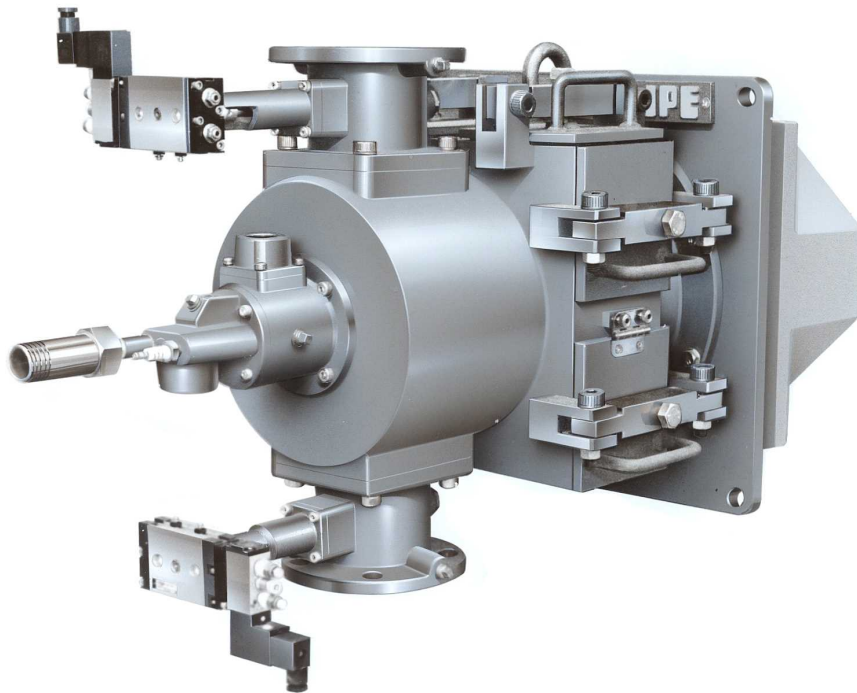


# HOPE

HG99086E

## HOPE SRB SELF REGENERATIVE GAS BURNER HANDLING MANUALS



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## 1) Inspection of Product and Accessories, and Outline

Thank you for your selection of HOPE SELF REGENERATIVE GAS BURNER type SRB. Please carefully read this instruction manual in order for you to be fully satisfied with the performance of this burner and to secure the safety in operation, maintenance and inspection. Also, please be sure to deliver this instruction manual to the end user, as well as to the constructor.

### ■ Inspection

Check to confirm whether or not the product is exactly in accordance with your order by referring to the nameplate and the specification table given below. Also check for damage and other irregularities caused by and during transportation.

### ■ Outline

SRB Type Self-Regenerative Gas Burner aims at a departure from the twin burner type, the basic concept of the regenerative combustion system. This burner is epoch-making in that it alone enables regenerative combustion by employing the unique combustion and switching methods.

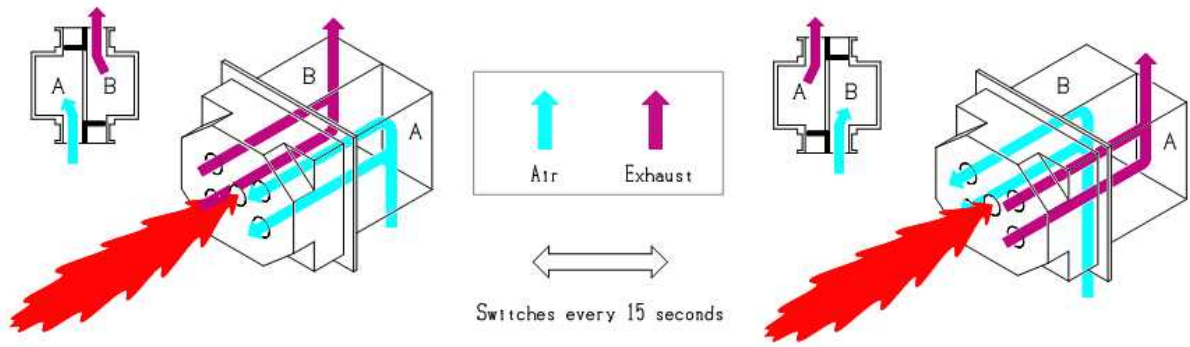
We are confident that this burner is indispensable for the protection of the earth environment in the future.

### ■ Features

1. Since the regenerative combustion system is integrated into one burner, cost can be reduced.
2. The energy-saving effect is so large that CO<sub>2</sub> emission can be reduced substantially.
3. With exhaust gas recirculation effect and multistage combustion, NO<sub>x</sub> emission can be controlled to a low level.
4. Since the conventional control system can be used as it is, the existing burner can be replaced easily.
5. Since the combustion is continuous, the in-furnace temperature and the in-furnace atmosphere are not disturbed.
6. Since there is no portion of extremely high temperature within the flame, very favorable temperature distribution can be obtained.
7. Since highly luminous flame is obtained, the radiant heat transfer effect can be improved.
8. The heat storage body can be replaced easily.

### ■ Fluid flow

The flue gas generated by combustion passes through the heat storage medium opposite to the heat storage medium through which the combustion air passes, and is discharged out of the furnace. At that time, the heat stored in the heat storage medium is used to preheat the combustion air by changing the flow path with the switching valve. This switching of supply and exhaust is performed at intervals of 15 seconds for heat storage combustion.



## 2) Specifications

### ■ Capacity and flow rate

Type	Main Burner		Pilot Burner		Exhaust
	Capacity kW (kcal/h)	Air Flow m <sup>3</sup> /h	Capacity kW (kcal/h)	Air Flow m <sup>3</sup> /h	Flow rate m <sup>3</sup> /h
SRB-7	70 (60,000)	125	7 (6,000)	7.2	170
SRB-15	150 (129,000)	270	9 (7,800)	9.5	360
SRB-25	250 (215,000)	450	14 (12,000)	15	600
SRB-40	400 (344,000)	720	14 (12,000)	15	960
SRB-60	600 (516,000)	1,080	16 (14,000)	17	1,440
SRB-100	1,000 (860,000)	1,800	23 (20,000)	24	2,400

### ※ Standard Pressure

Main Air	6kPa
Pilot Air	4kPa
Main Gas	10kPa
Pilot Gas	4kPa
Exhaust	-6kPa
Air pressure for actuator	0.3MPa

※ The above flow rate is for blower selection.

※ Make sure the exhaust blower is heat resistant up to 250 to 300° C.

※ Do not use at a furnace temperature of 1300° C or higher.

※ Center air is required for SRB-100.

Type	Center air flow rate	center air pressure
SRB-100	3.5 m <sup>3</sup> /h	0.1 MPa

■ Connection size and mass

Type	Main Burner Connection		Pilot Burner Connection		Exhaust Connection (JIS5KF)	Burner Mass kg	Ceramics Ball Mass kg	Ceramics Ball Size inch
	Air (JIS5KF)	Gas (Rc)	Air (Rc)	gas (Rc)				
SRB-7	80A	1	1	3/8	80A	160	12	3/8
SRB-15	80A	1	1	3/8	80A	210	20	3/8
SRB-25	100A	1 1/2	1	3/8	100A	330	40	1/2
SRB-40	125A	1 1/2	1	3/8	125A	500	60	3/4
SRB-60	150A	1 1/2	1	3/8	150A	750	120	3/4
SRB-100	200A	2 1/2	1	1/2	200A	1500	200	3/4

※ Ceramics ball are 25 kg per bag. Please order balls in units of 25 kg.

