



Anderson Thermal Solutions (Suzhou) Co., LTD

ANM75 Burner Operation Manual

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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 ³]
Composition	>98% CH ₄
Reference conditions	1,013.25 mbar, 0°C

5. ANM75 Series Burner Description

ANM75 series Burners are line type burner, ideal for generating large volumes of clean, hot air, used for ovens, dryers, fume incinerators, and similar industrial equipment.

Burners are constructed of carbon steel burner bodies and stainless steel air wings. The burner bodies supply fuel to the center of the air wings.

The air and fuel mixture inside the burner are controlled by air wing design and gas nozzles to optimize emissions and efficiency.

ANM75 series burner are modular design, can assembled from straight sections to various shape, allowing for customized heat inputs. Blower connects with burner air duct to provide combustion air with correct air flow and pressure. Brackets are available for slot firing or duct mounting and flanges are available for continuous flange mounting. Gas flow is controlled by gas control valve. Ignition can be by direct spark or by ignition pilot. Flame rod supervision can be from either one end or both ends. Combustion air flow (DP) switch and process air DP switches are factory mounted on the burner.

ANM75 Series Burner Advantage:

- An integral combustion air blower can be ordered mounted on the back of the burner, to provide combustion air.
- Stable operation over a wide range of duct velocities from 1.5m/s to 30m/s without installing a profile plate around the burner.
- High turn down ratio to 40:1 to match different requirement.
- The modular design, length of each module is 300 mm. Output of each module can get as high as 300KW, different modules can be installed with shape of line shape, "I" shape, "T" shape or "+" shape according to customer requirement.
- Only 10% excess air is needed when burner run at high fire.
- Reliable operation performance, once commissioning is complete, it is stable under same condition, no need extra adjustment or maintenance.
- Burner suit for different gas fuel such as natural gas, LPG or hydrogen.

6. Burner Component Introduction

75ANM series burners are mainly made up of air wings, gas channel, peripheral fixing device and connecting devices. Air wings were fixed by rivets, different components are connected together with rivets or bolts to form the Burner body. Shown as below Fig 1 is exploded drawing view, in which the air wing and outer connectors are made of stainless steel, gas channels and connectors are cast iron.

