization by setting parameter 641 to 1 while in standby (phase 12).

Error Code	Diag. Code	Description	Corrective Action
Note: Diagnostic codes are additive. If a diagnostic code appears that is not on this list, it is a combination of multiple diagnostic codes.			
83	Any #	Speed error VSD	A VSD speed error occurred. See diagnostics codes for more information.
	1	Lower control range limitation of control	See error code 80, diagnostic code 1.
	2	Upper control range limitation of control	See error code 80, diagnostic code 2.
	4	Interruption via disturbance pulses	See error code 81, diagnostic code 1.
	8	Curve too steep in terms of ramp speed	See error code 84.
	16	Interruption of speed signal	No speed signal was detected. 1) Ensure that the motor is rotating. If it is not, check the wiring of the VSD / PWM blower. 2) If using a VSD, turn the motor by hand to ensure that the LED on the speed sensor lights up when it sees the speed wheel. If it does not, decrease gap between speed wheel and speed sensor and check the wiring of the speed sensor. If there are no issues, replace speed sensor.
83	32	Quick shutdown due to excessive speed deviation	The speed of the motor was more than 10% different than the anticipated speed for more than 1 second. 1) Check the ramp times of the VSD and LMV3. Increase if necessary. The ramp times in the LMV3 should be at least 20% longer than the ramp times in the VSD. 2) Check the setting of parameter 661.
	64	VSD speed is below minimum speed (phase dependent)	1) Standby (phase 12): Ensure parameter 669:01 (maximum speed) is set to a higher value than parameter 669:00 (minimum speed). 2) Standby (phase 12): Ensure parameter 663 (near zone) is set to a higher value than parameter 662 (neutral zone). 3) Check the absolute speed (parameter 935) to ensure the correct speed is being detected by the LMV3.
	128	VSD speed exceeds maximum speed (phase dependent)	1) Standby (phase 12): Ensure parameter 226/266/326/366 is set to a higher value than parameter 665 (time outside near zone). 2) Standby (phase 12): Ensure parameter 669:01 (maximum speed) is set to a higher value than parameter 669:00 (minimum speed). 3) Standby (phase 12): Ensure parameter 663 (near zone) is set to a higher value than parameter 662 (neutral zone).
	255	Failed forced travel test	If the LMV3 remains at the same fire rate for an extended period of time, a minimal load change is forced, and the corresponding feedback from the PWM blower is checked. If this fault occurs, the PWM blower speed change was insufficient in response to the load change.
84	Any #	Curve slope actuators	The difference in position between two adjacent curve points is too large. See diagnostic code for which actuator / VSD has positions that are too far apart. For actuators, either increase the setting of parameter 544, or decrease the distance between curve points. For VSD, either increase the setting of parameter 544, decrease the setting of parameters 522 and 523, decrease the distance between curve points, or decrease parameter 647.
	1	VSD: Curve too steep in terms of ramp speed	
	2	Fuel actuator: Curve too steep in terms of ramp rate	
	4	Air actuator: Curve too steep in terms of ramp rate	

