Anderson Thermal Solutions (Suzhou) Co., LTD

FFA10 Burner Operation Manual

No：	ATS–Operation Manual–FFA10
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Contents

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 instructions

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℃. 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.

4. Description

FFA – FlexFire® Air burner is trademark of Anderson Thermal Solutions (Suzhou) Co., Ltd., it is designed for regenerative glass furnace, with adjustable mechanism for flame length and energy release position.

4.1 Standard configuration

As shown in Fig 1, standard burner sets including:

a. FlexFire® burner
b. Burner bracket and base plate
c. Seal plate (or water-cooling socket)

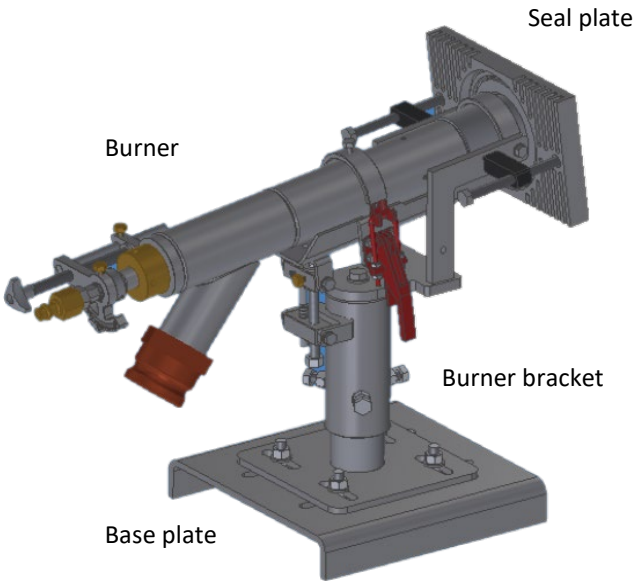

Figure 1. Flex Fire® burner standard configuration set

4.2 Inspection before burner bracket installation

Before installing the bracket, check the position of all the scales are in the middle position. Otherwise, loosen the fixing bolts and reset the scale to middle of the ruler. As shown in Figure 2, adjust the bracket so that the four fixing bolts are in the middle of the chute, and ensure that the bracket can move in all directions, front, back, left, and right.

There are two mounting brackets, one for side port firing, the other for underpart firing. (shown as Fig 2a and 2b)

