



Anderson Thermal Solutions (Suzhou) Co., LTD

ANX70 Series 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 material 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

The following table shows the combustion fuel characters of natural gas, safety rules must be obeyed when the 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. ANX70 Series Burner Description

ANX70 series burner is Anderson Thermal Solutions (Suzhou) Co., Ltd. patented nozzle mixing burner, with staged combustion, utilize Flue Gas Recirculation and other designs to

lower NO_x, suitable for medium and low temperature (< 850 °C) air heating, with low NO_x and monoxide carbon emission, high-performance burner. In addition, the burner is very easy to install and maintain. This series of products are used in indirect heating furnaces, air heating and other applications below the heating temperature below 850 °C.

ANX70 Series Burner Advantage:

- Staged combustion, primary combustion with excess fuel, and secondary air distribution is wide, greatly reducing the generation of NO_x.
- The second combustor design helps the flue gas recirculation inside the combustion chamber.
- Wide combustion turn-down ratio, up to 50:1.
- Reliable ignition, the burner can ignite at any point within the ignition range.
- Reliable operating performance, once commissioned, under the same operating conditions, no need further adjustment or maintenance.
- For indirect heating applications, heating efficiency increases due to the unique flame shape.

6. Burner Component Introduction

ANX70 series burners are mainly made up of blower, burner body, nozzle, combustor and spark, etc. Different components are connected together with bolts, shown as below Fig 1 is exploded drawing view, in which the nozzle and burner body are made of cast iron, combustor tube is stainless steel.

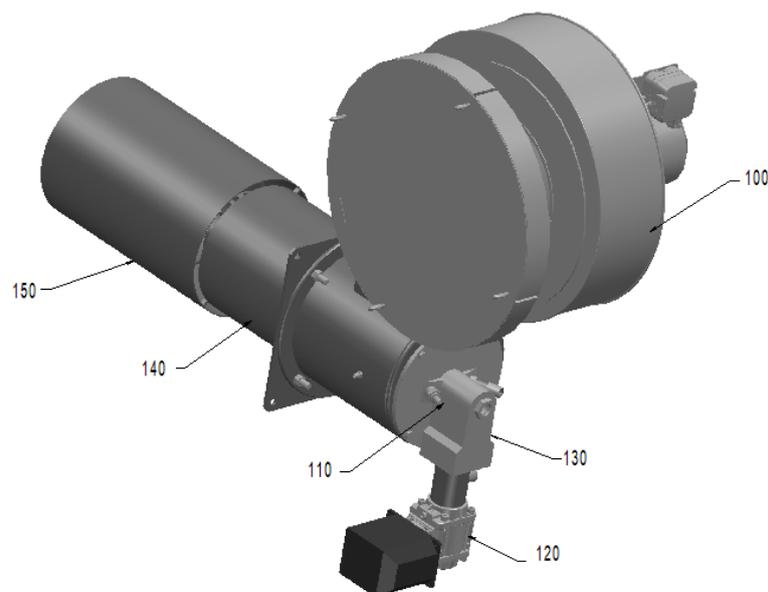


Fig 1. ANX70 Series Burner Explosion View

Number	Name
100	Blower assembly
110	Spark Rod
120	Gas Flow Control Valve
130	Burner Body
140	Primary Combustor
150	Second Combustor

7. Burner Operation Data

Following table 1 shows the ANX70 series of burner operation data.

Table 1: ANX70 series of burner operation data.

Type of Burner	Input kW	NG inlet Pressure (mbar)	CA Inlet Pressure (mbar)	NG Pressure Drop (mbar)		CA Pressure Drop (mbar)		Flame Length (mm)
		Maximum	Maximum	Max	Min	Max	Min	
70G300	26-300	31	41	8.5	0.2	15	0.5	850
70G600	53-560	23	31	11.0	0.2	18	0.5	860
70G900	80-900	31	38	11.0	0.2	17.5	0.5	1270

Notes:

- Above data is based on net heat value (LHV).
- Normal condition: 1 atmosphere, 0°C.
- Actual data varies by each application condition.
- Pressure or differential pressure value is based on 20°C, excess air 15%.
- Orifice diameter based on Natural gas as fuel.
- Flame length is measured from the combustor outlet, fuel is natural gas, running on ratio.

8. Performance Curves

The operation and emission curves of the ANX70 series burner is shown in figures 2 and 3.

