

Anderson Thermal Solutions (Suzhou) Co., LTD

## VFS82 Burner Operation Manual

<b>No:</b>	ATS–Operation Manual–VFS82
<b>Subject:</b>	VFS82 Burner Operation Manual
<b>Version :</b>	V1.0
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This manual has been written for those who are already familiar with all aspects of nozzle mix burner and its add-on components. Main contents of the manual including safety rules, burner installation, commissioning, operation parameters, maintenance and troubleshooting, spare parts, etc.

### 1. Disclaimer Notice

Anderson Thermal Solutions (Suzhou) Co., Ltd. reserves the right to change the construction and/or configuration of our product at any time without informing customers. If the product or its individual modules are used for purposes other than the designated purpose, their effectiveness and suitability must be confirmed.

Anderson warrants that the product itself will not infringe any patents. Every effort has been made to make this manual as accurate and complete as possible. If you find errors or omissions, please contact us so we can correct them.

### 2. Liability And Warranty

Due to negligence, breach of warranty or other reasons, Anderson's liability for its products is limited to the provision of such replacement parts and will not be liable for any other injury, loss or expense, whether direct or indirect, including but not limited to Loss of or damage to the use of materials that sell, install, use, fail to use or repair or replace Anderson related products.

The warranty is void if: any operation explicitly prohibited in this manual, any adjustment or assembly process not recommended or authorized.

### 3. Safety Guide

Only those who were trained and qualified person can follow the manual to operate or adjust the combustion system. The fire was prohibited within a radius of 5 meters of the combustion system. Flame, non-covered light sources or heat sources shall not be brought to the combustion area unless it is related to the process. Welding in combustion control area shall be approved to ensure the safety in the area and also preventive measures should be taken into consideration.



Before starting, the operator must confirm whether the burner and gas pipeline are in normal working condition, and there is no flammable substance around the burner. The burner must be operated with fuel and oxygen or air. The ignition and operation of the burner must be performed at the specified position. The burner has been correctly and safely installed before ignition. The ignition of the burner needs to be performed after the

combustion chamber is purged. If it is ignited at a low temperature, it needs to be replaced with 5 times the volume of the combustion chamber to avoid explosion.

However, it is not necessary to purge when the temperature is higher than 750°C. Air pipe or gas pipe connected with burner should be tight enough with no leakage, also the periodically check air or fuel nozzles of the burners to prevent to be blocked by dust, slag or other materials.

**ATTENTION: DANGER OF BEEN BURNT**



When burner in operation, combustion is severe, so the burner must be fixed. Hoses or cables in area of the combustion system must be suitable for high temperature, to prevent high temperature failure or cause safety accidents. Burners should be periodically inspected and cleaned. Copper wire brush may be used, if necessary, to clean burner head. The burner system should be checked twice a year for safety operation.

Burner commissioning shall take care of ignition position, minimum and maximum output position. Following interlocks will cause emergency stop, including gas low pressure, high pressure or low combustion air pressure, as well as emergency stop is triggered, the main power is out, UV signal failure or kiln safety conditions (such as high temperature limit, flue system opening, etc.) will cause the burner lockout. Users need to know the maintenance interval recommended by the manufacturer and the interval specified by national laws, whichever is shorter.

#### 4. Fuel Information

Following table shows combustion fuel characters of natural gas and oxygen, safety rules must be obeyed when operation carried out.

Fuel	Natural gas
Low Calorific value	35,900 [kJ/m <sup>3</sup> ]
Composition	>98% CH <sub>4</sub>
Reference conditions	1,013.25 mbar, 0°C

#### 5. VFS82 Series Burner Description

VFS82 series burners are the patented products of Anderson Thermal Solutions (Suzhou) Co., Ltd. Designed for high input capacity. It is widely used for industrial applications, including large dryers, ovens, calciners, kilns, thermal fluid heaters, thermal oxidizers, oil

heaters, vaporizers, boilers, liquid and waste incineration, and numerous environmentally sensitive air heating or similar application. The burners are nozzle mixture type. VFS82 series of burners are available in VFS82L and VFS82W. The L series provides a smaller diameter, longer flame than the W series. The W series burners have a larger diameter, shorter flame.