Error Code	Diag. Code	Description	Corrective Action
Note: Diagnostic codes are additive. If a diagnostic code appears that is not on this list, it is a combination of multiple diagnostic codes.			
85	Any #	Referencing error on actuators	All SQM33... actuators must travel outside of their 0-90° operating range before starting up the burner in order to "reference" their position. This fault means that the referencing was unsuccessful. 1) Check the setting of parameter 601 (fuel 0) and 608 (fuel 1). Index 00 sets the fuel actuator reference direction and index 01 sets the air actuator reference direction. 2) Check to make sure the actuators are not binding when trying to reference (ensure that overstroking below 0° or above 90° is possible). 3) Check the setting of parameter 613 (fuel 0) and 614 (fuel 1) to ensure the actuator type is set correctly. 4) Make sure that the actuator's are plugged into the correct terminal on the LMV3.
	0	Referencing error of fuel actuator	
	1	Referencing error of air actuator	
	128	Referencing error due to parameter change	
86	Any #	Error fuel actuator	An error occurred pertaining to the fuel actuator. See diagnostic codes for more information.
	0	Position error	Verify that the valve connected to the fuel actuator is not bound. Ensure that the torque requirements of the valve are less than the output of the fuel actuator. If everything checks out okay, replace the SQM33 actuator.
	1	Line interruption	Check the wiring between the fuel actuator and LMV3 terminal X54. Fix the wiring error and reset the fault. If no fuel actuator exists, choose a fuel train option (parameter 201/301) that does not require a fuel actuator.
	8	Curve too steep in terms of ramp rate	See error code 84.
86	16	Step deviation in comparison with last referencing	The fuel actuator is bound. 1) Check the setting of parameter 613:00 (fuel 0) and 614 (fuel 1) to ensure the actuator type is set correctly. 2) Check to see if the actuator gets bound somewhere along its working range. This can be done changing the home position of the actuator in standby (no alarm). 3) Ensure that the torque of the actuator is sufficient for the application.
87	Any #	Error air actuator	An error occurred pertaining to the air actuator. See diagnostic codes for more information.
	0	Position error	Verify that the valve / damper connected to the air actuator is not bound. Ensure that the torque requirements of the valve / damper are less than the output of the air actuator. If everything checks out okay, replace the SQM33 actuator.
	1	Line interruption	Check the wiring between the air actuator and LMV3 terminal X53. Fix the wiring error and reset the fault. If no air actuator exists, choose a fuel train option (parameter 201/301) that does not require an air actuator.
	8	Curve too steep in terms of ramp rate	See error code 84.
	16	Step deviation in comparison with last referencing	The air actuator is bound. 1) Check the setting of parameter 613:01 to ensure the actuator type is set correctly. 2) Check to see if the actuator gets bound somewhere along its working range. This can be done changing the home position of the actuator in standby (no alarm). 3) Ensure that the torque of the actuator is sufficient for the application.
90	Any #	Internal error basic unit	If the fault occurs continuously, replace the LMV3.
91	Any #	Internal error basic unit	
93	Any #	Error flame signal acquisition	Check the wiring of the QRB... flame detector and reset the fault. If the fault occurs continuously, replace the QRB... flame detector.
	3	Short-circuit of sensor	

Error Code	Diag. Code	Description	Corrective Action
Note: Diagnostic codes are additive. If a diagnostic code appears that is not on this list, it is a combination of multiple diagnostic codes.			
95	Any #	Error relay supervision	Check for voltage feeding back on the output given by the diagnostic code. Fix the wiring error / defective component causing the voltage feedback and reset the fault.
	3	External power supply NO contact (ignition transformer - X4-02.3)	
	4	External power supply NO contact (fuel valve 1 - X8-02.1)	
	5	External power supply NO contact (fuel valve 2 - X7-01.3)	
	6	External power supply NO contact (pilot valve - X7-02.3)	
96	Any #	Error relay supervision	Remove the wire from fan output terminal X3-05.1 and perform the following two tests: 1. With power connected to the LMV3 and the LMV3 in standby, ensure there is no voltage on fan output X3-05.1. 2. With no power connected to the LMV3, ensure there is no continuity between fan output X3-05.1 and neutral. If either test fails, replace the LMV3. If both tests are passed, reset the fault.
	3	Relay contacts have welded (ignition transformer)	
	4	Relay contacts have welded (fuel valve 1)	
	5	Relay contacts have welded (fuel valve 2)	
	6	Relay contacts have welded (pilot valve)	
97	Any #	Error relay supervision	
	0	Safety relay contacts have welded or external power supply fed to safety relay	
98	Any #	Error relay supervision	If the fault occurs continuously, replace the LMV3.
	2	Relay does not pull in (safety valve - X6-03.3)	
	3	Relay does not pull in (ignition transformer - X4-02.3)	
	4	Relay does not pull in (fuel valve 1 - X8-02.1)	
	5	Relay does not pull in (fuel valve 2 - X7-01.3)	
	6	Relay does not pull in (pilot valve - X7-02.3)	
99	Any #	Internal error relay control	If the fault occurs continuously, replace the LMV3.
	3	Internal error relay control	On software version V03.10, if this error occurs during standardization of the VSD, temporarily deactivate the alarm in the case of start prevention (set parameter 210 = 0), reset the fault, and re-standardize. Otherwise, if the fault occurs continuously, replace the LMV3.
100	Any #	Internal error relay control	If the fault occurs continuously, replace the LMV3.