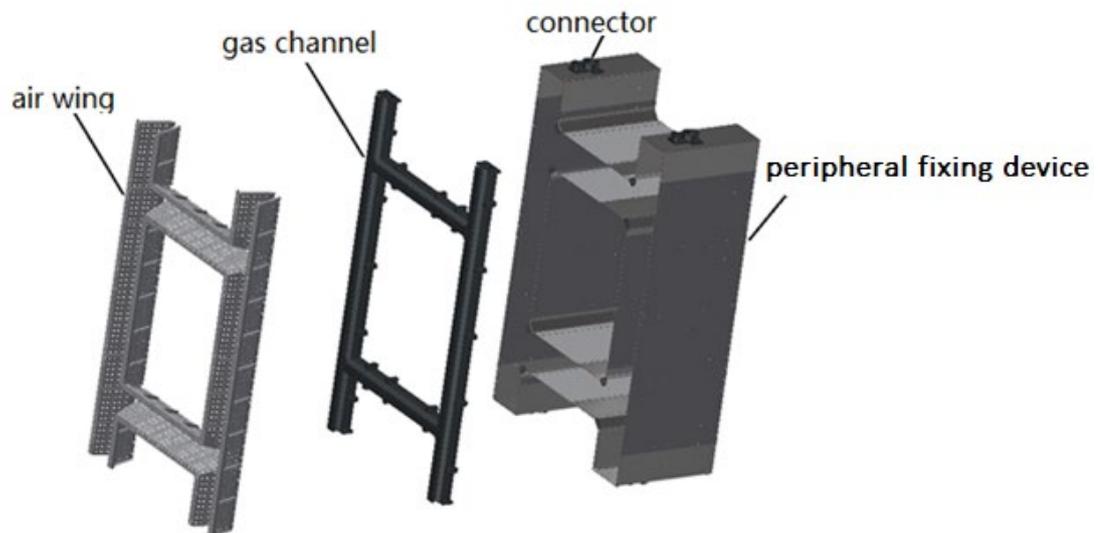


Fig 1. ANM75 Series Burner Explosion View

7. Burner Operation Data

- Maximum input: 990 kW/m (when air DP across burner is 2.5mbar)
- Minimum input: 24 kW/m
- Fuel inlet pressure: 22 mbar
- High fire flame length: 1100mm. (when air DP across burner is 2.5mbar, the lower air DP, the longer flame)
- Upstream temperature limit: –30°C to 400°C
- Downstream temperature limit: 800°C
- Ignition: Direct Spark Ignition or pilot ignition
- Flame detection: Flame rod or UV scanner
- Fuels: Natural Gas, Propane, hydrogen

Remark:

Air DP across burner means air pressure difference between burner inlet and chamber, gas pressure different means gas pressure difference between burner inlet and chamber.

8. Performance Curves

The operation and emission curves of the ANM75 series burner is shown in figure 2 and figure 3.

ANM75 Series Permance Graphs

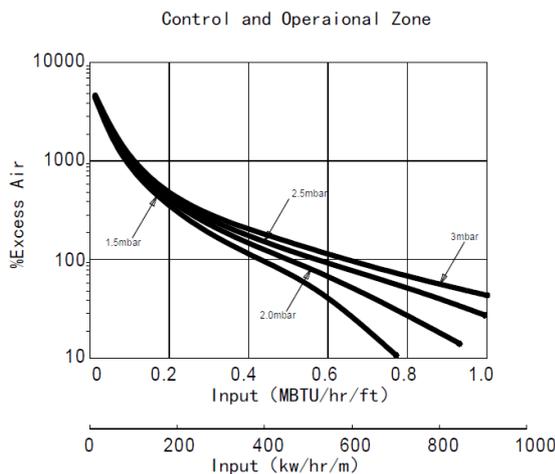


Fig 2. ANM75 Series Burner Operation

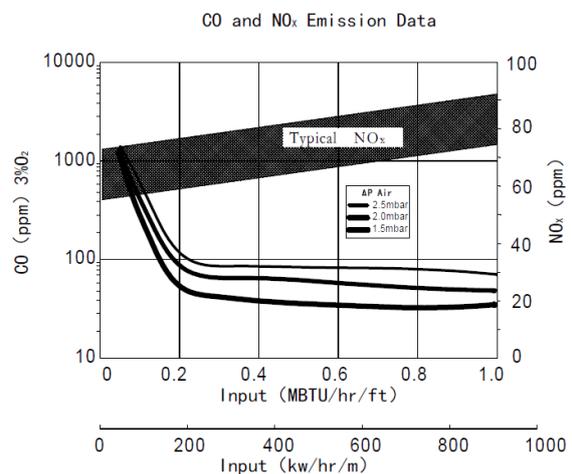


Fig 3. ANM75 Series Burner emission

9. Burner datasheet

The input and flame length curves of the ANM75 series burner is shown in figure 4 and 5