### 5.1 VFS82 Series Burner Advantages

Compared with other types of Anderson burners, VFS82 series burners with:

- High turndown capabilities on a wide range of fuels result from the stable flame produced by the swirl air.
- Clean, smoke-free combustion results from the unique “vortex generator” which vaporizes fuel oils.
- Low NOx and CO emissions.
- Rugged heavy gauge steel wind box and volute assemblies provide durability.
- Operates with low excess air for maximum efficiency or high excess air for high volume process air heating.
- Single wall alloy, air-cooled alloy, and refractory versions available.
- Standard firing arrangement is horizontal but can be fired vertically with additional gas lance support rods.
- suitable for different kinds of fuels such as natural gas, propane, light oil, or heavy oil.

### 5.2 VFS82 Series Burner Introduction

VFS82 series burner includes burner body, gas or oil nozzle, ignition burner, spark rod and peep sight, vortex generator components, flame monitor device, etc. It is to be noted that flame monitoring must be provided by an ultraviolet scanner. For gas fuel application, can use one UV scanner to monitor pilot and main flame signal; for dual fuel application, one UV to monitor pilot burner and the other for main fire as the fuel is oil.

VFS82 series of burners cross-section view shown as below Fig. 1.

Item	Description
100	Gas inlet
120	Burner combustor
200	Burner body
230	Combustion air entrance
250	Vortex generator component
377	Pilot burner

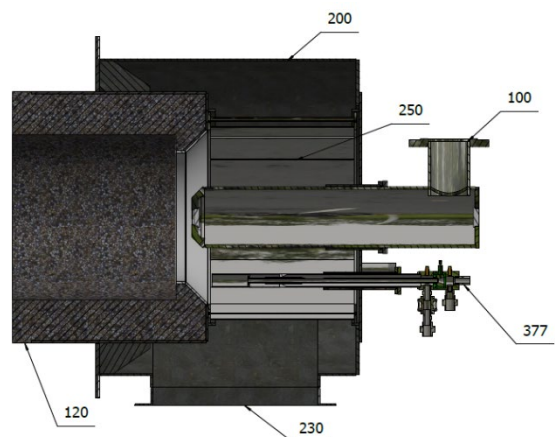


Fig. 1 VFS82 Cross Section View

### 5.3 Ignition Burner

VFS82 Series Burner has a separated ignition burner of maximum capacity 50kw. User need to supply fresh combustion air for ignition pilot, so, a small air blower or compressed air needs to be applied to the pilot burner. According to pilot burner's manual, 5mbar combustion air and 3mbar gas pressure are necessary for pilot burner operation. The pressure above is needed for neutral environment, if oven chamber pressure is not neutral, chamber pressure needs to be added to the pressure value above. It should be noted that the depth of ignition burner extend to main burner is adjustable according to site requirement. Pilot burner diagram shown as Fig. 2 as blew.

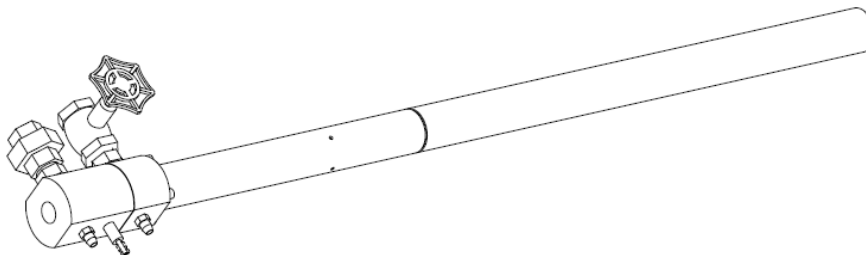


Fig. 2 Pilot burner

## 6. VFS82 Burner Operation Data

VFS82 series burners operation datasheet shown as Table 1:

Table 1: VFS82 Series Burners Operation Datasheet

PARAMETER	BURNER TYPE					
	VFS82G 30	VFS82G 50	VFS82G 65	VFS82G 95	VFS82G 120	VFS82G 160
Maximum Input (MW)	3	5	6.5	9.5	12	16
Minimum Input (MW)	0.1	0.2	0.3	0.4	0.4	0.6
Gas Inlet Pressure(mbar)	60	60	60	60	60	115
Combustion Air Pressure(mbar)	20	20	20	20	20	20

Max Air Flow (Nm <sup>3</sup> /h)		3450	5750	7475	10925	13800	18400
Max Gas Flow (Nm <sup>3</sup> /h)		300	500	650	950	1200	1600
High Fire Flame Length (m)	Model L	2.0	2.3	2.6	3.1	3.6	3.9
	Model W	1.8	2.0	2.4	2.7	3.0	3.3
High Fire Flame Diameter (m)	Model L	0.7	0.8	0.9	1.0	1.1	1.2
	Model W	0.7	0.8	0.9	1.1	1.2	1.4

**Remark:**

- Maximum combustion air temperature :260°C
- Maximum chamber temperature:1200°C
- Flame length and diameter measured here based on normal temperature combustion air and natural gas, and also the air gas ratio is 1:11
- Data above all based on natural gas, for other fuel, please contact Anderson Thermal Solutions (Suzhou) Co., Ltd.