3) Actuator

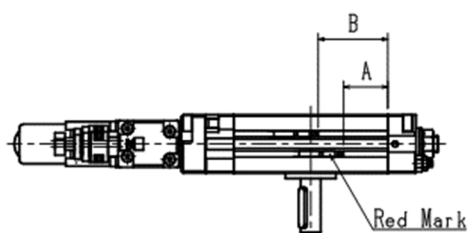
■ Standard Pressure 0.3MPa

	Type	air consumption L/min
SRB-7	CDRQ2B20-01	0.2×2
SRB-15	CDRQ2B20-01	0.2×2
SRB-25	CDRQ2B40-01	0.6×2
SRB-40	CDVRA1BS50-100Z	0.9×2
SRB-60	CDVRA1BS63-100Z	1.8×2
SRB-100	CDVRA1BS80-100Z	3.2×2

#### 4) Auto Switch

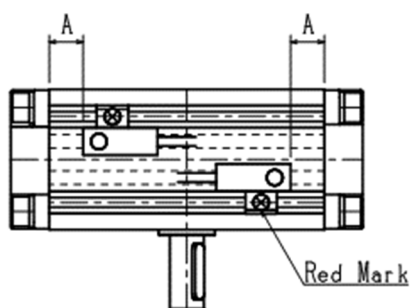
##### 4-1) Auto switch setting position

###### ■ SRB-7, 15, 25



	Reed auto switch		Solid state auto switch	
	A	B	A	B
SRB-7	22	34.5	26	38.5
SRB-15	22	34.5	26	38.5
SRB-25	34	53	38	57

###### ■ SRB-40, 60, 100



	Reed auto switch		Solid state auto switch	
	D-A59W	D-A53 D-A54 D-A64 D-A67	D-J51	D-F59 D-F5P D-J59 D-F59W D-F5PW D-J59W D-F5BA D-F59F
SRB-7	22	34.5	26	38.5
SRB-15	22	34.5	26	38.5
SRB-25	34	53	38	57

※ At the time of shipment, the auto switch on the detection side when the solenoid valve is not energized is marked with a red mark. The auto switch is set at the A and B dimension positions in the figure, but fine adjustment is required before use.

4-2) Auto switch selection table

An auto switch for motion detection is attached to the actuator. Please select from the table below.

The standard lead wire length is 0.5 m.

■ SRB(O) – 15, 25

Type	Special function	Electrical entry	Indicator light	wiring (output)	Load voltage		Auto switch model		Applicable load		
					DC	AC	Perpendicular	In-line			
Solid state auto switch	—	Grommet	Yes	3-wire (NPN)	24V	5V, 12V	—	D-M9NV	D-M9N	IC circuit	relay, PLC
				3-wire (PNP)				D-M9PV	D-M9P		
				2-wire				D-M9BV	D-M9B		
	3-wire (NPN)			5V, 12V	—	D-M9NWV	D-M9NW	IC circuit			
	3-wire (PNP)					D-M9PWV	D-M9PW				
	2-wire					D-M9BWV	D-M9BW				
	Diagnosis indication (2-color indicator)			24V	5V, 12V	—	D-M9NAV	D-M9NA	IC circuit		
							D-M9PAV	D-M9PA			
							D-M9BAV	D-M9BA			
							2-wire	12V		—	
Water resistant (2-color indicator)	5V, 12V	—	—	—	5V	—	D-A96V	D-A96	IC circuit	—	
				3-wire (NPN)	—	5V	—	D-A93V			D-A93
				2-wire	24V	12V	100V	D-A90V	D-A90		—
								100V or less	IC circuit		

■ SRB(O) – 40, 60, 100

Type	Special function	Electrical entry	Indicator light	wiring (output)	Load voltage		Auto switch model	Applicable load				
					DC	AC						
Solid state auto switch	—	Grommet	Yes	3-wire (NPN)	24V	5V, 12V	—	D-F59	IC circuit	relay, PLC		
				3-wire (PNP)				D-F5P				
				2-wire				D-J59				
	Diagnosis indication (2-color indicator)			24V	5V, 12V	—	D-J51	100V, 200V	—		D-F59W	IC circuit
							3-wire (PNP)				D-F5PW	
							2-wire				D-J59W	
							D-F5BA					
	Water resistant (2-color indicator)			24V	12V	—	D-F59F	5V, 12V	—		IC circuit	
							4-wire (NPN)				—	
	diagnostic output (2-color indicator)			5V, 12V	—	—	—	5V	—		D-A56	IC circuit
3-wire (NPN)		—	5V				—					
2-wire		24V	12V				100V, 200V	D-A53	—	—		
								D-A54				
								D-A64				
Diagnosis indication	200V or less	12V	—	—	—	—	D-A67	IC circuit	PLC			
				—	—	—	D-A59W			—	relay, PLC	

5) Matters to be attended for safety

Before installing, trial- operating, maintaining or inspecting this burner, please learn the inside of this burner, information of safety and other matters to be attended by reading this instruction manual and all of attached documents.

The rank of the matters to be attended is classified to "Top danger"

"Danger" and "Caution" in this instruction manual.



In case of wrong operating, it is predicted that serious dangerous situation will happen and the operator or other people.

May die or may be seriously injured.









In case of wrong operating, it is predicted that dangerous situation will happen and operator or other people may die or may be seriously injured.



In case of wrong operating, it is predicted that dangerous situation will happen and the operator or other people will be injured or only material described.


NOTE, Even the matters classified to CAUTION have a possibility of causing serious results. Then, never fail to abide by matters described.

Meaning of the mark		Example
 Compulsion	This symbol indicates the contents that force or direct an action. Specific contents of such action are given nearby.	 Be sure to do!
 Prohibition	This symbol indicates the contents that prohibit an action. Specific contents of such action are given nearby.	 Don't touch!
 Precaution	This symbol indicates the contents that call attention. Specific contents of such attention calling are given nearby.	 Be careful. It's hot!




6) Read without fail




 Be sure to do!

Never fail to exhaust the air in the furnace (pre-purge) before igniting. Repeated ignitions may cause explosion due to the gas stagnated in the furnace, please install safety devices like a flame supper visor.




 Electric-shock  
Caution

Never fail to cut the electricity of transformer when you take off the ignition plug in order to check the spark of it.

 Prohibited

Never fail to take off the site-hole when igniting or on-fire the burner.  
※flame in the furnace may blow out.



 Don't touch!

Never touch the mounting plate of the burner and fitting parts of the burner, Ceramic-tube-base, Air-body.  
These area are high temperature when the burner is burning.