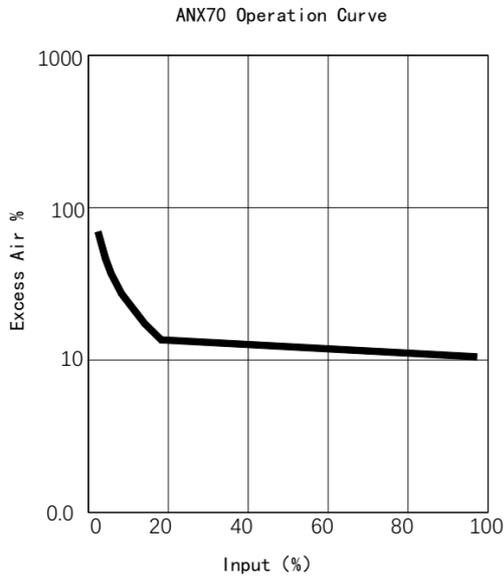


Fig 2. ANX70 Series Burner Operation Zone

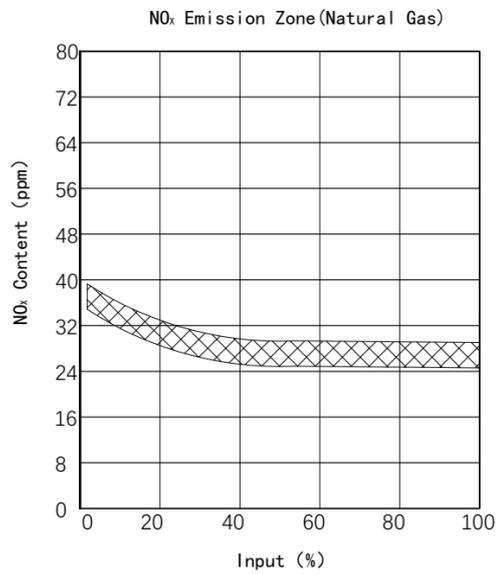
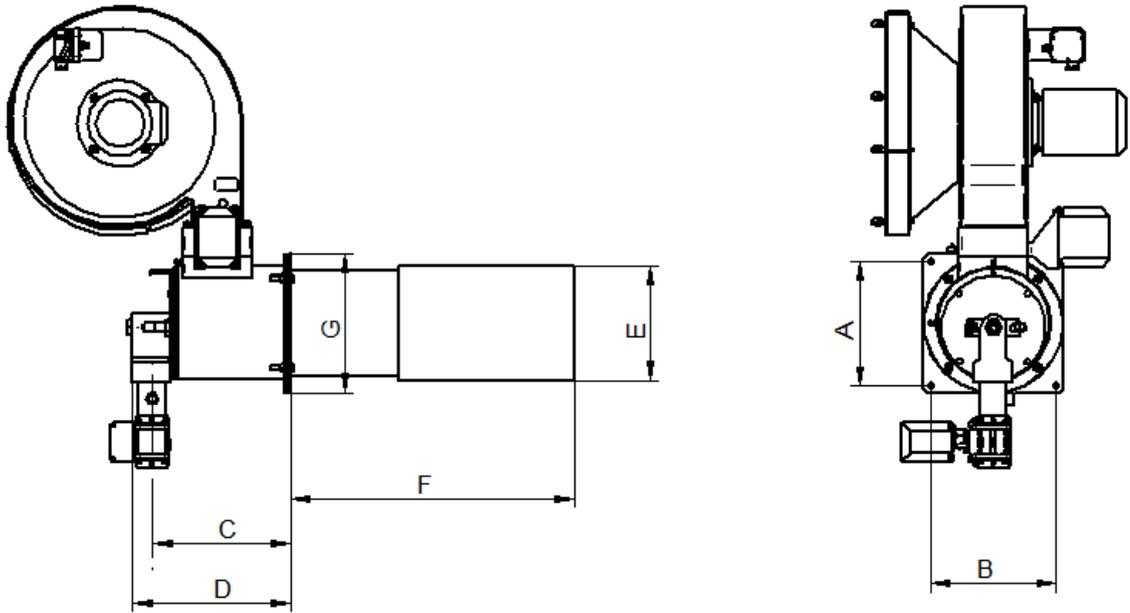


Fig 3. 70NAX Series Burner Emission

9. Burner Installation Dimension

Following Fig 4 shows the ANX70 burner installation dimension.

Fig 4. ANX70 Series Burner Installation Dimension



ANX70 Series burner installation dimension shown as table 2

Table 2 ANX70 Series burner installation dimension (mm)

Type	A	B	C	D	E	F	G
70G300	285.5	285.5	290	308.5	260	670	330
70G600	285.5	285.5	290	308.5	260	670	330
70G900	285.5	285.5	320	360	260	670	330

10. Burner Installation

10.1 Storage:

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

10.2 Handing

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

10.3 Pre-Installation Checklist

Air quality requirement:

- If there are corrosive fumes or materials in the surrounding air, find clean air source to supply to the burner. Observe ambient temperature limits as stated in operation data.
- If combustion air from outside of the burner room, must provide an opening in the room wall of at least 6 cm² per 1 kW to supply the burner fresh combustion air.
- 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 with enough room so it may be easily accessed for inspection.

10.4 Operation Requirement

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

If the gas or air inlet orientation needs to be changed, need to disconnect the flexible hose connected to the burner, remove the four bolts on rear cover, then take out rear cover and rotate to the right position to connect. Then install the four bolts. Re-connect the piping.