Error Code	Diag. Code	Description	Corrective Action
Note: Diagnostic codes are additive. If a diagnostic code appears that is not on this list, it is a combination of multiple diagnostic codes.			
105	Any #	Internal error contact sampling	1. Check the connections of the neutrals to all of the connected switches, valves, etc. 2. The diagnostic code determines which terminal on the LMV3 has an issue. Check for inductive loads that cause voltage to be present on the terminal after the LMV3 de-energizes the terminal. If voltage exists on an output terminal, such as a fuel valve, after the LMV3 de-energizes the terminal, it will cause a fault. Voltage must drop to zero on the terminal within about 10 ms after the terminal is de-energized.
	0	Stuck-at failure (pressure switch-min - X5-01.2)	
	1	Stuck-at failure (pressure switch-max / POC - X5-02.2)	
	2	Stuck-at failure (pressure switch valve proving - X9-04.2)	
	3	Stuck-at failure (air pressure - X3-02.1)	
	4	Stuck-at failure (fuel selection fuel 1 - X5-03.3)	
	5	Stuck-at failure (load controller on / off - X5-03.1)	
	6	Stuck-at failure (fuel selection fuel 0 - X5-03.2)	
	7	Stuck-at failure (safety loop / burner flange - X3-04.1, X3-03.1)	
	8	Stuck-at failure (safety valve - X6-03.3)	
	9	Stuck-at failure (ignition transformer - X4-02.3)	
	10	Stuck-at failure (fuel valve 1 - X8-02.1)	
	11	Stuck-at failure (fuel valve 2 - X7-01.3)	
	12	Stuck-at failure (pilot valve - X7-02.3)	
	13	Stuck-at failure (reset - X8-04.1)	
106	Any #	Internal error contact request	If the fault occurs continuously, replace the LMV3.
107	Any #	Internal error contact request	
108	Any #	Internal error contact request	
110	Any #	Internal error voltage monitor test	
111	Any #	Power failure	Mains voltage is too low. The mains voltage must be 102-132 VAC. Once the mains voltage returns to the required range, error code 112 will be triggered. Reset the LMV3. Note: After recovering from this fault, the fault history will only show error code 112, and the error code 111 will not be shown.
112	0	Mains voltage recovery	No fault: This code is triggered when mains voltage recovers after being too low (see error code 111).
113	Any #	Internal error mains voltage supervision	If the fault occurs continuously, replace the LMV3.
115	Any #	Internal error system counter	
116	0	Designed lifetime exceeded (250,000 startups)	The LMV3 will still operate, but this fault cannot be reset and internal parts of the LMV3 have exceeded their designed lifetime. It is recommended to replace the LMV3.
117	0	Lifetime exceeded - operation no longer allowed	Replace the LMV3.
120	0	Interrupt limitation fuel meter input	The LMV3 has detected too many disturbance pulses at the fuel meter input. Reduce electrical noise and reset the fault.

Error Code	Diag. Code	Description	Corrective Action
Note: Diagnostic codes are additive. If a diagnostic code appears that is not on this list, it is a combination of multiple diagnostic codes.			
121	Any #	Internal error EEPROM access	Reset the fault and check to make sure the last parameter that was viewed / changed is set properly. Restore the parameter set if possible. If the fault occurs continuously, replace the LMV3.
122	Any #	Internal error EEPROM access	
123	Any #	Internal error EEPROM access	
124	Any #	Internal error EEPROM access	
125	Any #	Internal error EEPROM read access	Reset the fault and check to make sure the last parameter that was viewed / changed is set properly. If the fault occurs continuously, replace the LMV3.
126	Any #	Internal error EEPROM write access	
127	Any #	Internal error EEPROM access	Reset the fault and check to make sure the last parameter that was viewed / changed is set properly. Restore the parameter set if possible. If the fault occurs continuously, replace the LMV3.
128	0	Internal error EEPROM access - synchronization during initialization	If the fault occurs continuously, replace the LMV3.
129	Any #	Internal error EEPROM access - command synchronization	Reset the fault and check to make sure the last parameter that was viewed / changed is set properly. If the fault occurs continuously, replace the LMV3.
130	Any #	Internal error EEPROM access - timeout	
131	Any #	Internal error EEPROM access - page on abort	
132	Any #	Internal error EEPROM register initialization	If the fault occurs continuously, replace the LMV3.
133	Any #	Internal error EEPROM access - request synchronization	Reset the fault and check to make sure the last parameter that was viewed / changed is set properly. If the fault occurs continuously, replace the LMV3.
134	Any #	Internal error EEPROM access - request synchronization	
135	Any #	Internal error EEPROM access - request synchronization	
136	Any #	Restore	No fault: A restore was started via parameter 050. New LMV3s require a reset after a restore. Reset the LMV3.
	1	Restore started - for further diagnostic codes, refer to error code 137	