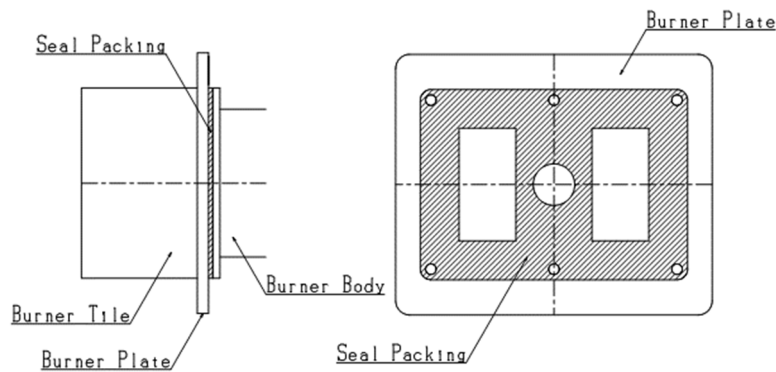
## Packings

1. Do not use the attached gasket for sealing this burner.
2. Put the replaced old gaskets pouch and there away them according to the waste disposal regulation or the waste cleaning regulation. Never burn up them.

## 7) Installation

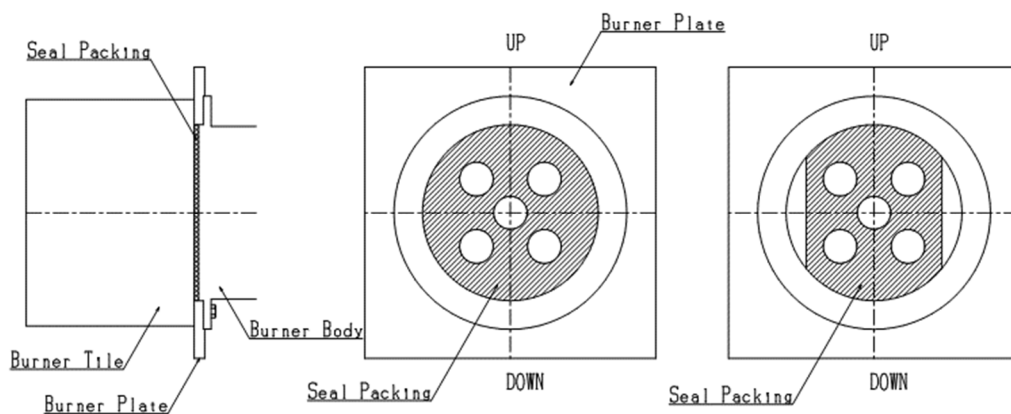
1. When separating the burner front plate tile and the burner body, remove the burner gun first before separating.
2. When installing the main body to the burner front plate tile, make sure that the seal packing is installed. Also, pay attention to the mounting direction of the seal packing.

### ■ SRB-7

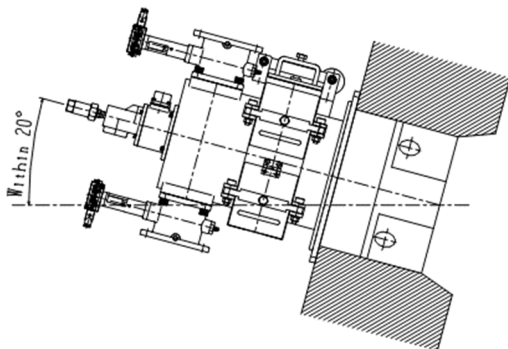


### ■ SRB-15, 25, 40, 60

### ■ SRB-100

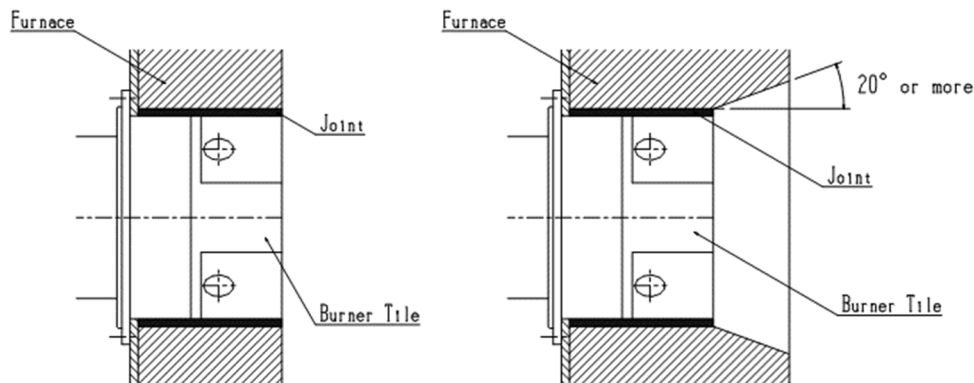


3. In order to facilitate the replacement of the heat storage element, please install the switch valve so that it faces up and down.
4. In consideration of the load on the perforated plate, the inclination angle of the burner installation should be within  $15^\circ$ .



5. Back up the outer surface of the burner tile, especially the lower surface, with refractory bricks, castables, etc. so that the burner tile does not fall.
  - ※ Burner tiles will fall if caught with ceramic fiber (wool or blanket, etc.) There is fear. Be sure to back up with refractory bricks, castables, etc.

6. When installing the burner to the furnace body, fill the gap between the installation opening and the burner tile with refractory mortar and fix it.
7. Make the front of the burner tile flush with the furnace wall. If the furnace wall is thick, taper the front of the burner tile up, down, left, and right by 20° or more.



8. Air inlet and flue gas outlet can be on top or bottom
9. For maintenance, secure a space behind the burner where the burner gun can be pulled out.

