Anderson Thermal Solutions (Suzhou) Co., LTD

VFI84 Burner Operation Manual

No：	ATS–Operation Manual–VFI84
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CONTENT

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 configuation 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 inposition. 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 trigged, 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/m3]
Composition	>98% CH4
Reference conditions	1,013.25 mbar, 0°C

5. VFI84 Series Burner Description

VFI84 series of burners are the patented products of Anderson Thermal Solutions (Suzhou) Co., Ltd. Designed for the incineration exhaust from dryers, ovens and other similar equipment. The burners are nozzle mixture type.

5.1 VFI84 Series Burner Operation Process

VFI84 series of burners are mounted in the exhaust duct and required the exhaust stream to supply all of the oxygen needed for complete combustion. Because of character of the process, they are well suited to applications require clean high rate of destruction of volatile organic compounds, smoke and odors. Do not use choke rings or other turbulence-inducingdevices in downstream combustion chambers—they may cause erratic burner performance.

VFI84 series of burners' operation process shown as Fig 1.

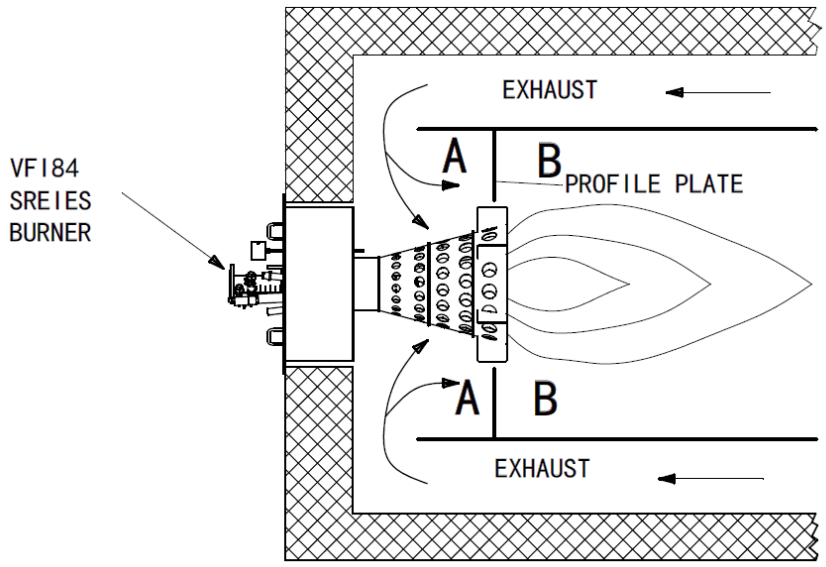
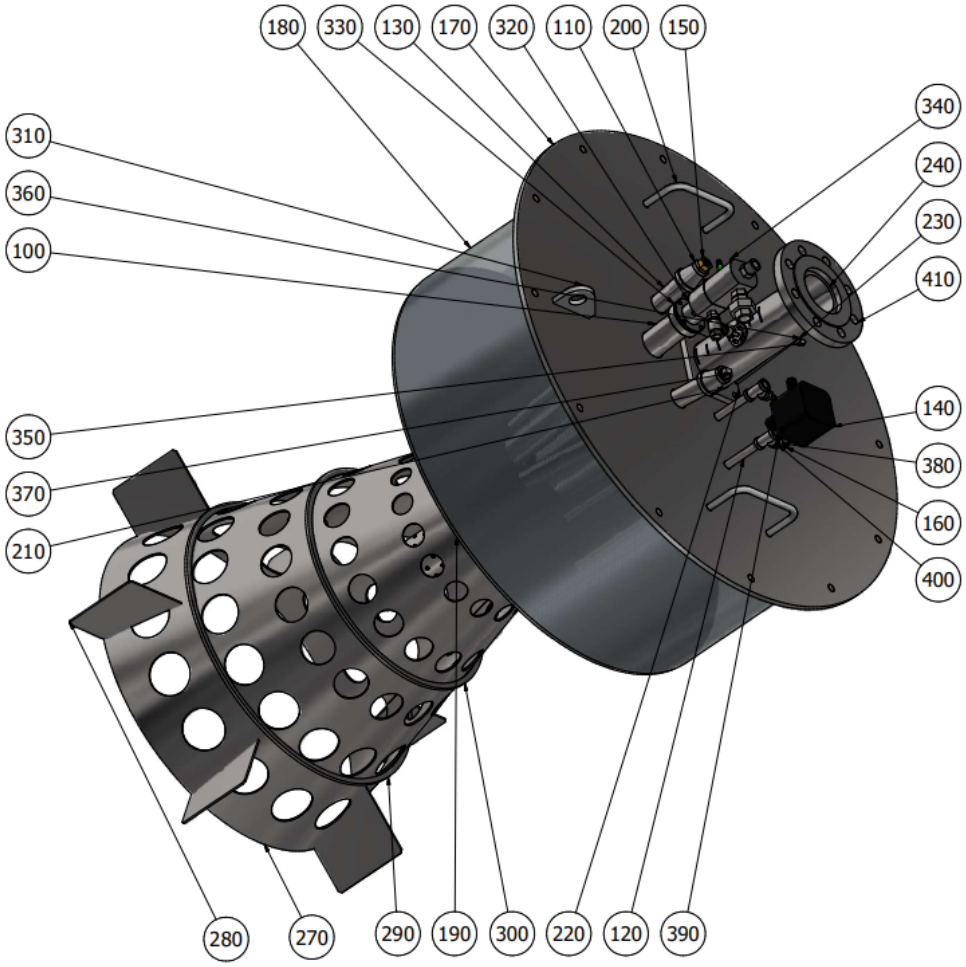