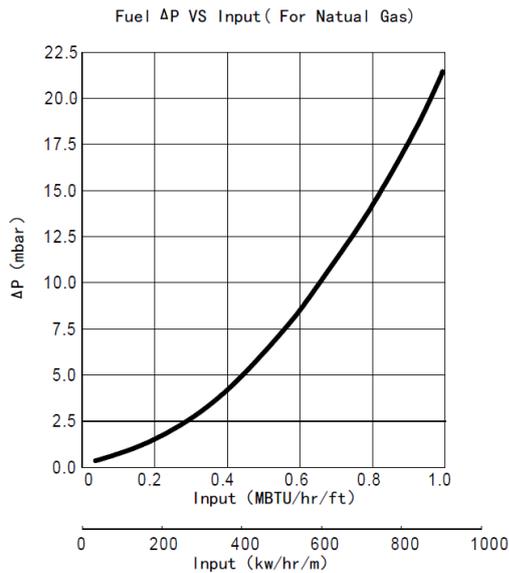


Fig 4. ANM75 Series Burner Input Curve

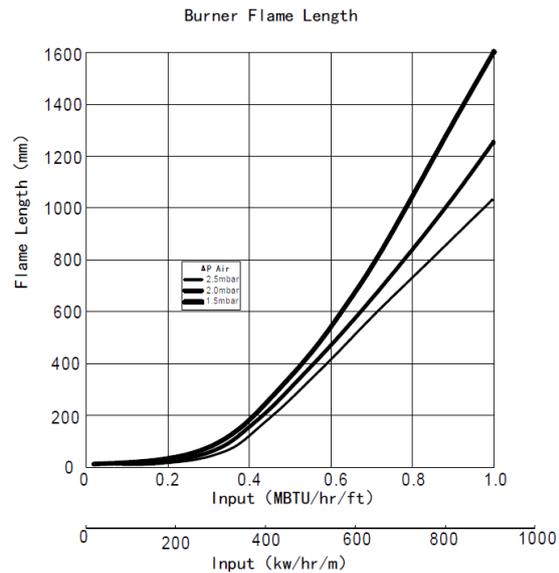


Fig5. ANM75 Series Burner Flame Length Curve

10. Burner Installation

10.1 Storage:

1. Make sure that the area is clean.
2. Store the components in a cool, clean, dry room.
3. Keep the components in the original package as long as possible

10.2 Handing

1. Make sure that the components are clean and free of damage.
2. Protect the components from weather, damage, dirt and moisture.
3. Protect the components from excessive temperatures and humidity.
4. Use appropriate support equipment, i.e., harnesses, straps, chains etc. when lifting burner components.

10.3 Pre-Installation Checklist

If there are corrosive fumes or materials in the surrounding air, find a clean air source to supply to the burner. Observe ambient temperature limits as stated in Datasheet.

Combustion air from outside of burner room, needs at least 6 cm² per 1 kW to supply sufficient fresh, outdoor combustion air.

Combustion air from inside duct, there must be a minimum of 18% O₂ present in the process air flow to ensure proper burner performance.

Do not allow exhaust gases to accumulate in the work area. Provide a means for exhausting these gases from the building by blower, install the burner so it may be easily accessed for inspection.

10.4 Environment

Be sure the burner operating environment matches the original operating specifications. Check the following items:

- Voltage, frequency, and stability of electrical power

- Fuel type and fuel supply pressure
- Adequate fresh, clean, combustion air
- Humidity, altitude, temperature and presence of damaging corrosive gases of the supply air.

10.5 Burner Mounting

1. Mounting methods

The installation modes of ANM75 series burners are as follows: process air parallel to combustion flame, process air vertical to combustion flame, the former can be divided into blower installed in the air duct and outside the air duct, the specific diagram shows as fig 6 that the air duct burner installed in the center of the air duct.