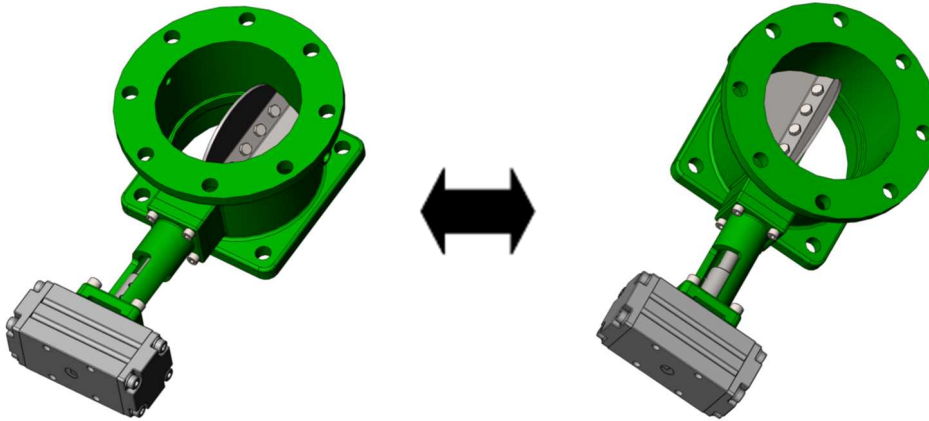
## 8) Piping

1. Be sure to clean the piping so that no sealing tape, sealing agent, chips, etc. remain in the piping. It may cause malfunction of solenoid valves, governors, valves, etc.
2. When connecting pipes, install pipe supports at appropriate positions so that excessive force is not applied to the burner.
3. In order to detect the air pressure at the burner inlet, the air pipe to the burner inlet should be straight pipe with a diameter of 3 times or more. Also, before and after the orifice flowmeter, be sure to provide a straight pipe section that is about 6 times the pipe diameter.
4. Use air from which drain or mist has been removed for the actuator driving air of the switching valve.
5. Since high-temperature gas containing a large amount of moisture passes through the piping on the exhaust side, it is recommended to consider drain removal and corrosion countermeasures.
6. The piping on the exhaust side becomes hot, so please guard the piping so that your body does not touch it directly.
7. Install gas adjustment valves, butterfly dampers, orifice flow meters, etc. in positions that are easy to operate during adjustment.
8. Use gas adjustment valves and butterfly dampers with lock functions.
9. The orifice flowmeter has a fixed flow direction, so make sure to connect the IN and OUT correctly.
10. Install the gas solenoid valve as close as possible to the burner inlet.

## 9) Switching valve operation and Time chart

### ■ Switching valve

As shown in the figure below, the valve discs of the switching valves installed above and below move every 15 seconds to switch the combustion air and exhaust flow paths.

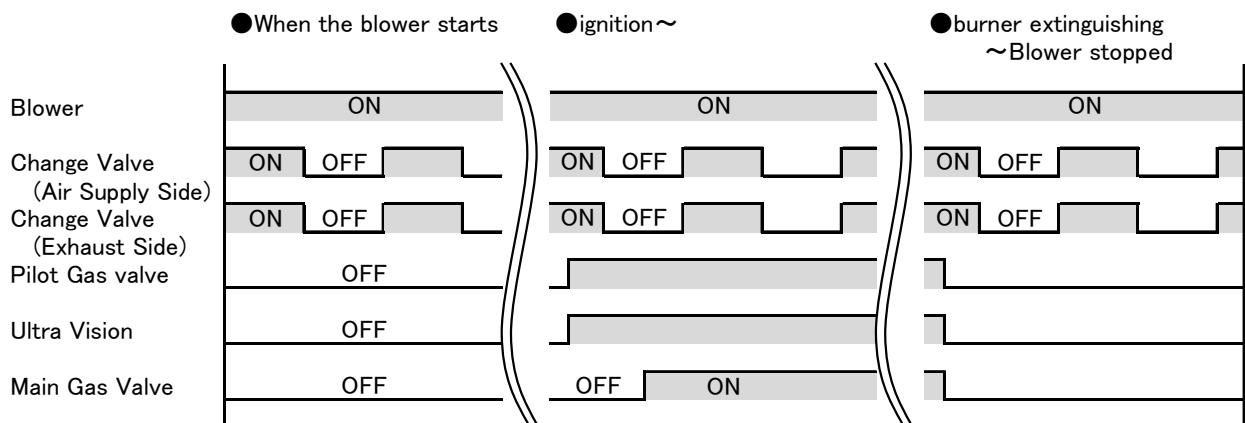


Switching should be done at intervals of 15 seconds. Be sure to turn ON/OFF the power to the intake valve and the exhaust valve at the same time. Never turn on the intake valve and turn off the exhaust valve or vice versa.

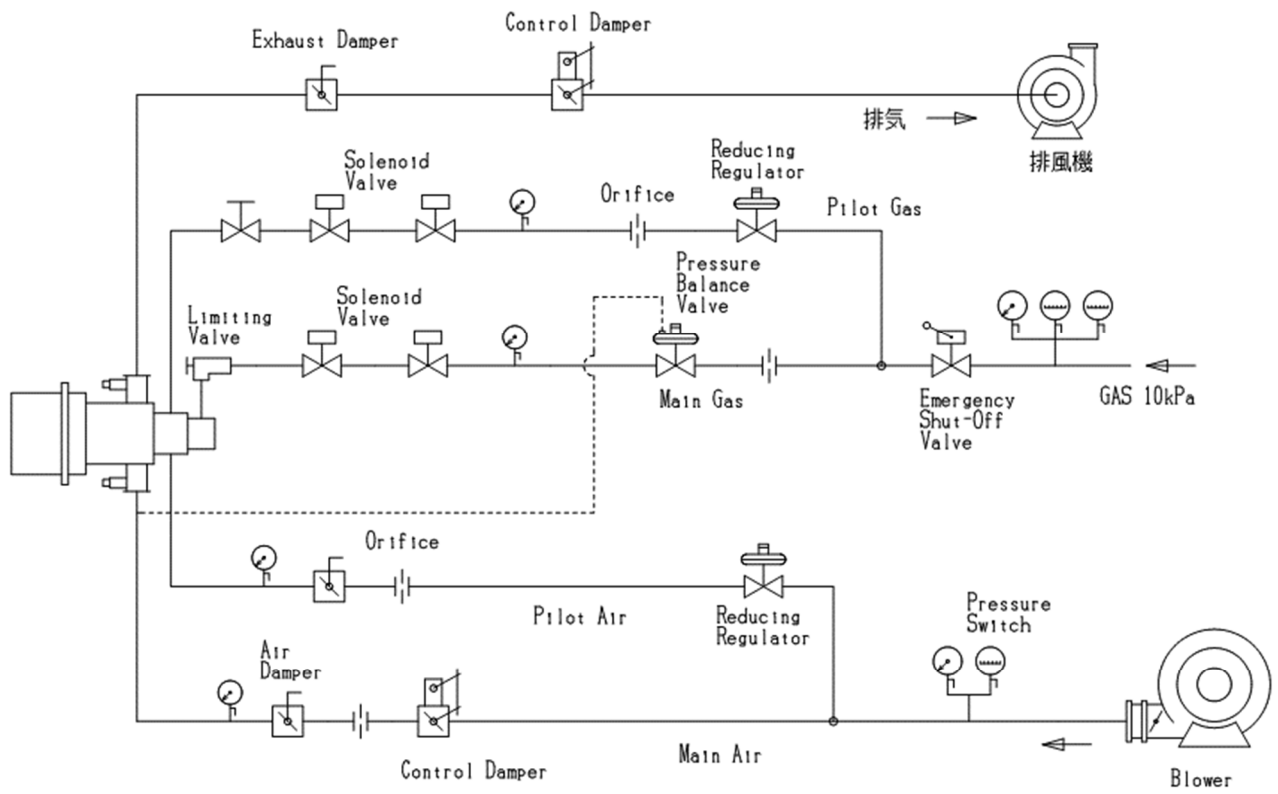
### ■ Control valve

Please control so that the operation of the air control valve and the operation of the exhaust control valve are synchronized.

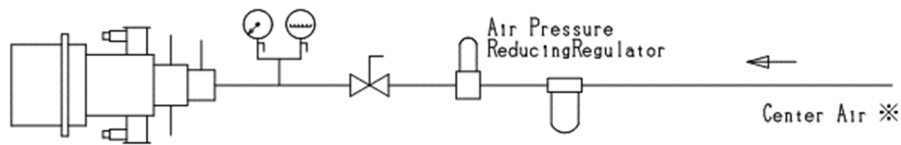
### ■ Time chart



10) Flow sheet



※Only SRB-100 requires center-air socket. (SRB-15, 25, 40, 60 don't require any center-air socket.)