a. Side port firing

b. Under port firing

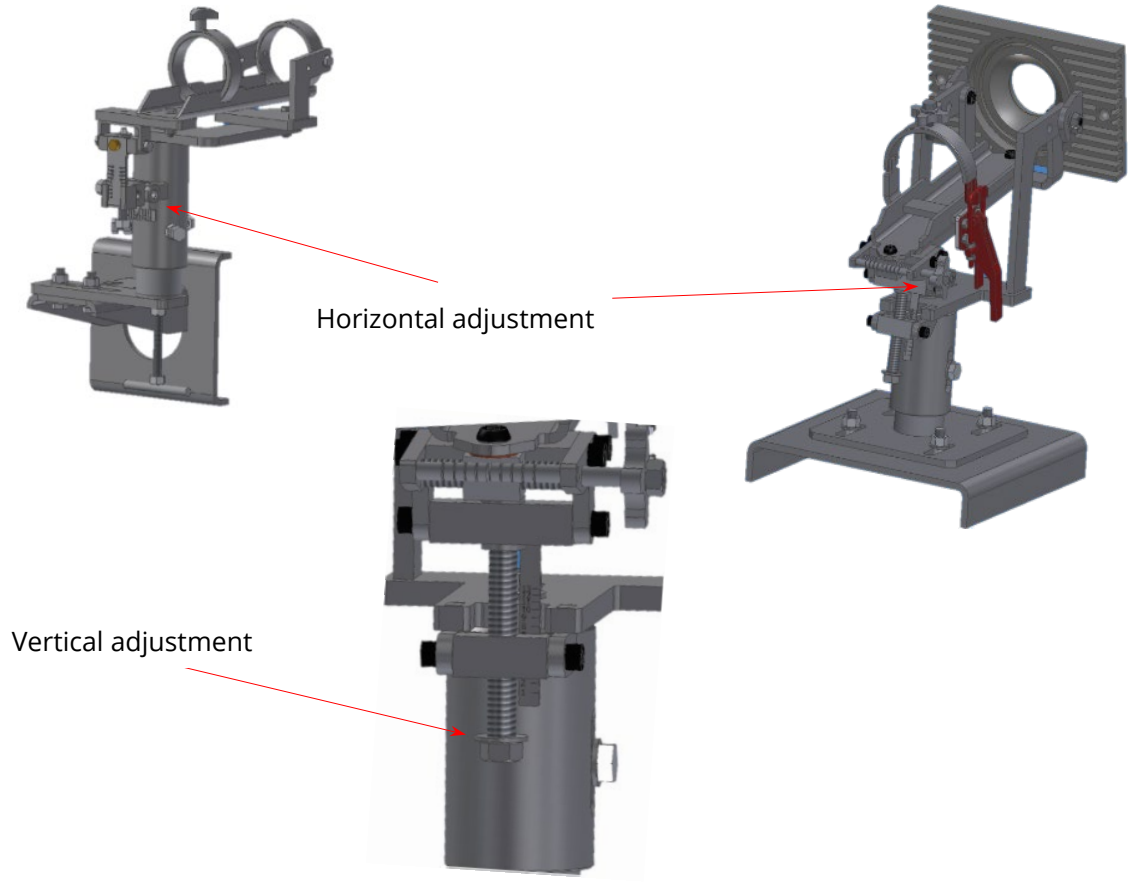

Figure 2. FlexFire® burner Adjustment Mechanism

4.3 Positioning burner bracket

Use the positioning tube (sold separately) to locate the bracket. The installation position of the bracket should ensure that the center of the burner nozzle and the sealing plate are coaxial and fit tight without gap.
Secure the bracket with all fixing bolts so that it cannot move

4.4 Burner data

Model	Input capacity MW	Nozzle OD Φ (mm)	Gas flow (NCMH)		Pressure @ burner (mbar)		Cooling air (NCMH)	
			Min	Max	Min	Max	Min	Max
10G3000	0.6-3.0	77	60	300	16	500	10	20
10G6000	2.5-6.0	95	125	600	16	500	10	20
10G9000	5.0-9.0	110	250	900	16	500	10	20

5. Prepare for startup

Warning

Gas line and cooling airline must be equipped with check valves, otherwise flashback may occur!

1. Make sure all gas, cooling air ball valves before burner area closed
2. Confirm that the gas and cooling air have been supplied to the nearest point of burner, where with manual shut-off valves.
3. Confirm that the gas and cooling air solenoid valves are properly controlled, that is, the gas solenoid valve on the firing side is open, the cooling air solenoid valve on the non-firing side is open, and closed those valves for opposite side.
4. Adjust the opening of the gas flow needle valve on down comer of each burner, it is recommended that the opening be 2/3 of the full opening.

6. Burner installation

6.1 Burner bracket installation

6.1.1 Fix the bracket to the steel structure.

1. Attach the seal plate to burner block, or to the burner bracket, and tighten it with fixing bolts. Figure 3
2. The seal plate needs to be cooled by cooling air, it is recommended to use a 2” air duct, and the pipe towards to the seal plate with an angle, so that the cooling air can completely cover the seal plate.