Burner operation curve shown as Fig. 3 and Fig. 4 below:

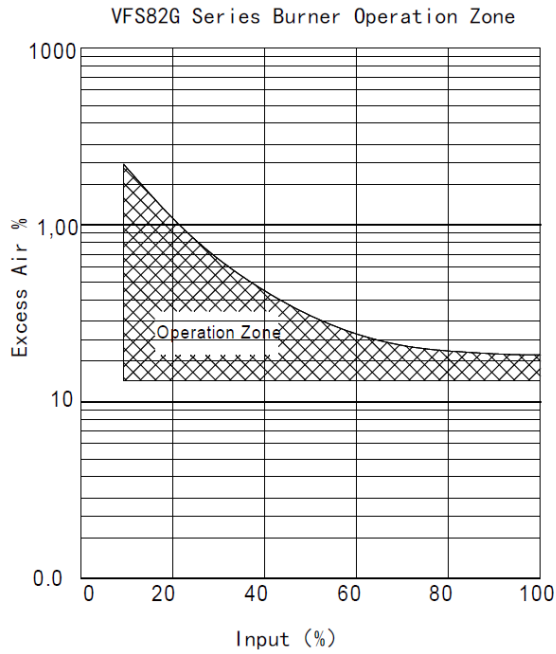


Fig. 3 VFS82G Series Burner Operation Zone

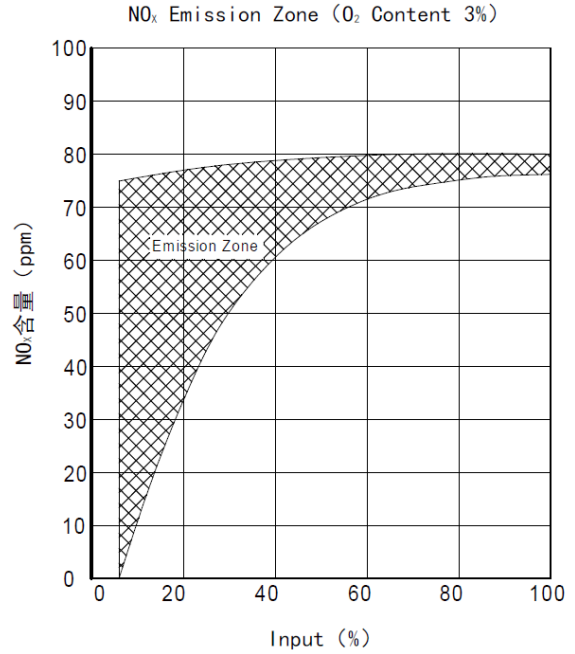
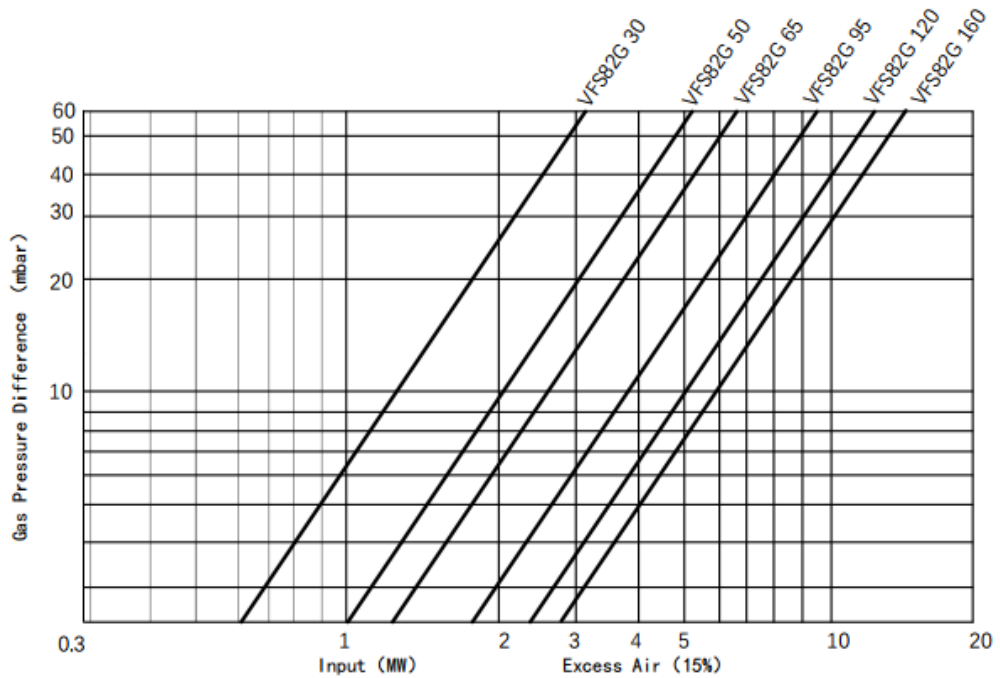