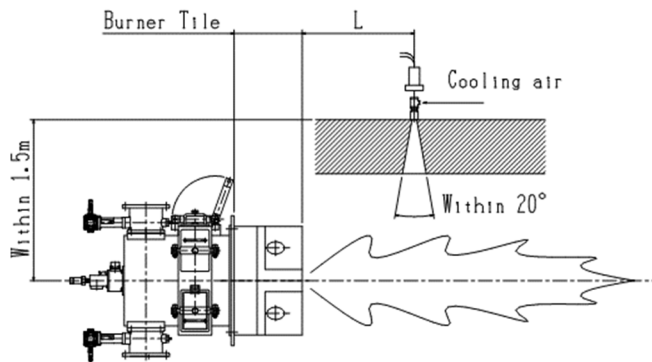
## 11) Monitoring of Main Flame

Please be sure to use a high-sensitivity model to monitor the flame of the mainframe from the following position.

Type	Burner tile length (mm)	Distance from tile tip L (mm)
SRB-7	250	300
SRB-15	260	300
SRB-25	300	300
SRB-40	350	400
SRB-60	384	400
SRB-100	450	400

In order to prevent heat transfer from the furnace wall, please perform an air purge from the Ultravision installation part.

To facilitate flame detection, please provide a taper within  $20^\circ$  on the furnace wall as shown in the figure. The distance from the Ultravision to the frame monitoring position should be within 1.5m as a guideline.



## 12) Operation (Preparing · Igniting · Adjusting · Extinguishing)

### ■ Preparing

1. Make sure all gas cocks are close.
2. Check for leaks in gas pipes with air or nitrogen, etc.
3. Check that air, gas, and equipment on each line operate normally.
4. Confirm that the gas is supplied at the specified pressure and that the inside of the pipe is replaced.
5. Start the blower and confirm that the rotation direction and outlet pressure are the specified pressure.
6. Supply high pressure air and power to the switching valve actuator and set the switching time to 15 seconds.
7. Set the control damper and hand damper to 6 kPa for maximum combustion and 0.1 to 0.5 kPa for minimum combustion.
8. Adjust the exhaust damper to the same negative pressure as the air pressure to synchronize with the air pressure.
9. Fully open the control damper to purge the air inside the furnace.  
(Purge should be about 5 times the volume of the furnace.)
10. Set control damper to minimum burn position.
11. Only SRB-100 has center air, so set the reference pressure to 0.1 MPa.

### ■ Igniting

12. Confirm that the cock, solenoid valve and limiting valve in front of the burner are fully closed.
13. Confirm that the cock, solenoid valve and limiting valve in front of the burner are fully closed.
14. Fully open the pilot air cock and set the pressure to 4 kPa with an adjustment valve, etc.
15. Measure the flow rate of pilot air with an orifice flow meter.
16. After fully opening the pilot gas cock and pressing the ignition button, gradually open the gas adjustment valve to ignite.
17. After ignition, calculate the gas amount from the air flow rate so that the air ratio becomes 1.1, find the differential pressure of the orifice flow meter that matches the flow rate, and set it with the gas adjustment valve.
18. At this time, be sure to convert the specific gravity of the gas body.
19. Check the ignition operation 2-3 times and also check the value of the flame detector.
20. After confirming that the main gas solenoid valve is open, fully open the gas cock and gradually open the limiting valve to ignite the main burner.

### ■ Adjusting

21. After ignition, fully open the control damper and set the air to the maximum combustion position.
22. Raise the temperature to the operating temperature with an air ratio of about 1.5. (Measure the flow rate with the air and gas orifice flow meter and set with the limiting valve. As the furnace temperature rises, the air ratio decreases.)

23. When the temperature is close to the operating temperature, adjust the air ratio to 1.3. (at this time, change the temperature controller from auto to manual for maximum combustion)
24. When measuring gas volume with an orifice flowmeter in the same way as pilot gas, please convert the specific gravity of the gas body.
25. After setting the air ratio, set the control damper to the minimum combustion position and check the minimum combustion.
26. Joint control motor and control damper for desired turndown.

■ Extinguishing

27. Fully close the cock and solenoid valve located immediately before the burner, and check to confirm that the fire has been extinguished.

※ Stop the blower after the in-furnace temperature lowers to below 500°C to protect the nozzle.

### 13) Notes

1. At a furnace temperature of 500 °C or less, burn with an air ratio of 1.5 or more. (Otherwise, there is a danger of generating CO or misfiring.)
2. Approximately 20% of the exhaust gas is exhausted from the furnace, so be sure to install a flue and damper.
3. To protect the nozzle, stop the combustion blower after the temperature inside the furnace drops below 500°C. Also, do not stop the switching valve actuator while the blower is running.
4. In order to reduce damage to the nozzle, it is recommended to extinguish the pilot burner at a furnace temperature of 1000°C when using at a furnace temperature of 1100°C or higher.
5. Do not use at a furnace temperature of 1300°C or higher.
6. When approaching the burner and its surroundings for inspection, etc., or when working with the burner or piping, be sure to wear protective gloves, protective caps, protective glasses, etc., as they are hot.
7. Design the piping with a margin to prevent pressure loss and drift.
8. If necessary, take measures against noise, such as installing a noise filter.

### 14) Inspection

#### 1) Confirmation of combustion

1. Check the air flow rate and gas flow rate of each burner by pressure and differential pressure based on the adjustment value, and adjust the damper and valve according to the situation.

(Checklist)

- Pilot air differential pressure
- Pilot gas differential pressure
- Main air pressure
- Main air differential pressure



- Main gas differential pressure
- Exhaust pressure

When the temperature of the furnace is high compared to when the temperature is low, the main air becomes difficult to flow due to pressure loss and the flow rate decreases. Therefore, adjust the main burner at the maximum operating temperature and 100%.

At constant power, the main air pressure increases and the exhaust pressure decreases as the temperature increases.

When the differential pressure of the main air is 80% or less than the set standard differential pressure at a certain standard temperature, inspect the heat storage element. If it becomes 110% or more, please check the switching valve.

2. Confirm that the flame voltage value during combustion is 2V or more.
3. Especially in winter, depending on the fuel, it is easy to liquefy in the gas pipes, resulting in excess gas and soot generation.

## 2) Confirmation of exhaust temperature

Check the exhaust temperature regularly.

If the temperature is 300° C or higher, there may be an abnormality in the heat storage element or switching valve. Check the heat storage element and switching valve.

## 3) Inspection of switching valve

1. Confirm that the valve operates reliably 90° .
2. Confirm that the supply pressure of high-pressure air to the switching valve is 0.3 MPa, and check and clean the filter, mist separator, auto drain, etc.
3. Adjust the speed controller and check that the valve operates smoothly. Excessive speed may cause valve failure. However, since the current SRB-15 switching valve standard product cannot be adjusted, the current standard product does not have a speed controller.
4. Periodically apply grease.  
Use Sumitemp Grease NO.2 from Sumiko Lubricant Co., Ltd. or equivalent.
5. Check the auto switch (sensor) position.
6. If there is a problem with the valve or actuator, replace the switching valve.