Error Code	Diag. Code	Description	Corrective Action
Note: Diagnostic codes are additive. If a diagnostic code appears that is not on this list, it is a combination of multiple diagnostic codes.			
137	Any #	Internal error - backup / restore	An error occurred while attempting to perform a backup or restore via parameter 050. See diagnostic codes for more information.
	157 (-99)	Restore - ok, but backup < data set of current system	No fault: Restore was successful, but the backup data record is smaller than in the current system.
	239 (-17)	Backup - storage of backup in AZL23 faulty	Reset the fault and repeat the backup.
	240 (-16)	Restore - no backup in AZL23	There is no parameter set stored in the AZL23, so the restore process could not be completed. Reset the fault.
	241 (-15)	Restore - abortion due to unsuitable product no. (ASN)	The parameter set stored in the AZL23 has an unsuitable product no. (ASN), so the restore process was aborted. Reset the fault.
	242 (-14)	Backup - backup made is inconsistent	The backed up parameter set is faulty and cannot be transferred back to the LMV3. Reset the fault.
	243 (-13)	Backup - data comparison between μCs faulty	Reset the fault and repeat the backup.
	244 (-12)	Backup data are incompatible	The parameter set stored in the AZL23 is not compatible with the LMV3 software version, so the restore could not be completed. Reset the fault.
	245 (-11)	Access error to parameter Restore_Complete	Reset the fault and repeat the restore.
	246 (-10)	Restore - timeout when storing in EEPROM	Reset the fault and repeat the restore.
	247 (-9)	Data received are inconsistent	Some data in the parameter set stored in the AZL23 is invalid, so the restore could not be completed. Reset the fault.
	248 (-8)	Restore cannot at present be made	Reset the fault and repeat the restore.
	249 (-7)	Restore - abortion due to unsuitable burner identification	The parameter set stored in the AZL23 has an unsuitable burner identification and must not be transferred to the LMV3. Reset the fault and do not attempt the restore again.
	250 (-6)	Backup - CRC of one page is not correct	The restore was not possible because the backup data record is invalid. Reset the fault.
	251 (-5)	Backup - burner identification is not defined	A valid burner ID (parameter 113) is required to perform a backup. Set the burner ID, reset the fault, and start the backup again.
	252 (-4)	After restore, pages still on ABORT	Reset the fault and repeat the restore.
	253 (-3)	Restore cannot at present be made	Reset the fault and repeat the restore.
	254 (-2)	Abortion due to transmission error	Reset the fault and repeat the restore.
	255 (-1)	Abortion due to timeout during backup / restore	Communication between the LMV3 and AZL23 was interrupted during the backup or restore. Re-establish communication and reset the fault. If the fault continues, it is possible the AZL23 is too old and does not support the backup / restore functions. If this is the case, replace the AZL23.
146	Any #	Timeout building automation interface	Modbus communication has been interrupted for longer than the setting of parameter 142. Re-establish communication, then reset the fault.
	1	Modbus timeout	
	2	Reserved	