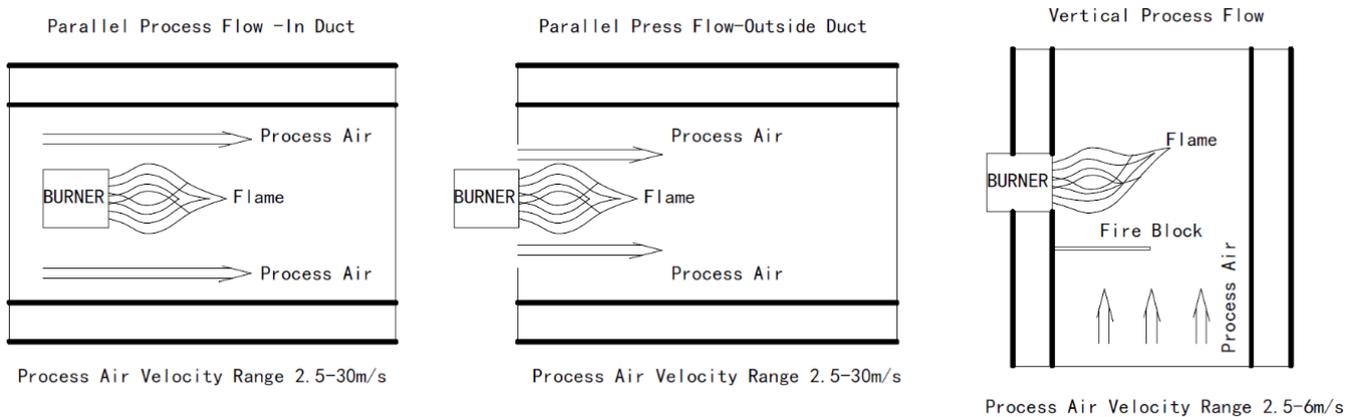


Fig 6. ANM 75Series Burner Installation Layout

2. Corner distance

When laying in the duct, allow least length downstream of the burner should be 1100mm to avoid flame impingement; as fig 7 below shown, please see fig 5 for flame length.

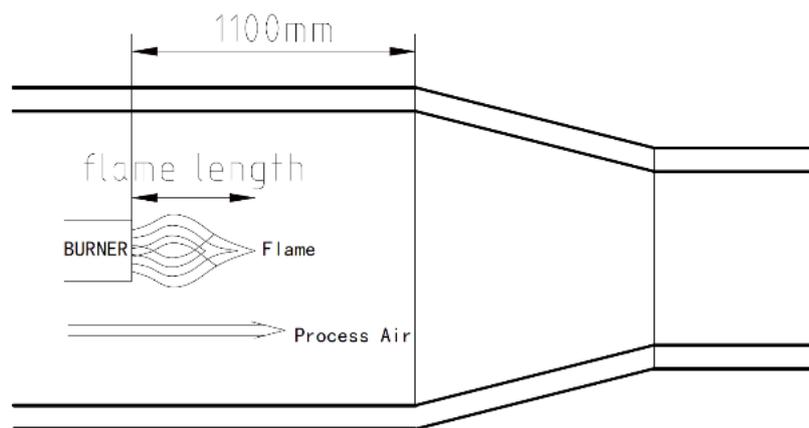


Fig 7. ANM75 Series Burner Installation Layout

When burner longer than 900 mm, use a hanger or a pedestal to support the blower and motor. Process air velocity must be within the limits.

3. Profile Plate Adjust

Provide an opening in the duct 80mm larger than the external burner dimensions gap on all 4 sides.

Profile plates are not required for good burner operation, but uniform velocity must be maintained for the full length of the burner. If velocity is not uniform, profile plates can be used to correct this condition. Profile plates should be positioned flush with the firing end of the burner. If necessary, the plates can be located up to 1/2" back from the firing end, but under no circumstances should they be in front of the burner.

4. Valve train connection

Locate the valve train as close as possible to the burner to make sure gas reach the burner during the trial for ignition time. Sufficiently size shut off valves in the valve train. In order to decrease pressure loss in pipe, minimize piping elbows to be used while pipe union is recommended. Flexible pipe is good optional but pressure lost must be considered.

5. Flame monitoring

There are two different types of flame sensors:

UV scanners

Each ANM75 Series burner is capable of U.V. flame monitoring. The burner will not come equipped with a UV scanner. A 1/2" BSPT connection is provided on each burner for the connection of UV scanner.

Flame Rod

If the flame rod option was selected when the burner was ordered, the burner will be delivered with the flame rod already installed on the burner.

10.6 Checklist after installation

To verify the system was properly installed, perform the following checks:

- Be sure there are no leaks on gas lines.
- Be sure all the components for flame monitoring, pressure switch and wiring are properly installed.
- Be sure all components of the spark ignition system are installed and functioning properly.
- Be sure the blower rotates in the proper direction. If the rotation is incorrect, have a qualified electrician rewire the blower to rotate in the proper direction.
- Be sure all valves are installed in the proper location and correctly oriented relative to the flow direction.