Fig 1 VFI84 Series of Burner Operation Process

5.2 VFI84 Series Burner component's introduction

VFI84 series burner including burner body, gas or oil nozzle, pilot burner, spark rod and peep sight, etc. It is to be noted that flame monitoring must be provided by an ultraviolet scanner. Flame rod monitoring is not acceptable. VFI84 series burner schematic diagram and related components are shown in Figure 2 below.



Number	Name	Number	Name
110/150	peep sight	140	air pressure switch
170/180	burner body	**200**	installation handle
310	pilot burner	370	UV installation point
390	chamber pressure test	410	gas inlet flange

Fig2 VFI84 Series Burner diagram

5.3 Pilot burner

VFI84 Series Burner has a separated pilot burner of maximum capacity 50kw.User need to supply fresh combustion air for pilot burner, typically a small air blower or compressed air need to apply to pilot burner. According to pilot burner's manual, 5 mbar combustion air and 3 mbar gas pressure is necessary for pilot burner operation continually. These pressure requirements satisfy combustion chamber with neutral pressure, if oven chamber pressure exists, chamber pressure needs to be added to the pressure value mentioned above. It should be noted that the depth of pilot burner

extend to the main burner is adjustable according to site requirement. Pilot burner diagram shown as Fig as blow.

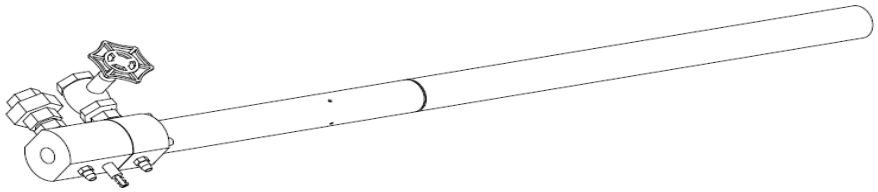


Fig 3 pilot burner

5.4 Combustion Air

Air passing through the burner for combustion must contain 13% or more oxygen. Combustion air pressure difference between burner (shown as A and B in figure 1) should be at the range of 2-8 mbar, optimum operation is obtained at 5-8 mbar. Profiling of the process stream is required.