Error Code	Diag. Code	Description	Corrective Action
Note: Diagnostic codes are additive. If a diagnostic code appears that is not on this list, it is a combination of multiple diagnostic codes.			
150	Any #	TUV test	A fault occurred during the TUV test. See diagnostic codes for more information.
	1 (-1)	Invalid phase	The TUV test can only be started in phase 60 (operation). Reset the fault. When the LMV3 reaches phase 60, attempt to start the TUV test again.
	2 (-2)	TUV test default output too low	The TUV test default output (parameter 133/134) cannot be set lower than the lower load limit (parameter 545/565). Either increase the TUV test default output or decrease the lower load limit, then reset the fault.
	3 (-3)	TUV test default output too high	The TUV test default output (parameter 133/134) cannot be set higher than the upper load limit (parameter 546/566). Either decrease the TUV test default output or increase the upper load limit, then reset the fault.
	4 (-4)	Manual interruption	No fault: The TUV test was aborted manually by the user.
	5 (-5)	TUV test timeout	There was no loss of flame after shutdown of the fuel valves. Check for extraneous light or a faulty flame scanner, then reset the fault and start the TUV test again.
154	Any #	Trim function: Invalid analog value	An invalid 4-20 mA signal was detected on input X64. Check the wiring to terminal X64. Check the value of parameter 916. A value under -16% indicates <4 mA is being detected, while a value over 26% indicates >20 mA is being detected.
	1	Start prevention	
	2	Warning (trim function temporarily disabled)	
155	Any #	Trim function: Invalid curve setting of VSD / PWM blower	The following equations set the limits on the curve settings for the VSD / PWM blower. Fuel 0: Parameter 669:00 + parameter 547 curve point parameter 669:01 - parameter 548 Fuel 1: Parameter 669:00 + parameter 567 curve point parameter 669:01 - parameter 568
	1-9	Minimum value VSD curve invalid	A VSD curve point is below the permissible minimum value (diagnostic code = point number, example: 1 = point P1)
	21-29	Maximum value VSD curve invalid	A VSD curve point is above the permissible maximum value (diagnostic code = point number, example: 21 = point P1)
	41-49	Fuel 1: Minimum value VSD curve invalid	Fuel 1: A VSD curve point is below the permissible minimum value (diagnostic code = point number, example: 41 = point P1)
	61-69	Fuel 1: Maximum value VSD curve invalid	Fuel 1: A VSD curve point is above the permissible maximum value (diagnostic code = point number, example: 61 = point P1)
156	Any #	Trim function: Maximum time for trim limit exceeded	A trim limit was met for the maximum allowable time. See diagnostic codes for more information.
	0	Lower limit trim function	The VSD trim signal was lower than allowed by the minimum trim limit (parameter 547) for a time period longer than the maximum time allowed (parameter 551).
	1	Upper limit trim function	The VSD trim signal was higher than allowed by the maximum trim limit (parameter 548) for a time period longer than the maximum allowed (parameter 551).
	10	Fuel 1: Lower limit trim function	The VSD trim signal was lower than allowed by the minimum trim limit (parameter 567) for a time period longer than the maximum time allowed (parameter 571).
	11	Fuel 1: Upper limit trim function	The VSD trim signal was higher than allowed by the maximum trim limit (parameter 568) for a time period longer than the maximum allowed (parameter 571).
157	Any #	Trim function: Failed the analog input test	A fault occurred during the analog input test. See diagnostic codes for more information.
	0	Analog value standby	If the analog input test is enabled, the LMV3 looks for 12mA to be present on terminal X64 during standby. Check parameter 916 to ensure that the input signal lies in the permissible range of -1%...+1%. Setting parameter 530 to a value other than 2 or 4 disables the analog input test.
	1	Analog value prevention	If the analog input test is enabled, the LMV3 looks for 4mA to be present on terminal X64 during prepurge. Check parameter 916 to ensure that the input signal lies in the permissible range of -16%...-14%. Setting parameter 530 to a value other than 2 or 4 disables the analog input test.