10.7 Prepare for adjustment

After installation of the burner system components is complete, the following steps should be followed in order to prepare for adjustment:

- Set the air flow switch so that it drops out at 50% below the maximum pressure of the combustion air blower.

- Set the low gas pressure switch at 50% below the gas pressure measured at the inlet to the main gas valve train. Set the high gas pressure switch at 50% above the gas pressure measured at the inlet to the main gas valve train.
- Try to ignite the burner before the purge and other timers have finished their cycles. Make sure that the flame monitoring system indicates a flame failure.
- Trip out the pressure switches and other limit interlocks. Make sure that the main gas valve train closes.
- If the simulated limit condition or the simulated flame fault cannot be responded at the specified fault response time, the fuel system needs to be turned off to correct the existing problems.

10.8 Burner starting

Special attention:

The ANM75 Series burners, described herein, are designed to mix fuel with air and burn the mixture. All fuel burning devices are capable of producing fires and explosions, if improperly applied, installed, adjusted, controlled, or maintained. Do not bypass any safety feature; fire or explosion could result. Never try to light a burner if it shows signs of damage or malfunction.

If you are adjusting burner for the first time, you must follow these steps:

1. Reset the system: Start circulating duct fan, close these valves, the automatic gas valves and manual gas cocks.
2. Set air flow: Measure the air pressure drop across the burner inlet and duct. Turn the disc on the blower air inlet until the air pressure is between 1.5 to 3.0 mbar. For a given input, lower air pressure drops will produce a longer flame, and higher drops will produce a shorter flame with slightly higher CO levels
3. Burner ignition: The gas actuator gets ignition position, the spark plug starts ignition, at the same time, pilot gas valve open let gas go through the burner to get flame which is detected by flame or UV scanner to establish stable pilot flame.
4. Main gas valve open after pilot flame established to set up main flame, all the ignition process finished.
5. Set high/ low fire gas: Drive the gas actuator to the high fire position, adjust the outlet of the pressure regulate according to the combustion parameter diagram, set the gas flow. Then drive the actuator to low fire position, adjust valve opening, setting gas flow, then get to the high fire position again, adjust gas flow for the second time, driving again to low fire position to set gas flow to make sure that all settings are still the same. Do this cycle several times between high and low fire until satisfied.
6. Determine gas flow: After several cycles of high and low fire positions, check whether the gas flow at different load positions is similar in same position. It is very difficult to measure the very low gas pressures experienced at low fire, and it may be necessary to rely on visual inspection of the flame. This is especially true when gas turndowns in excess of 20 to 1 are being used. The main intent is to provide a stable flame with good flame signal that will not cause the chamber temperature

to overshoot.

10.9 Stop Procedure

Do not turn the combustion air blower off until the chamber temperature is below 120°C. This will prevent hot gases from back flowing into the burner and blower causing damage to the burner.

1. Stop the burner through the burner control system.
2. Run the combustion air blower until the chamber temperature drops below 80°C.
3. Shut off the combustion air blower.
4. Close all manual gas valves to the burner

11. 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.

11.1 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 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.
- Inspect and clean the combustion air blower rotor. Clean and/or replace the combustion air blower filter if applicable.

11.2 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.

12. 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	PILOT IGNITION ONLY	
	Pilot gas pressure low	Adjust pilot gas pressure
	Pilot gas cock closed	Open pilot gas cock
	Pilot solenoid valve close	Check wire for solenoid valve
	Gas adjusting valve set too low	Increase opening of the valve
	Air in the pilot line	Repeat start for several times
PILOT IGNITION OR DIRECT SPARK		
Attempting to ignite at inputs greater than 60%	Reduce start point gas flow. Verify control circuit.	
Weak or non-existent spark.	Verify ignition transformer is a 6,000 – 8,000 Volt transformer	