## 4) Inspection of blower and exhaust blower

1. Check the filter, and clean or replace it if necessary.
2. Make sure blower inlet and outlet pressure is rated.

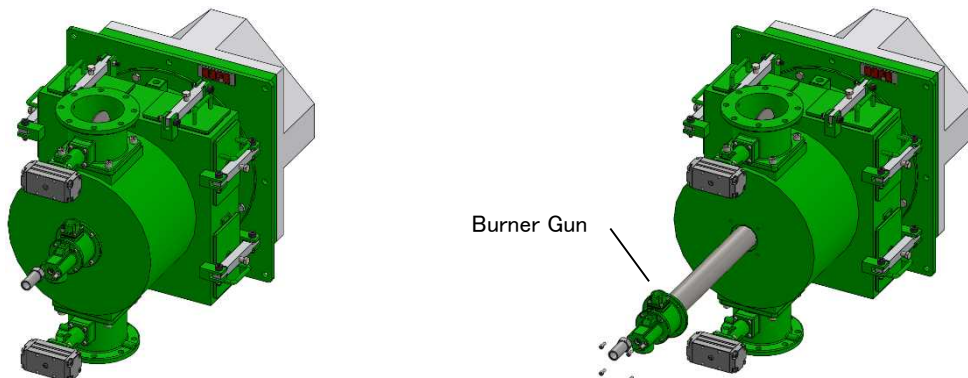
## 5) Inspection of piping

Regularly inspect the manual valves and control valves installed in the exhaust line and grease them up. Exhaust gas contains a lot of moisture. Corrosion caused by components contained in moisture or atmospheric gas may cause malfunction.

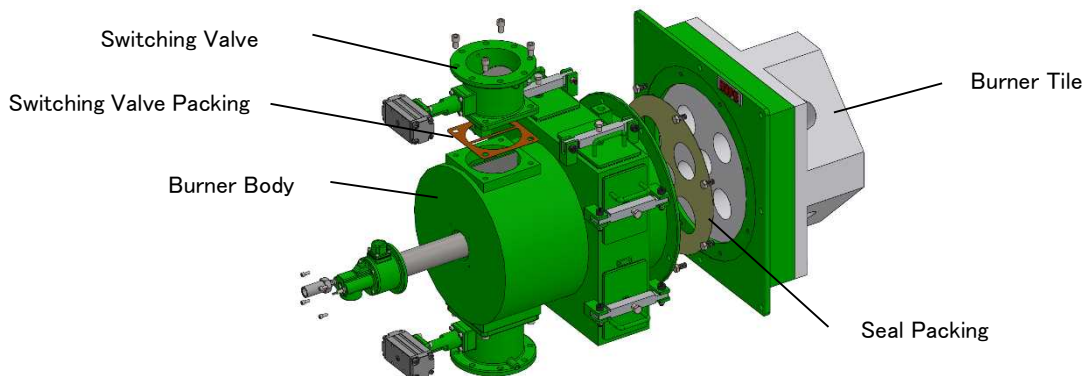
## 6) Burner inspection

1. Pull out the burner gun and inspect the nozzle, check for carbon adhesion, deformation and corrosion, and clean or replace it depending on the situation.
2. If there are cracks or defects in the burner tile, please replace the burner tile according to the situation.
3. Check the flame condition, the red heat of the front plate, cracks in the sight hole, etc., and replace it if you find any defects.
4. When separating the burner tile and the main body, please pull out the burner gun first and then separate it.

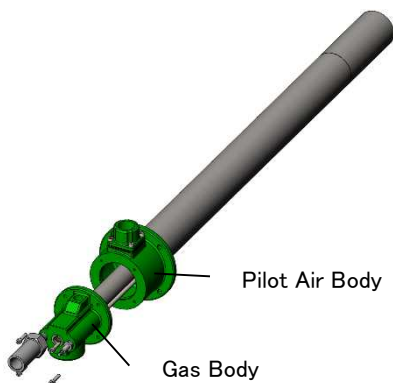
● Burner gun extraction



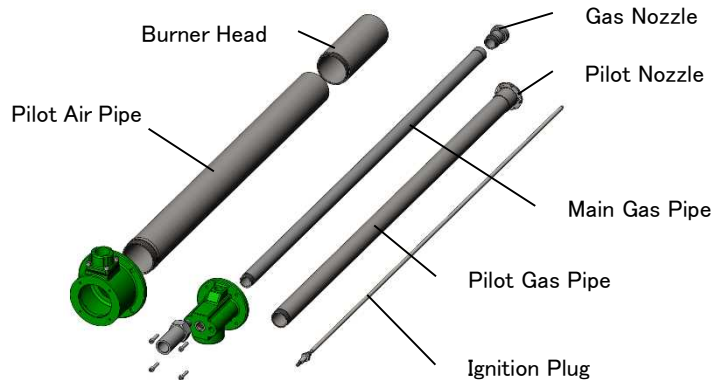
● Separation of burner tile and body, switching valve



● Extract gas body



● Burner gun disassembly



※The pilot nozzle and pilot gas pipe are welded together.

7) Inspection of Ignition plug

1. If there are cracks or cracks in the insulator, replace it.
2. If there is damage to the tip or adhesion of carbon, clean or replace it.