INDUSTRIAL COMBUSTION

Error Code	Diag. Code	Description	Corrective Action
Note: Diagnostic codes are additive. If a diagnostic code appears that is not on this list, it is a combination of multiple diagnostic codes.			
165	Any #	Internal error	If the fault occurs continuously, replace the LMV3.
166	0	Internal error watchdog reset	
167	Any #	Manual locking	The LMV3 has been manually locked (no fault). Reset the LMV3 to clear the fault.
	1	Manual locking by contact	
	2	Manual locking by AZL23	
	3	Manual locking by PC software	
	8	Manual locking by AZL23 - timeout / communication breakdown	During a curve adjustment on the AZL23, the timeout for menu operation has elapsed (parameter 127), or communication between the LMV3 and AZL23 has been lost. Re-establish communication and reset the fault.
	9	Manual locking by PC software - communication breakdown	During a curve adjustment on the ACS410 software, communication between the LMV3 and the ACS410 software has been lost for more than 30 seconds. Re-establish communication and reset the fault.
	33	Manual locking by PC software - test of lockout	A reset was made via the ACS410 software when the LMV3 was not in alarm. Reset the LMV3 to clear the fault.
168	Any #	Internal error management	If the fault occurs continuously, replace the LMV3.
169	Any #	Internal error management	
170	Any #	Internal error management	
171	Any #	Internal error management	If the fault occurs continuously, replace the LMV3.
200 OFF	Any #	System error-free	The LMV3 displays this code when there are no current faults.
201 OFF UPr0 OFF Upr1	Any #	Prevention of startup	The LMV3 cannot start up because a parameter is not defined. The diagnostic code calls out which parameter is not defined. Choose a valid selection for the undefined parameter and then reset the fault.
	1	No operating mode selected	
	2	No fuel train defined	
	4	No curves defined	
	8	Standardized speed undefined	
	16	Backup / restore was not possible	
202	Any #	Internal error operating mode selection	Make a valid selection of parameter 201/301, then reset the fault.
203	Any #	Internal error	Make a valid selection of parameter 201/301, then reset the fault. If the fault occurs continuously, replace the LMV3.
204	24	Program stop is active (phase 24)	No fault: The program stop feature is active. Set parameter 208 to 0 to deactivate the program stop if it is no longer required.
	36	Program stop is active (phase 36)	
	44	Program stop is active (phase 44)	
	52	Program stop is active (phase 52)	
205	Any #	Internal error	If the fault occurs continuously, replace the LMV3.

Error Code	Diag. Code	Description	Corrective Action
Note: Diagnostic codes are additive. If a diagnostic code appears that is not on this list, it is a combination of multiple diagnostic codes.			
206	0	Inadmissible combination of units (LMV3 / AZL23)	Reset the LMV3. If the fault occurs continuously, replace the LMV3 and / or AZL23.
207	Any #	Version compatibility LMV3 / AZL23	Replace the unit called out in the diagnostic code. Be sure that the new unit has up-to-date software.
	0	LMV3 version is too old	
	1	AZL23 version is too old	
208	Any #	Internal error	If the fault occurs continuously, replace the LMV3.
209	Any #	Internal error	
210	0	Selected operation mode is not released for the LMV3	Select a different operation mode via parameter 201/301.
240	Any #	Internal error	If the fault occurs continuously, replace the LMV3.
242	Any #	Invalid parameterization	Make a valid selection of parameter 277/377, then reset the fault.
	0	Invalid setting of parameter 277	Set parameter 277 to a valid value.
	1	Invalid setting of parameter 377	Set parameter 377 to a valid value.
245	Any #	Internal error	If the fault occurs continuously, replace the LMV3.
250	Any #	Internal error	

6.5 — Restoring LMV3 Parameters

To restore a backed up parameter set (see **Section 3.6.2 (I)**, **Back up the LMV3 parameter settings to the AZL**):

With the display showing **{400: Set}** “400” flashing,

press **(-)** until the backup 000 parameter group displays as:

{000: Int} “000” flashing

Press **(↵ enter)** to select this parameter set.

Press **(+)** to advance to parameter 050 where display shows:

{050.00: 0} “050” blinking

Press **(↵ enter)** to select the parameter and the display shows:

{bAC_uP}

Press **(+)** to go to “restore” parameter:

{rEStorE}

Press **(↵ enter)** to select the restore process; the display shows:

{ 0}

Press **(+)** to shift the value in change mode 1 position to the left. The display shows

{ 1 } with "1" flashing

Note: to detect potential display errors the value is displayed 1 place shifted to the left.

Press **(↵ enter)** to activate the restore process; the "1" shifts to the right edge and stops flashing:

{ 1}

Wait approximately 8 seconds and display changes to a non-flashing "0".

{ 0}

Restore is complete.

Note: Before restoring the backup data on the basic unit, the latter compares the burner identification (parameter 113) and LMV product no. with the burner identification and product no. of the backup data set. If the data is consistent with the equipment, they are restored. If not, the restore process is aborted. If the process stops or an error occurs during the restoration, the display shows a negative value. For error diagnostics, the cause of the error can be determined from the diagnostic code of error message 137 (see Error code list). When the restore process is successfully completed, value 0 appears on the display.