	There is no power to the ignition transformer	Restore the power to the ignition transformer
	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
	Igniter insulator is broken. Igniter is grounding out.	Inspect the igniter. Replace if broken.
	Not enough gas:	
	The gas flow into the burner is too low.	Check the start-up settings. Adjust low fire gas setting if necessary
	Gas valve does not open	Check the wiring to the automatic gas shut-off valve. Check the output from the flame safeguard. Open manual gas cock.
	No flame signal	
	Broken flame rod Dirty UV scanner lens Flame rod grounding not good	Replace if necessary Inspect and clean sensor. Verify that the flame rod is installed correctly and is the correct length.
The low fire flame is weak or unstable	Not enough gas Incorrect air flow setting	Check start-up settings and adjust to increase gas flow. Check air pressure drop across the burner and adjust.
The burner does not go to high fire.	Not enough gas pressure out of main gas regulator. Gas pressure drops as input is increased main gas control valve is not functioning	Adjust pressure regulator so pressure is provided as stated Check for clogging of valves and regulators in gas line. Pressure regulator may be incorrectly sized. Replace if necessary



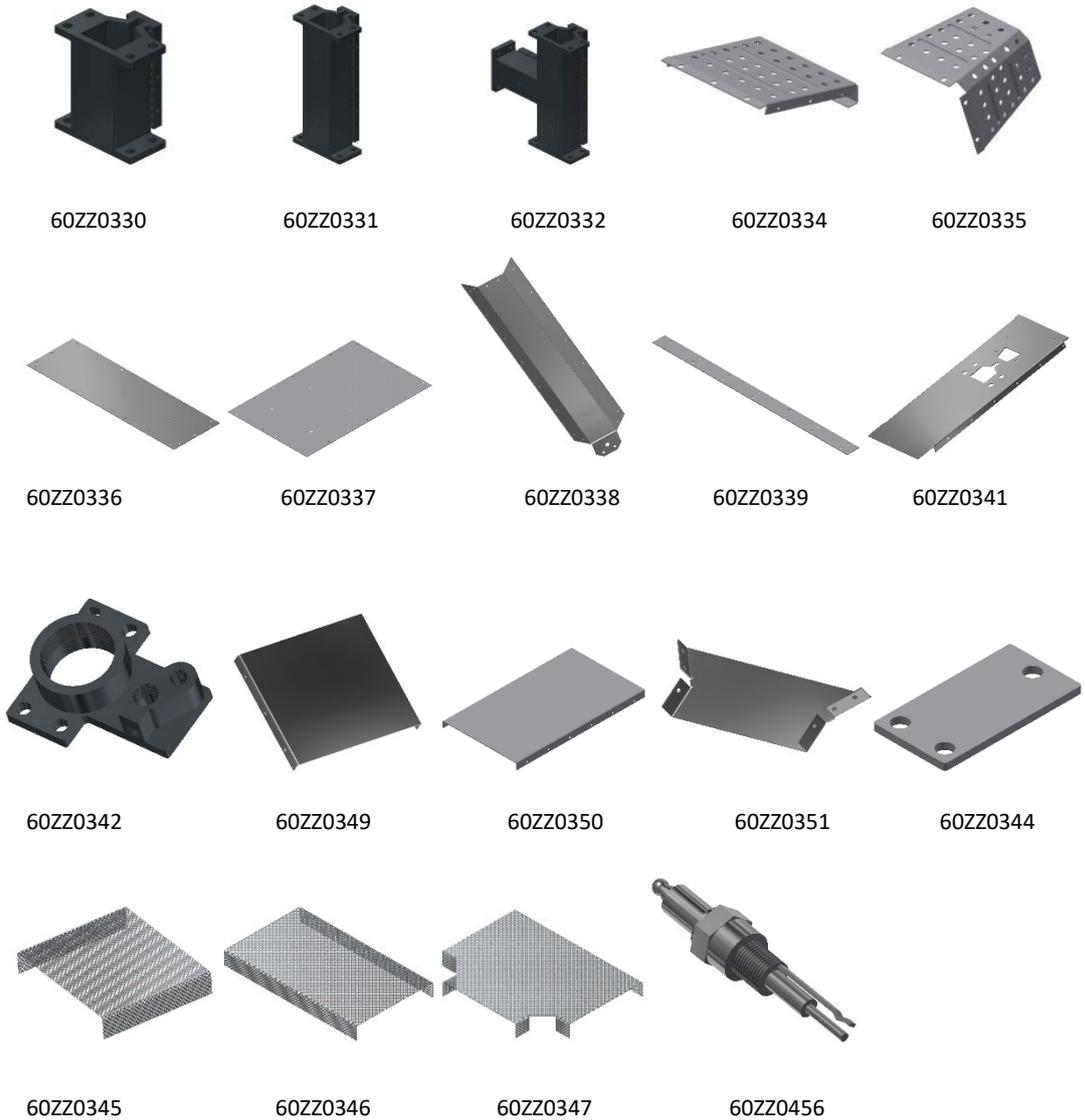
<p>Burner does not achieve capacity.</p>	<p>Main gas control valve is not functioning. Burner is firing below rated input Burner gas holes are plugged</p>	<p>Check actuator and linkage Check gas pressure DP, adjust main gas pressure regulator as necessary Inspect gas holes for dirt or lint as needed</p>
<p>Main flame is uneven along the length of the burner.</p>	<p>Air pressure drop/velocity is too low. Poor air distribution in duct Air wings are dirty, holes are clogged</p>	<p>Increase air pressure drop Check profiling and duct obstructions Inspect and clean air wings if necessary</p>
<p>Main flame is yellow and long at high fire</p>	<p>Gas pressure too high at burner inlet. Air wings are dirty, holes are clogged. Air pressure drop/velocity too low.</p>	<p>Check gas pressure against design. Adjust main gas pressure regulator Inspect and clean air wings if necessary. Open air damper on combustion air blower</p>
<p>CO emission is too high.</p>	<p>Burner is run outside specified working range Process air velocity exceeds limits</p>	<p>Adjust burner settings Adjust process air flow, to make velocity within limits;</p>