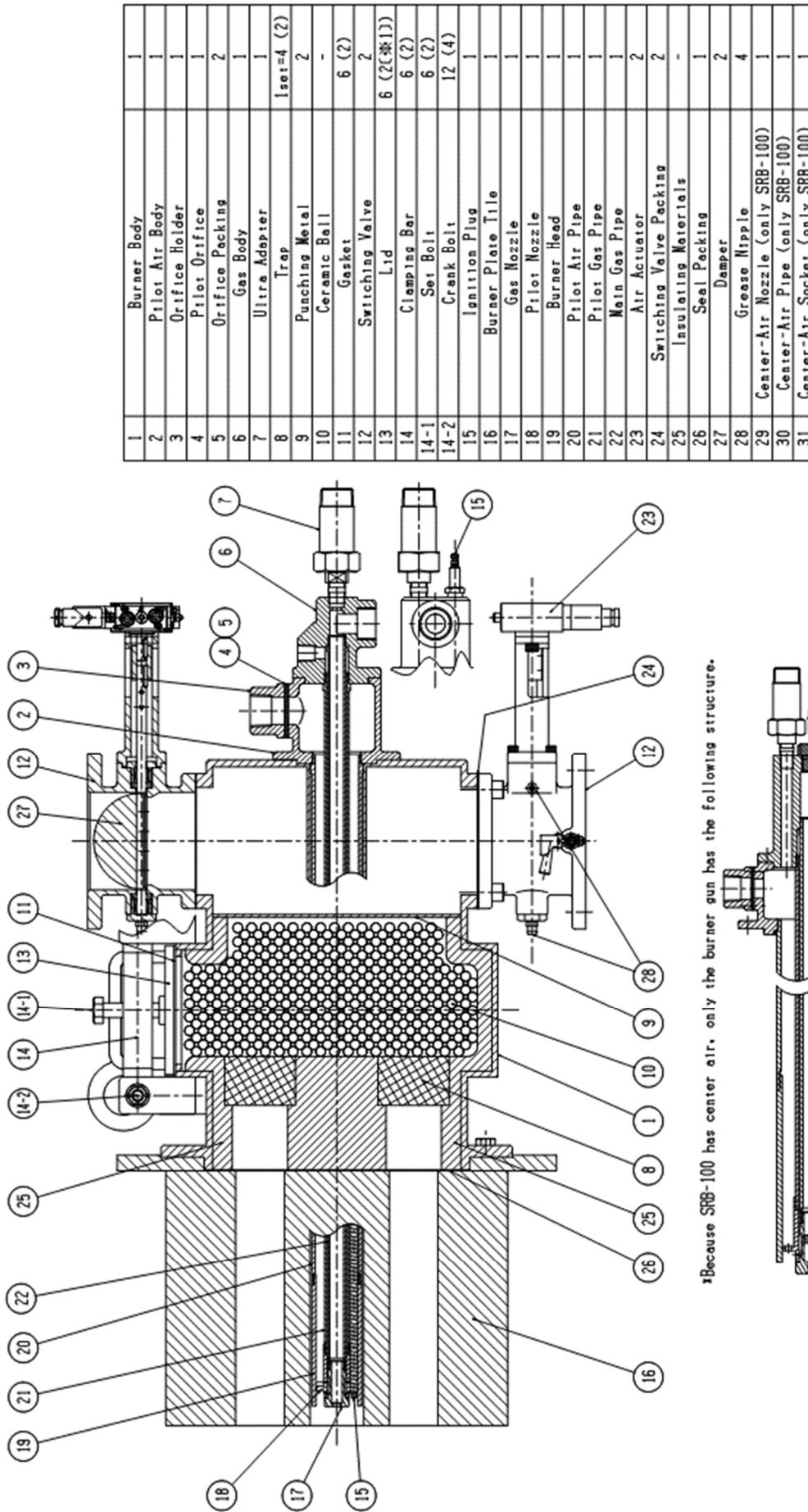
8) Inspection of Ultravision

If there is dirt, clean it and check the signal.

9) Inspection of heat storage element

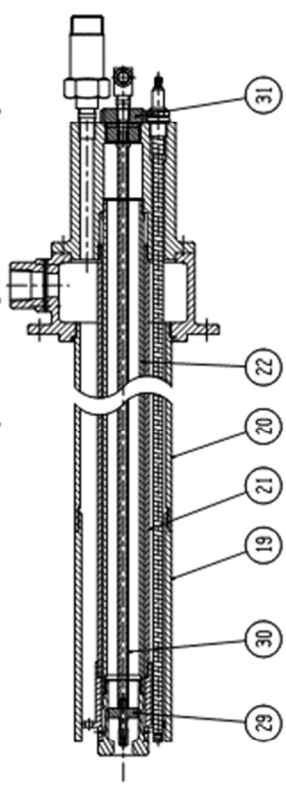
1. Check that the amount of ceramic balls is appropriate, and replenish as needed. In particular, after filling the ball, the haze of the ball decreases due to combustion, etc., so please check again after 2 weeks to 1 month after replacement.
2. Since the regenerative burner sucks combustion exhaust gas, depending on the state of the combustion atmosphere, foreign matter may adhere to the ball and clog it. Regularly clean and replace the ball, and remove any cracks.

15) Structural drawing



( ) indicates the number of parts for SRB-7.  
 (\*1) The SRB-7 heat storage element lid has a lid for the discharge port, but a closing flange for the input port.

\*Because SRB-100 has center air, only the burner gun has the following structure.



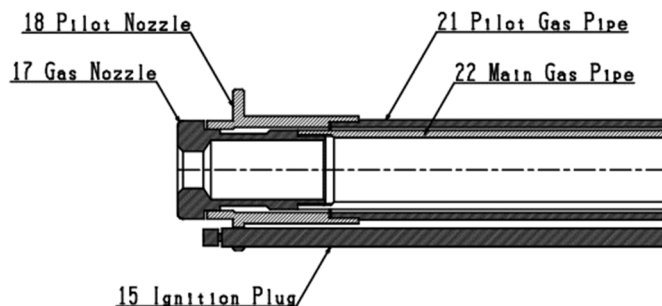
## 16) Disassembly

※ Perform disassembly after cooling the furnace. Also, be sure to wear protective gloves, etc.

1. Make sure that all power sources such as combustion blowers are turned off.
2. Make sure all gas cocks are closed.
3. Loosen the gas pipe union, etc.
4. Remove the bolts holding the air flange and ⑫switching valve, and remove the air flange. Don't lose the packing at this time.
5. Remove the air tube of the ⑬Air Actuator and the DIN terminal of the solenoid valve.
6. Remove the bolt of the switching valve, and remove the switching valve and packing.
7. Since only SRB-100 is provided with center air, remove the ⑲⑳㉑center air set from the ⑥gas body. ㉑The center air socket is a screw-in type (with an O-ring). If the ultra adapter is in the way and cannot be removed, remove the ultra adapter first.
8. Remove the bolts of the ⑥gas body, and pull out the gas body, ②main gas pipe, ①pilot pipe, etc. At this time, be careful not to break the insulator of the ⑮Ignition plug.
9. Remove the ②pilot air body bolts and pull out the ⑳air pipe.
10. Remove ①burner body from ⑯Burner tile. At this time, be sure to replace the ⑲seal packing. (Be sure to remove the burner gun before separating the front plate tile and the burner body.)
11. When assembling, be sure to apply an anti-seizure agent to the bolts and threads.

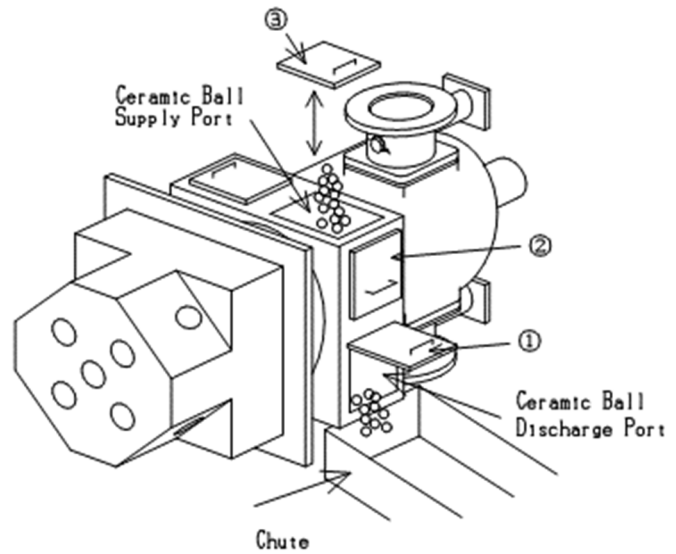
## 17) Nozzle replacement

1. Remove the ⑮Ignition plug (remove first as it is easily damaged)
2. Remove ⑰gas nozzle.
3. Remove ⑱pilot nozzle and ⑲pilot gas pipe. Both are welded together.
4. Assemble in the reverse order of disassembly. Be sure to apply an anti-seizure agent to the threads.
5. When assembling the ⑱pilot nozzle, make sure that the ⑥gas body Ignition plug installation position and ⑱pilot nozzle Ignition plug installation position are straight along the axis. (Don't tilt it.)
6. Install the ⑮Ignition plug and check the spark.
7. Install the nozzle part. Watch out for broken Ignition plug at this point.