Fig. 4 VFS82G Series Burner NO<sub>x</sub> Emission Zone

VFS82G series burner gas pressure drop cross burner vs. input curve shown as Fig. 5





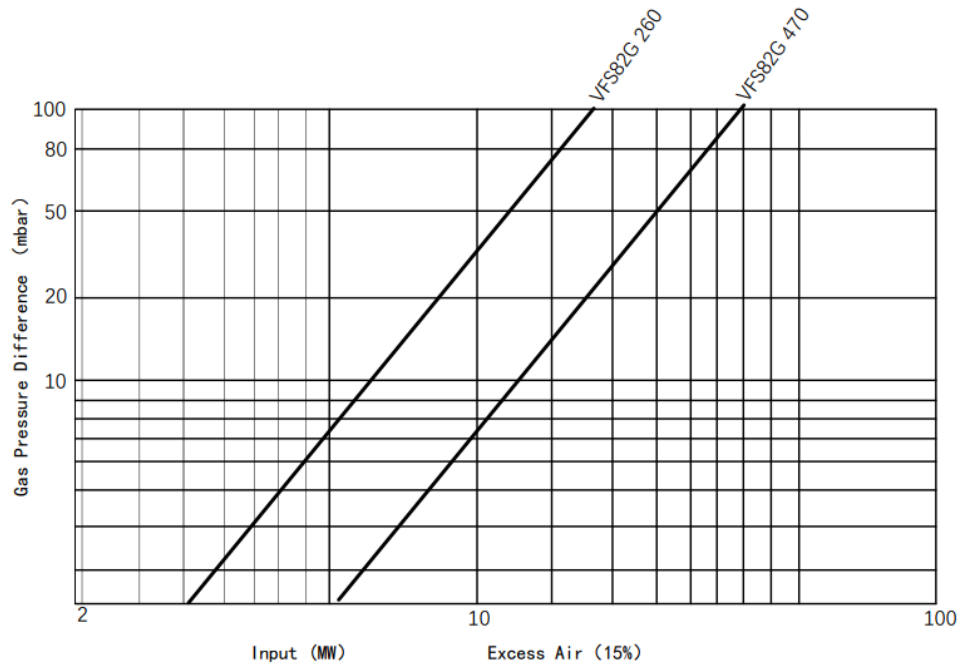


Fig. 5 VFS82G Series Burner Operation Gas Pressure Drop Curve

VFS82G series burner air pressure drop cross burner vs. input curve shown as Fig. 6