A message **Err C:136 D: 1** (restore started) is displayed momentarily to acknowledge a 'restore' has been initiated.

⚠ Caution

- **On completion of the restore process, the sequence of functions and the parameter settings must be checked.**

6.6 — Default Settings

Default settings for certain key parameters are listed below.

TABLE 6- 3. Q Burner Parameter Guide

Option	Description	Value
42	OEM Password	YYYYY
113	ID	351
186.01	Drop out delay of flame signal	30
201	Burner Operating Mode	7
227	Gas: Safety time 1 (TSA1)	4
229	Time to respond to pressure faults in TSA1 & TSA2	5
230	Gas Interval 1 (flame establishment before release to modulate)	5
231	Safety time 2 TSA2 (time main valve and pilot valve on before pilot off)	5
232	Gas Interval 2 (main flame establishment)	5
233	Time allow see flame after turned off	3
234	Postpurge Time	3
236	Gas: Pressure switch-min input X5-01 0 = inactive, 1 = pressure switch-min (before fuel valve 1), 2 = valve proving via pressure switch-min (between fuel valve 1 (V1) and fuel valve 2 (V2)	1
237	Gas: Pressure switch-max / POC input X5-02 1 = Pressure switch-max, 2 = POC	1
502.01	no-flame prepurge positions fuel actuator	0
502.02	no-flame postpurge positions fuel actuator	0
542	Activate PWM	1
601.01	Actuator reference point	1
602.01	Actuator direction of rotation	0

Hold down the i/reset key to get to Service Parameters

Startup/Service Report

Startup/Service Report (required to validate warranty)

The following information should be filled in by the service technician at startup or after any adjustment to the burner. A copy of the startup report MUST be forwarded to IC to validate burner warranty.

Registration

Startup Date:	
Serial Number:	
Burner Model:	

LEGEND

"w.c. = inches water column (pressure)
MMBH = Million British Thermal Units Per Hour
Stack Temp (gross) = flue gas temperature inside stack

BURNER CHECKS

Electric Power (enter readings)	**Voltage**	**Amperage**
Burner motor/control circuit:		

Combustion air:	Air path to burner air-inlet is clear? (circle one)	no	yes
	Burner room has adequate supply of fresh air? (circle one)	no	yes
Gas Train Leak Test:	Train tested; corrective action taken if required (circle one)	no/fail	yes/passed

Test readings (enter values):		**Test Conducted at Gas Firing Rate**		
		Low	**50%**	**High**
	Firing Rate (MMBH)			
	Flame Signal Reading			
	Steam Pressure (PSIG)			
	Water Temperature °F			
	Room Temp °F			
	Stack Temp (gross) °F			
	O2%			
	CO2%			
	CO (PPM)			
	NOx (PPM)			
	Combustion Efficiency %			
	Stack-Draft pressure ("w.c.)			
	Furnace Pressure ("w.c.)			
	Blast Tube Pressure ("w.c.)			
Gas Pressure at:	regulator inlet ("w.c.)			
	regulator outlet ("w.c.)			
	burner manifold ("w.c.)			

FUEL CURVE

LMV3 Fuel-Curve Settings (enter values):	**fuel-curve point**	**Air Speed %**	**Fuel angle (°)**
	P0 (ignition)		
	P1 (low fire)		
	P2		
	P3		
	P4		
	P5		
	P6		
	P7		
	P8		
	P9 (high fire)		

CONTROL CHECK

Note: certain devices may not be applicable		**Test**	**Set Point**
Heat Exchanger:	Low Water Cutoff (LWCO)		
	Auxiliary Low Water Cutoff (ALWCO)		
	High Water Cutoff (HWCO)		
	Operating (cut in & cut off) Limit control		
	Operating (modulation) Control		
	High Limit		
Burner:	Combustion Air Switch		
	Flame Failure		
Gas Train:	High-gas pressure switch		
	Low-gas pressure switch		
	Proof-of closure switch		

SIGN OFF

	Printed Name	Signature	Date
Commissioned by:			
End User - Accepted by:			

Contacts

Industrial Combustion Technical Support:
Phone: (608)-328-9010
Email: technicalservicegroup@ind-comb.com

Siemens SCC Combustion
Phone: (224) 366-8445
Email: techsupport@SCCcombustion.com

Warranty Policy

Limited Warranty: The Company warrants that at the time of shipment, the equipment manufactured by it shall be merchantable, free from defects in material and workmanship and shall possess the characteristics represented in writing by the Company. The Company's warranty is conditioned upon the equipment being properly installed and maintained and operated within the equipment's capacity under normal load conditions with competent supervised operators.