6. VFI84 Burner Operation Data

Follow parameters should be at specific range when VFI84 series burners are applicated

- Maximum exhaust temperature of upstream of burner: 600 °C
- Maximum exhaust temperature of downstream of burner: 900 °C
- Maximum hot exhaust pressure difference between burner: 8 mbar (A and B pressure difference in figure 1)
- Minimum hot exhaust pressure difference between burner: 2 mbar (A and B pressure difference in figure 1)
- Minimum exhaust oxygen content: 13%.
- When hot exhaust pressure drop of the burner is 5 mbar, the exhaust flue gas turndown ratio can be about 2. The ratio increases when pressure drop gets higher.
- Maximum burner fuel turndown ratio will be 26 when the pressure drop between the burner is 5 mbar
- Maximum ignition capacity:50 kw (with natural gas and fresh air)
- Maximum flame length:3 times length of the burner cone diameter.
- Flame supervision: UV scanner only
- NO_X emission: typically, less than 3000 ppm.
- CO emission: less than 100 ppm if combustion chamber is 700 °C or hotter, and the incoming fume stream contains at least 16% oxygen by volume

7. VFI84 Burner Selection

Figure 4 horizontal axis is inlet temperature of the process stream, use the actual inlet temperature curve, read up to the curve representing the desired stream outlet temperature and then left is the KW/hr. required per cubic meter of process stream. Multiply this figure times the cubic meter of process stream flow at high fire. This is the

required KW input from the burner at high fire. In the example shown on the graph, the inlet process stream temperature is 400 °C, and the desired outlet temperature is 800°C. This requires 172*10^{-3}KW/h, then multiply the total volume of the exhaust is the capacity of the burner needed. Select in Table 1 below, you can get the total capacity input.

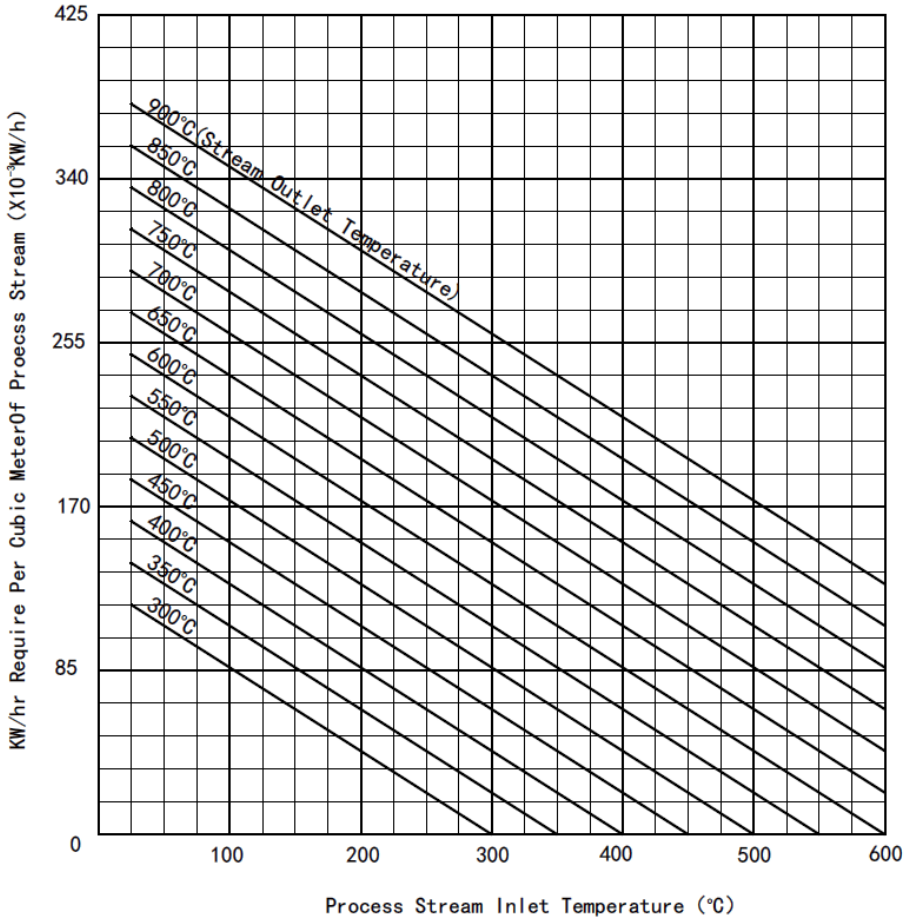


Fig 4 Burner Input Curve Diagram

VFI84 series burner provides 9 types of different capacity burners, table 1 below is the VFI84 series Burner capacity.