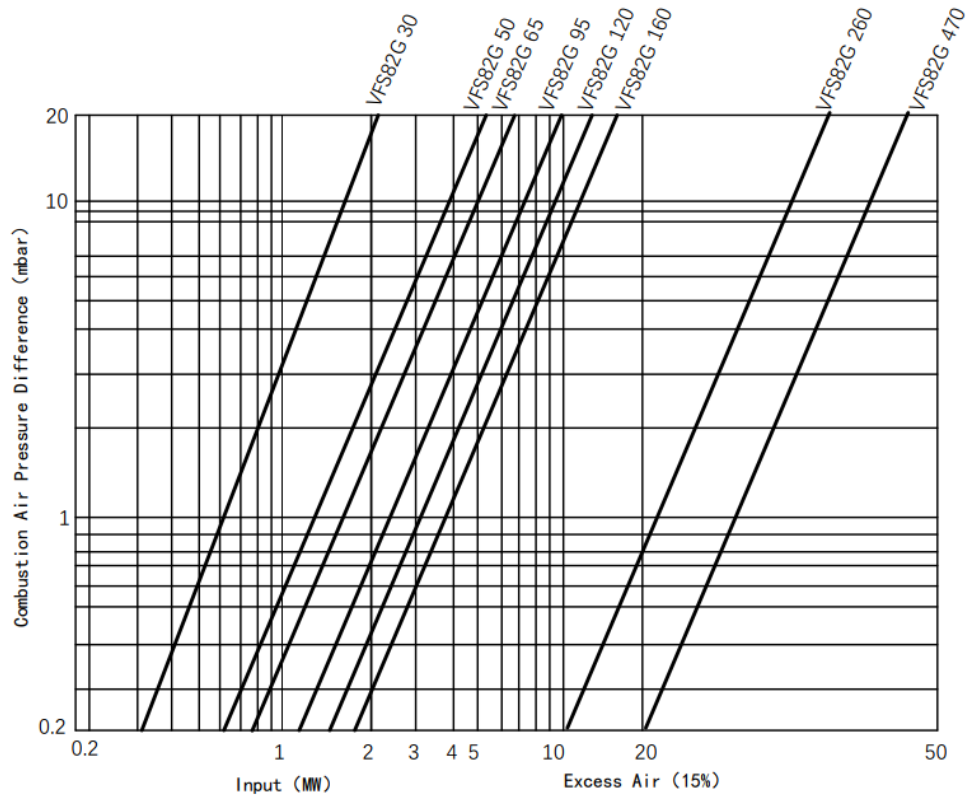


Fig. 6 VFS82G Series Burner Operation Air Pressure Drop Curve

**Remark:** Pressure drop refers pressure difference between burner and oven chamber.

## 7. VFS82G Series Burner Installation

When installing this series of burners, the burner is fixed to the mounting hole of the furnace with bolts, it should be noted that a gasket is required between the burner and the furnace wall. The gasket may be ceramic fiber or glass fiber. When the burner is installed, the burner can be rotated according to the site condition. After burner is installed, make the related components wired. The combustion air inlet pipeline of the combustor could be moved in the normal direction. It could be moved and adjusted when the flame signal is not good or the occurrence of a ringing phenomenon occurs in the ignition area. VFS82 series of burner installation dimensions as Fig. 8.

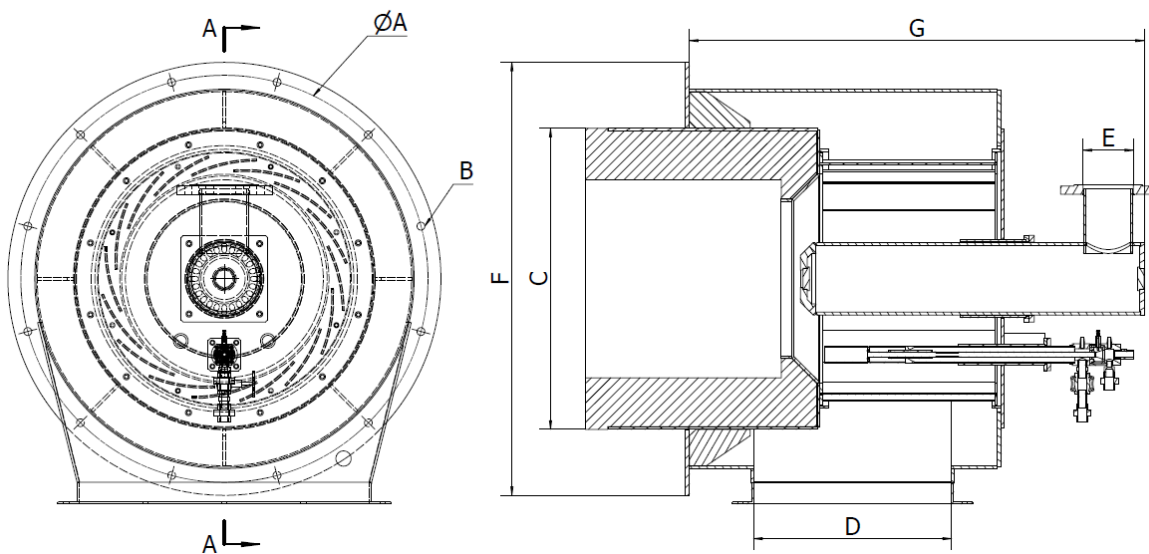


Fig. 8 VFS82G Series Burner Installation Diagram

Different types of VFS82 burner dimensions shown as Table 2.