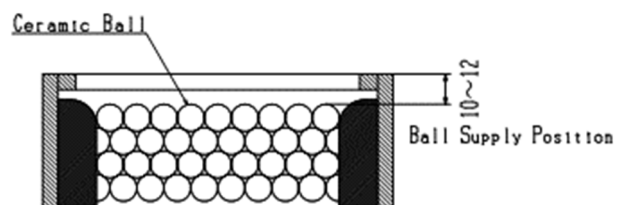
## 18) Replacement of Ceramic Balls

1. Place a chute or saucer under the lid of ①.
2. Loosen the presser bolt that holds the lid in ①, and remove one of the two crank bolts.
3. Pull out the crank bar and open the lid to reveal the ball. At this time, the ball may be hot, so please be careful.
4. Next, open the lid of ② in the same way, and put out the remaining balls.
5. Check through windows ① and ② that the perforations inside the heat storage element and the punching metal are not clogged.



6. If large cracks or cracks are found in the perforated plate or punching metal, the heat storage ball may fall off, so please take measures such as replacing or repairing the main unit.
7. Confirm that there is no damage such as large cracks on the castable in the heat storage element.
8. If there is no problem, return the covers of ① and ② to their original positions and fasten them firmly with the crank bar and bolts. Don't forget the packing at this time.
9. Next, open the top ③ lid in the same way.

10. Fill new balls from there. The filling position should be about 10 to 12 mm from the top as shown in the right figure. Never push the lid while it is floating.
11. Close the lid of ③ in the same way as ① and ②. This completes the filling of one side of the ball.



12. Replace the other ball in the same way as above.
13. If the ball you took out is broken, remove it. Please wash the remaining ball with water and dry it thoroughly before using.
14. Check the amount of balls again after 2 weeks to 1 month after filling the balls. If the ball is less bulky, refill it.

## 19) Spare Parts

The following items are available as consumables and replacement parts. It is recommended to have it on hand as a spare part so that it can be dealt with immediately on site.

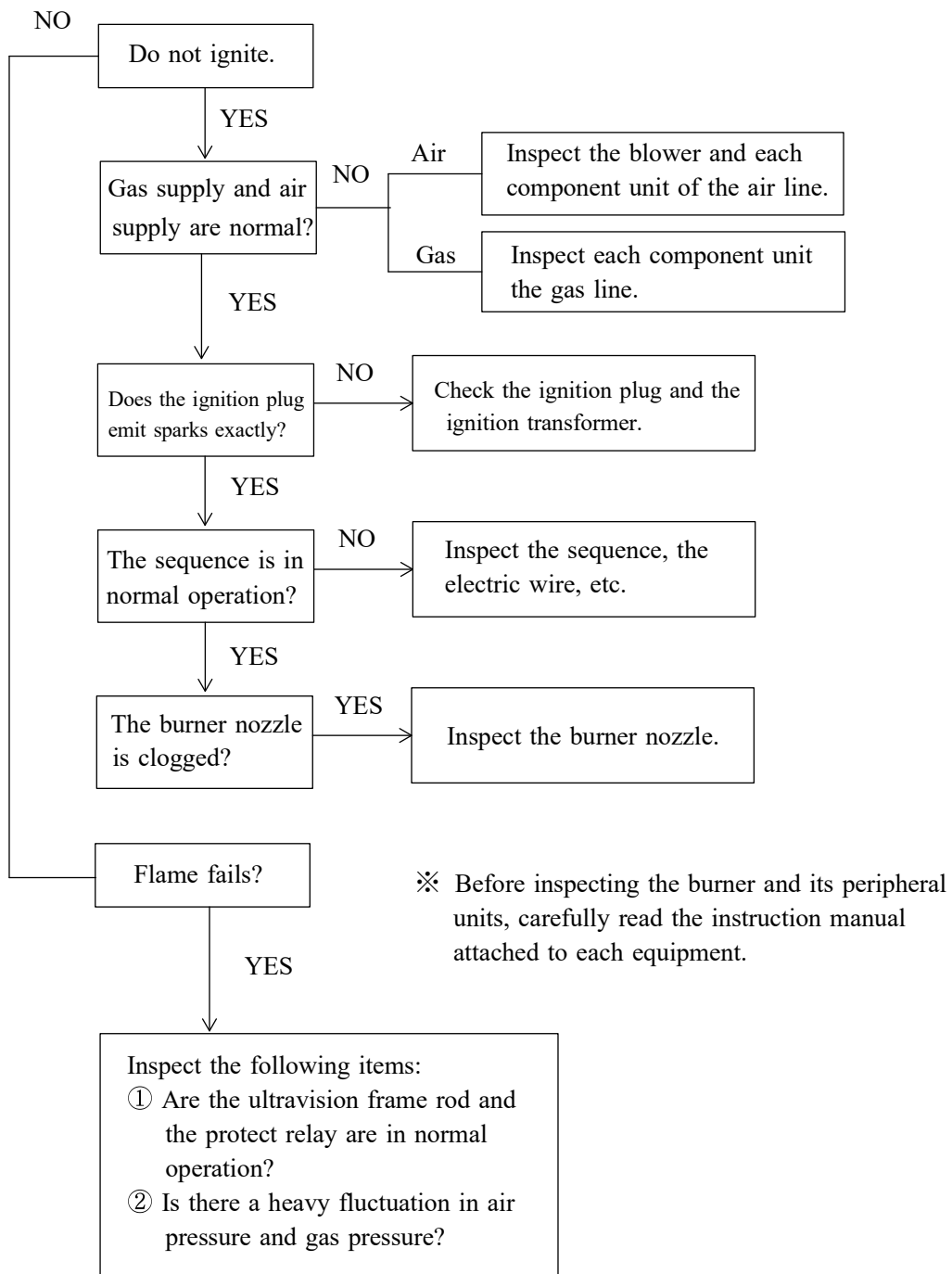
1. Heat storage ball
2. Switching valve (The same valve is used for combustion air and exhaust.)
3. Spark plug
4. Packing
5. Gas nozzle, pilot nozzle
6. Pipes such as gas pipes

## 20) Warning Plate

When the installation construction has been completed, check to confirm that the warning plate shown below is firmly attached to the burner body. If the warning plate is lost, immediately contact our sales department for instructions.



## 21) Troubleshooting



※ If there is any questions, contact our sale department.