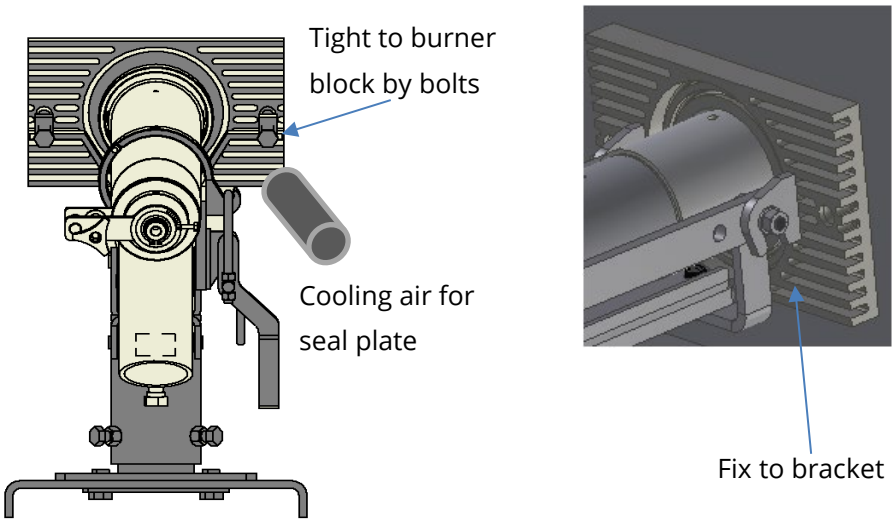

Figure 3： FlexFire®Burner standard configuration and seal plate installation

3. Before installing the bracket, all position rulers should be checked first, and they should be in the zero position, otherwise, the fixing bolts should be loosened first, and set to zero. Adjust the bracket so that the four fixing bolts are in the middle of the chute to ensure that the bracket can move in all directions.
   Note: The bracket used in the side burn installation method and the bottom burn installation method is not the same (as shown in the figure 2)
4. Fix the bracket on the steel structure. Allow the sealing plate to fit perfectly to the burner brick. Use a positioning tube (sold separately) to position the bracket so that the bracket can be installed in such a way that the sealing plate and the burner block are concentric, and can be fitted without gaps with the burner block. Secure the bracket so that it cannot be easily moved.
5. Move the burner bracket backward so that the seal plate and burner block are not pushed, and there will be no force between due to thermal expansion during furnace heat-up.
6. Use thermal insulation fiber to plug the burner block hole to prevent the heat in the furnace from releasing out.
7. During furnace heat-up process, both the steel structure and the refractory block will move due to expansion, and the burner holder needs to be readjusted.
8. Move out the insulation fiber from burner seal plate and burner block.
9. Before the furnace is ready to run, move the burner bracket forward so that the center of the hole of the seal plate and the burner block is completely touching each other, and the convex ring of the seal plate can fully enter the groove of the burner block to ensure that the seal plate and the burner block are completely fitted.

Warning

Lack of cooling air will greatly reduce lifetime of the burner tip, gasket seal plate!

6.2 Burner bracket fixing in position

1. Use the positioning tube (to be purchased separately) to position the bracket so that the installation position of the bracket can ensure that the burner is concentric with the seal plate and can be fitted with the seal plate without gap. After confirming that the installation position of the bracket is basically the same as the drawing, proceed to the next step, Otherwise, adjust the position of the burner bracket on the steel structure.
2. Bracket position adjustment: Visually adjust the bracket position and height so that the positioning tube on the bracket is concentric with the burner brick hole. Be careful to keep the height of the bracket in the middle of the adjustment mechanism, and determine the height of the support beam.
3. Push the bracket forward until the front end of the positioning tube is close to the

seal plate. If necessary, adjust the height of the bracket to keep the bracket concentric with the burner block.

4. Fix the position of the bracket and remove the positioning tube. Secure the base plate to steel structure.

6.3 Install burner

1. Place the burner on the bracket, make the nozzle end against the sealing plate, and fix the burner with the bracket locking ring. Make sure that the burner does not slip due to external forces.
2. Connect the burner cooling air hose to the cooling air inlet.
3. Connect the burner gas hose to the gas inlet as shown in Figure 4.
4. Open the cooling air ball valve at the front end of the burner and check the pressure at 100-500mbar. Adjust the cooling air needle valve (or globe valve) to make the pressure meet the requirements.

7. Start burner

1. Check that the cooling air hose and gas hose are properly and securely connected.
2. After reversal, open the gas manual ball valve on down comer on the firing side.
3. Open the corresponding gas flow control valve to establish the gas flow.
4. For the same port burner, an average flow or a satisfactory flow distribution ratio can be obtained by adjusting the needle valve opening.

Figure 4: Flex Fire® burner connections

8. Flame Adjustment

8.1 Flame length adjustment

1. When the gas flow reaches the normal flow, the flame length can be adjusted through the flame length adjustment knob.
2. As shown in Figure 5, FVR (Flow Velocity Regulator) is used for flame length adjustment. Rotate the FVR counterclockwise, the gas velocity increases, and the flame becomes shorter; rotate the FVR clockwise, the gas velocity becomes slower, and the flame becomes longer.
3. On the adjustment mechanism, there is a scale with an engraved line, and the positions are marked as 1-5. Position 1 is fully rotated clockwise, the shortest flame, and position 5 is fully rotated counterclockwise, and the longest flame.

8.2 Energy release position adjustment

1. After the flame length is adjusted, the energy release position can be adjusted through the FDR (Flow Distribution Regulator adjustment knob).
2. There is an angle scale marked on the FDR disc, when the FDR rotates, the gas flow

into the inner and outer nozzles changes. Rotating the FDR adjustment to the left (clockwise) will increase the flow of gas in the inner nozzle, the gas velocity will be faster, the flame will be shorter, and the energy release position will move forward. Turning to the right (counter-clockwise) reduces the flow of gas to the inner nozzle, the gas velocity slows, the flame gets longer, and the energy release position recedes.