13. Appendix

13.1 List of Spare Parts of the Burner

Number	Product No.	Product Name
1	60ZZ0330	Burner Body, 150mm, Cast Iron
2	60ZZ0331	Burner Body, 300mm, Cast Iron
3	60ZZ0332	Burner Body, 450mm, Cast Iron
4	60ZZ0334	Air Wing, 150mm, 310SS
5	60ZZ0335	Air Wing, 90 Degrees, 300mm, 310SS
6	60ZZ0336	Side Plate, 150mm, 304SS
7	60ZZ0337	Side Plate, 300mm, 304SS
8	60ZZ0338	Side Plate, 90 Degrees, 304SS
9	60ZZ0339	Side Plate, 30mm, 304SS
10	60ZZ0341	End Plate, Inlet, 310SS
11	60ZZ0342	Flange, Rc2" Inlet, Cast Iron
12	60ZZ0349	Back Plate, 150mm, 304SS
13	60ZZ0350	Back Plate, 300mm, 304SS
14	60ZZ0351	Back Plate, 63mm, 304SS
15	60ZZ0344	Lifting Plate, 304SS
16	60ZZ0345	Diffuser Plate, 150mm, W=173mm, H=30mm, Carbon Steel
17	60ZZ0346	Diffuser Plate, 300mm, Carbon Steel
18	60ZZ0347	Diffuser Plate, 450mm, Carbon Steel
19	60ZZ0456	Ignition Spark, M14*1.25, OD=3.5mm, Self-Ground, Line Burner

13.2 Spare parts reference figure



13.3 Operation Manual 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

13.4 Half Year 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				

13.5 Yearly 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

Our telephone no. is +86 (512) 6592 4663

Our email address is: info@andtecs.com

Meanwhile, you can also visit our website www.andtecs.com to get more product information.