1. Install the flame sensor

Install the flame sensor (UV or flame rod) to the rear cover pipe screw hole or extent pipe, make electrical connect to the flame controller.

2. Installing the Spark Plug

Install the spark plug into the opening in the rear cover, make electrical connect to the flame controller, please to be noted that do *not* apply any grease to the threads of the spark plug. You can cause bad grounding of the spark plug if you apply grease to it. Bad grounding of the spark plug results in a weak spark.

3. Burner Mounting

Fix burner flange with bolts to the wall of chamber, different types of burner dimensions shown in date sheets, make sure that the wall of the chamber is strong enough to support the weight of the burner.

If necessary, reinforce the area where you plan to install the burner to support the weight of the burner.

Refractory furnace walls must allow for thermal expansion as recommended by the refractory supplier – the wall should apply no stress on the burner block or refractory layer surrounding the burner block.

If the combustor or burner block is shorter than the furnace wall thickness the block or combustor should be pulled back into the wall. To prevent refractory overheating, a 45° chamfer should be applied.

Make sure the ceramic fiber is filled between the burner and the chamber wall if the gap is more than 20 mm.

10.6 Checklist after installation

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

- Be sure there are no leaks in the gas lines.
- Be sure all the components, including the flame monitoring and control system, 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 the 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% of 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 commission

Special attention:

The ANX70 Series burners, described herein, are designed to mix fuel with air. All fuel burning devices will cause fires and explosions if improperly applied, installed, adjusted, controlled, or maintained. Do not bypass any safety feature, never try to light a burner if it shows signs of damage or malfunction.

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

1. Reset the system: Start combustion blower with valve fully open, close all the automatic gas valves and manual gas cocks. Pay more attention to rotate direction of blower.
2. Set the system to high fire, but DO NOT ignite the burner(s). Use the datasheet from the appropriate ANX70 burner table to set the differential air pressure needed at high fire.
3. Set the system to low fire air. Drive to low fire position. Measure pressure with manometer set to 0.5 mbar. This is the initial setting only. Further adjustment may be required.
4. Make sure all the settings are still the same after you cycle the system several times between high and low fire.
5. Burner ignition: open all the manual shut off valves, make sure air blower is running, automatic control valve is driven to low fire by flame controller, start spark ignition, gas safety shut off valves open and flame on, flame signal feedback to controller, adjust gas and combustion pressure by the opening gas/air control valve till strong flame signal achieved.
6. High fire gas setting: drive burner to high fire, set gas differential pressure between burner and chamber according to the datasheet of relative type of burner. Then drive the burner to low fire and back to high fire again, to check the differential pressure. Make several recycles till the differential pressure remains the same.
7. Low fire gas setting: Drive the system to low fire. Setting low fire gas differential pressure according to datasheet of relative type of burner This is target value for low fire. Drive burner to high fire then go back to low fire, to check differential pressure. Make several recycles of low and high fire change till the differential pressure not change.

NOTE: It is very difficult to measure the very low pressures for low fire, and it may be necessary to rely on visual inspection. This is especially true when gas turndowns is over 20:1. The main intent is to provide a stable flame with a good flame signal that will not cause the furnace temperature to overshoot.

8. Verify the Gas Settings: Make sure that all settings are still the same after cycling, the system several times between high and low fire.

10.9 Start burner

1. Start blower.
2. Open all the valves including automotive and manual valves.
3. Start ignition procedure.

4. Confirm the ignition procedure finished then control valve opening is controlled by 4-20 mA.

10.10 Stop Procedure

Do not turn the combustion air blower off until the chamber temperature is below 80°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. Turn off the combustion air blower.
4. Close all manual gas valves to the burner
5. 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 checks 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.

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11.1 Half-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 ignite electrodes.
- Check valve motors and control valves for free, smooth action and adjustment.
- Check for the proper operation of ventilation equipment.

- Test the interlock sequence on all safety equipment. Manually force each interlock to intentionally fail while at the same time check 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 valves for proper operation.
- Inspect and clean the combustion air blower rotor. Clean and/or replace the combustion air blower filter if applicable.

11.2 Annual 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 ignition cable and connectors.

Be sure the burner bodies and combustor, nozzles, the ignitor 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 been 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 the 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.
		There is no power to the ignition transformer

Start-up sequence runs but burner does not light	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 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 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 it if necessary
	Not enough gas: Start gas solenoid valve does not open	Check solenoid valve coil for proper orientation. Replace if necessary
The low fire flame is weak or unstable	Low fire adjusted too slow	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
	Not enough gas	
	Incorrect air flow setting	
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 Thermal Solutions (Suzhou) Co., Ltd.
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 where necessary
Cannot achieve full capacity	Air filter is blocked	Clean or replace the air filter.
	Gas pressure is too low into the main gas pressure regulator	Adjust gas pressure. Re-check setup pressures
	Increase furnace/chamber pressures Poor piping practices	Contact Anderson



13. Appendix

13.1 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

13.2 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				

13.3 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 to get more product information.