3. The adjustment of flame length and energy release position will affect NOx emission. The general principle is: reducing the gas velocity will reduce NOx, but it must be combined with the process to ensure that the flame shape meets the process requirements

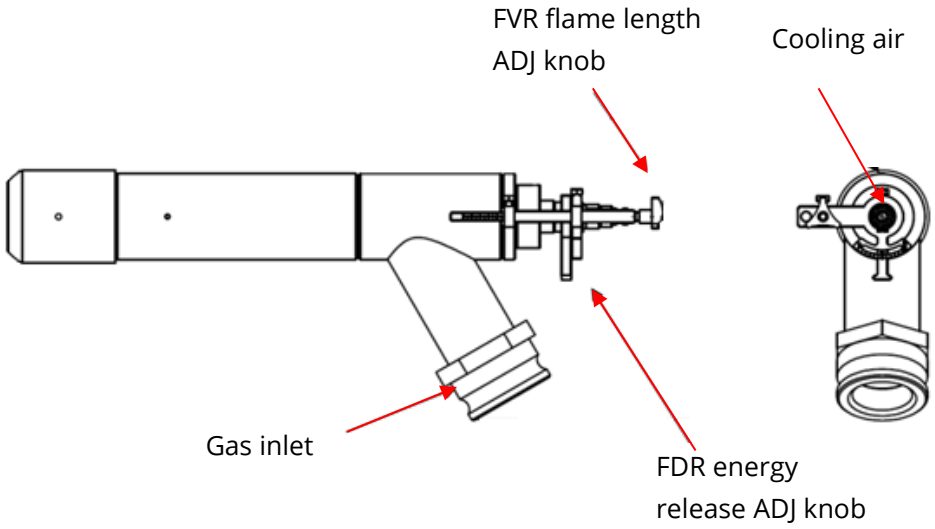

Figure 5: FlexFire® burner adjustment mechanism

8.3 Other adjustments

The adjustment of the flame needs to be considered in combination with the up and down, left and right adjustment mechanisms of the burner bracket. The angle and speed of the combination of natural gas and combustion air have an impact on the shape of the flame.

9. Burner stops

1. Close the gas/cooling air ball valve on down comers, disconnect the hoses, and remove the burner from bracket.
2. Plug the hole in the middle of the seal plate with ceramic fiber.

10. Troubleshooting

10.1 Flame touches burner block

1. Realign the burner into the center of burner block
2. Clean the burner block

3. Clean the seal plate

10.2 Smoky flame

1. Gas rich-reduce gas flow
2. Lean air-increase combustion air flow
3. Debris block the burner tip-take out burner and clean
4. Built-up particles inside burner block-take out burner and clean

10.3 Flame too long

1. Keep the gas pressure at 30-500mbar
2. Reduce the gas flow so that the single burner is within the rated flow range, see the technical data sheet
3. Increase the gas velocity and reduce the flame length through the flame length adjustment mechanism
4. Poor mixing, adjust the flame angle upward

10.4 Flame too short

1. Maintain gas pressure and increase gas flow
2. Reduce the gas velocity and extend the flame length through the flame length adjustment mechanism
3. Mixing too fast, adjust the flame angle downward

11. Maintenance and cautious

11.1 Dismantle burner for maintenance

1. Loosen the inner gas gun lock nut
2. Loosen the packing nut
3. Pull out the inner tube assembly of the front section of the burner
4. Removing the inner nozzle
5. Removing the outer nozzle

11.2 Cleaning the inner nozzle, outer nozzle and gas gun assembly

11.3 Precautions when reassembling

1. Inspect the outer nozzle seal and packing, and replace if damaged
2. It is also possible to remove the inner and outer nozzles separately without removing the burner

Cautious

If the supply of internal cooling air is stopped for more than 20 minutes, to prevent burner being damaged, the burner should be removed and insert the ceramic fiber into the middle of the seal plate. Lack of the supply of external cooling air for a long time will cause damage to the seal plate.
To adjust the burner, the corresponding fixing bolts need to be loosened, and should be re-locked after the adjustment is completed. Do not remove the gas metal hose or locking device when the gas is not completely shut off.

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Our email address is: **info@andtecs.com**
Meanwhile, you can also visit our website www.andtecs.com to get more product information.