Equipment, accessories, and other parts and components not manufactured by the Company are warranted only to the extent of and by the original manufacturer's warranty to the Company. In no event shall such other manufacturer's warranty create any more extensive warranty obligations of the Company to the Buyer than the Company's warranty covering equipment manufactured by the Company.

Exclusions from Warranty: (I) THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES, ORAL OR EXPRESS OR IMPLIED, INCLUDING ANY WARRANTIES THAT EXTEND BEYOND THE DESCRIPTION OF THE EQUIPMENT. THERE ARE NO EXPRESS WARRANTIES OTHER THAN THOSE CONTAINED HEREIN TO THE EXTENT PERMITTED BY THE LAW. THERE ARE NO IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE. THE PROVISIONS AS TO DURATION, WARRANTY ADJUSTMENT AND LIMITATION OF LIABILITY SHALL BE THE SAME FOR BOTH IMPLIED WARRANTIES (IF ANY) AND EXPRESSED WARRANTIES.

(II) The Company's warranty is solely as stated in (a) above and does not apply or extend, for example, to: expendable item; ordinary wear and tear; altered units; units repaired by persons not expressly approved by the Company; materials not of the Company's manufacture; or damage caused by accident, the elements, abuse, misuse, temporary heat, overloading, or by erosive or corrosive substances or by the alien presence of oil, grease, scale, deposits or other contaminants in the equipment.

Warranty Adjustment: Buyer must make claim of any breach of any warranty by written notice to the Company's home office within thirty (30) days of the discovery of any defect. The Company agrees at its option to repair or replace, BUT NOT INSTALL, F.O.B. Company's plant, any part or parts of the equipment which within twelve (12) months from the date of initial operation but no more than eighteen (18) months from date of shipment shall prove the Company's satisfaction (including return to the Company's plant, transportation prepaid, for inspection, if required by the Company) to be defective within the above warranty. Any warranty adjustments made by the Company shall not extend the initial warranty period set forth above. Expenses incurred by Buyer in replacing or repairing or returning the equipment or any part or parts will not be reimbursed by the Company.

Spare and Replacement Parts Warranty Adjustment: The Company sells spare and replacement parts. This subparagraph (10.4) is the warranty adjustment for such parts. Buyer must make claim of any breach of any spare or replacement parts by written notice to the Company's home office within thirty (30) days of the discovery of any alleged defect for all such parts manufactured by the company. The Company agrees at its option to repair or replace, BUT NOT INSTALL, F.O.B. Company's plant, any part or parts or material it manufacture which, within one (1) year from the date of shipment shall prove to Company's satisfaction (including return to the Company's plant, transportation prepaid, for inspection, if required by the Company) to be defective within this part warranty. The warranty and warranty period for spare and replacement parts not manufactured by the company (purchased by the Company, from third party suppliers) shall be limited to the warranty and warranty adjustment extended to the Company by the original manufacturer of such parts; In no event shall such other manufacturer's warranty create any more extensive warranty obligations of the Company to the Buyer for such parts than the Company's warranty

adjustment covering part manufactured by the Company as set forth in this subparagraph (10.4). Expenses incurred by Buyer in replacing or repairing or returning the spare or replacement parts will not be reimbursed by the Company.

Limitation of Liability: The above warranty adjustment set forth Buyer's exclusive remedy and the extent of the Company's liability for breach of implied (if any) and express warranties, representations, instructions or defects from any cause in connection with the sale or use of the equipment. THE COMPANY SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES OR FOR LOSS, DAMAGE OR EXPENSE, DIRECTLY OR INDIRECTLY ARISING FROM THE USE OF THE EQUIPMENT OR FROM ANY OTHER CAUSE WHETHER BASED ON WARRANTY (EXPRESS OR IMPLIED) OR TORT OR CONTRACT, and regardless of any advice or recommendations that may have been rendered concerning the purchase, installation, or use of the equipment.