Table 2 VFS82G Series Burner Installation Dimension

VFS82G	A(mm)	B(mm)	C(mm)	D(mm)	E	F(mm)	G(mm)
30	927	12	772	229	2.5'	991	641
50	1080	12	899	305	3'	1143	838
65	1207	12	1000	381	3'	1270	984
95	1397	16	1153	457	3	1473	1203
120	1524	16	1280	533	DN100	1600	1394
160	1702	24	1407	622	DN100	1778	1557

## 8. Burner Start, Commissioning and Stop

For the first time burner startup, then you must follow these steps:

1. Reset the System:  
Close the automatic fuel shut-off valves and the fuel cocks.
2. Set High Fire Combustion Air Pressure Drop:  
Start the combustion air fan.  
Set the air control damper to produce the desired high fire pressure drop across the burner. Air pressure drop should be read as a differential pressure between the wind box pressure test port and the chamber. See the datasheets for the combustion air pressure drop versus air flow curves.
3. Verify Air Settings:  
Make sure that all the settings are still the same after you cycle the system several times between high fire and low fire. Check the air proving switch and adjust if necessary.
4. Ignition pilot burner:  
Run the system only with ignition pilot burner, adjust combustion air and gas pressure to get stable flame signal. Please refer to relative pilot burner datasheet.
5. Main burner ignition:  
Make sure the combustion air fan is running. Adjust the main gas regulator to supply the minimum pressure required; see the datasheets for gas pressure drop information. Verify that the main gas control valve is at its minimum open position. Light the pilot. Open all manual fuel shut-off valves. Initiate the ignition sequence through the flame safety. Check that the pilot and main burner flames are ignited. Measure the gas pressure drop, taken between the burner pressure taps as indicated on the datasheets and a tap in the combustion chamber. The gas flame should be pale blue color set inside the refractory combustion block. Low fire setting finished.
6. Adjust High Fire:  
Drive the main gas control valve to high fire. Measure the gas and air pressure drops at high fire and compare to the appropriate chart on the datasheets. If the maximum input is not achieved or is too high, an adjustment can be made to the main gas control valve or the main gas pressure regulator can be adjusted higher or lower. The main gas flame should be slightly blue periphery and a somewhat yellowish center at high fire, refer to datasheets for flame length estimates.
7. Verify Settings:  
Once the high and low fire conditions have been set, cycle the burner from high to low fire several times to check repeatability of settings. Shut down the burner and relight to ensure automated pilot and main flame ignition operates correctly. Check all safety interlocks and limits to ensure proper operation.
8. Stop Procedure:  
Drive combustion air and gas valves to low fire position. Shut off main gas supply valves and pilot. Leave combustion air at low fire until combustion chamber and block are cooled to under 80°C; once cooled, shut off combustion air fan. Shut off all manual valves

as required.

## 9. Burner Maintenance

Preventive maintenance is the key to a reliable, safe and efficient combustion system. The core of any preventive maintenance system is a list of periodic tasks. These are guidelines only. The customer should make the final determination on maintenance intervals and tasks to be performed while considering the working environment.

System regular safety audit must be taken out, including gas leakage check no longer than every half a year. If necessary, the frequency of audit should be increased. Leak detection, control functions of the equipment must be included in the scope of audit. Only Anderson technicians or those who are been trained and qualified by Anderson, as well as other relevant professionals, can maintain the burners. All valves, especially ball valves, must be slowly open or close when switching in order to prevent pressure shock in pipe.

### 9.1 Bi-annual checklist

- Inspect the flame sensing devices for good condition and cleanliness.
- Check for proper air and gas pressures.
- Test all the system alarms for proper response signals.
- Check and clean igniter electrodes.
- Check valve motors and control valves for free, smooth action and adjustment.
- Check for the proper operation of ventilating equipment.
- Test the interlock sequence on all safety equipment. Manually force each interlock to intentionally fail while at the same time noting if related equipment closes or stops as specified by the manufacturer. Test the flame safeguard by manually shutting off the gas to the burner.
- Test the manual gas shut off cocks for proper operation.