BURENER TPYE	CAPACITY（KW）	
	MINIMUM	MAXIMUM
VFI84G2000	75	2000
VFI84G2500	100	2500
VFI84G4000	150	4000
VFI84G5000	200	5000

Table 1 VFI84 Series Burner Capacity

8. VFI84 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 arbitrarily rotated according to the site condition. When installation is completed, then related components are made electrically connected.
The gas gun could be pushed in or pull out when the flame signal is not good during switch from pilot to main burner.
VFI84 series of burner installation dimensions as Figure 5 shown below

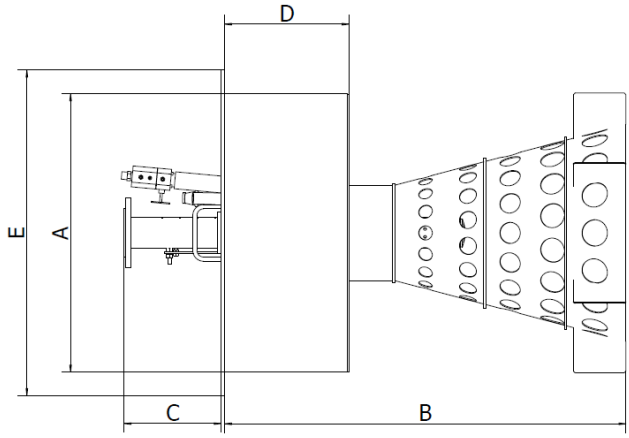


Fig 5 VFI84 Serises Burener Installtion Diagram

Different types of VFI84 burner dimensions shown as Table 2 below.

Burner Type	Dimension（mm）				
	A	B	C	D	E
VFI84G2000	595	905	275	253	708
VFI84G2500	695	1055	275	303	808
VFI84G4000	795	1147	280	353	930
VFI84G5000	895	1395	280	353	1030

Table 2 VFI84G burner installation table

9. Burner Main Fire Commissioning

1. Once the pilot is established, the main gas flow can be adjusted. Drive the control motor to low fire.
2. Adjust the gas control valve opening to obtain a stable low fire flame.
3. Drive the gas control valve to high fire. Adjust gas pressure difference of burner inlet and chamber to the range 75-87 mbar.

4. Drive the control valve to low fire and check for a stable low fire flame.
5. Cycle the temperature control valve to high fire and verify that the pressure drop is consistent with the previous setting. Re-adjust if necessary.
6. As the incinerator comes up to temperature, backpressures and combustion air temperatures will change. Make final burner adjustments after the incinerator has reached its normal operating temperature.

10. 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 check list. 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, and control functions of the equipment must be included in the scope of the audit. Only Anderson technicians or those who are 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.

10.1 Half a year 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 actuators 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.

10.2 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 ignite and the flame sensors are not damaged or distorted.

11. Troubleshooting Procedures

Problem	Possible Cause	Solution
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 transformer and 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 control valve 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 regulator and investigate.

	Not enough gas: The gas pressure out of the main gas pressure regulator is too low	Check start-up setting. Check 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 the 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. Compared to the 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

12. Appendix

12.1 Training Record

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

Manual Number and Revision	Date	Who (Name)	Signature

12.2 Half Year Audit Record

Routine audits 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				

12.3 Yealy 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 question. Please call us or send e–mail to get more information
Our telephone no. is +86 (512) 6592 4663
Our email address is mail to**: info@andtecs.com**
Meanwhile, you can also visit our website www.andtecs.com to get more product information.