### 9.2 Yearly checklist

- Leak test the safety shut-off valves and pipe for tightness of closure to make sure no leakage.
- Test the pressure switch settings by checking the switch movements against pressure settings and comparing these with the actual impulse pressure.
- Visually check igniter cable and connectors.
- Be sure the burner bodies and air wings, the igniter and the flame sensors are not damaged or distorted.

## 10. Troubleshooting Procedures

<b>Problem</b>	<b>Possible Cause</b>	<b>Solution</b>
Cannot initiate a start sequence	Air pressure switch has not made contact	Check air pressure switch adjustment. Check air filter. Check blower rotation. Check outlet pressure from blower.
	High gas pressure switch has activated. Low gas pressure switch has activated	Check incoming gas pressure, adjust if necessary. Check pressure switch setting and operation
	Purge cycle not completed.	Check flame safeguard system or purge timer.
	Malfunction of the flame safeguard system (e.g., flame sensor failure or electrical noise in the sensor line). No power to the control unit.	Have a qualified electrician troubleshoot and correct the problem.
	Main power is off.	Be sure the main power to the system is switched to the “on” position.
Start-up sequence runs but burner does not light	There is no power to the ignition transformer	Restore the power to the ignition transformer
	No power to ignition transformer or wire broken between transformer and sparker	Check electrical connection between the transformer and the sparker.
	The igniter needs cleaning	Clean the igniter
	The igniter is not correctly grounded to the burner	Clean the threads on the igniter and the burner. NOTE: Do not apply grease to the threads on the igniter
	Too much gas: Improper gas valve train sequence	Verify solenoid valve is down-stream of proportionator
	Too much gas: Manual gas butterfly valves have been opened too far	Check pressures and settings against start-up report and adjust as necessary
	Too much gas: Gas pressure out of the main gas pressure regulator is too high	Check start-up setting. If necessary, remove the regulator and investigate.
	Not enough gas: The gas pressure out of the main gas pressure regulator is too low	Check start-up setting. Check the regulator and adjust if necessary

	Not enough gas: Start gas solenoid valve does not open	Check solenoid valve coil for proper orientation. Replace if necessary
	Not enough gas: Gas valve not open, not enough gas. Air in the gas line	Check wiring to the automatic gas shut-off valve. Check output from the flame safeguard. Open gas cock. Purge gas line.
The low fire flame is weak or unstable	Low fire adjusted too slow Not enough gas Incorrect air flow setting	Increase low fire gas setting. Check start-up settings and adjust to increase low gas flow. Check start-up settings. Investigate any change, i.e., blocked filter, loose connections.
The burner goes off when it cycles to high fire	Insufficient air (flame too rich)	Check start-up settings. Check air filter, clean or replace if required
The burner is erratic and does not respond to adjustment	Flame signal weak Internal damage to the burner. Some parts inside the burner may be loose or dirty.	Check condition of flame monitoring device. Contact Anderson
The burner is unstable or produces soot or smoke	The air/gas ratio is out of adjustment	Measure all gas pressures and air pressures. Compare to initial start-up settings, and adjust them were necessary
Cannot achieve full capacity	Air filter is blocked Gas pressure is too low into the main gas pressure regulator Increase furnace/chamber pressures Poor piping practices	Clean or replace the air filter. Adjust gas pressure. Re-check setup pressures Contact Anderson

## 11. Appendix

### 11.1 Training Record

Each trained person must verify that he has read and understood the contents of the operating manual and know how to operate and maintain this series of burners correctly.

Manual Number and Revision	Date	Who (Name)	Signature

### 11.2 Bi-annual Audit Record

Routine audit must be made every 6 months. Please sign the following table.

Function Audit	Date	Inspector	Problem description	Next Audit Time
Flame sensor state				
air and gas pressure				
Alarm signals				
igniter electrode				
Control motors				
Ventilate equipment				
Interlock Function				
Shut off cock function				
Combustion air blower				

### 11.3 Annual Audit Record

Yearly audit list as follow but not only included

Function Audit	Date	Inspector	Problem description	Next Audit Time
Leak test				
Pressure switch test				
Cable and connectors				
Burner bodies and air wings				

**Attention:** Safety audit is prohibited when burner is running, otherwise, an accident could be caused!



If you have any questions. Please call us or send an e-mail to get more information

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Meanwhile, you can also visit our website [www.andtecs.com](http://www.andtecs.com) to get more product information.