



Zhangjiagang Wilford Thermal Technology Co.,Ltd.

Installation & Operation Manual

WNS Series horizontal Gas -fired (Oil) Boiler

- →*Please read this manual carefully before using this machine;*
- →*Only qualified workers can operate this machine;*
- →*If the operation method is not correct, dangerous accidents may happen.*

Version: WNS-1101

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Special recommendation

Well-beloved user, please install a electric power leakage protector before using this machine !

1. General description

※ This manual should be used for WNS Series horizontal Gas -fired (Oil) Boiler. Please read the manual before use or maintenance.

※ Boiler installation and use shall comply with the following laws and regulations: GB50041 "boiler room design specifications"; GB50273 "industrial boiler installation construction and acceptance"; GB4272 "equipment and pipe insulation technology General"; GB/T17954 "industrial boilers economy running"; TSG G0002 "boiler energy saving technical supervision and management procedures"; TSG G0001 "Boiler Safety Technology Supervision" and so on;

※ Boiler water must meet state standards of GB1576 "industrial boiler water quality requirements". Boiler should be equipped with water softener, otherwise it is easy to be scaled and cause lower efficiency and service life, even accidents.

※ Do not use low conductivity medium such as distilled water, pure water, it will affect level controlling and measuring.

※ Pipes connected to boiler must meet state standards.

※ To make sure operating safety, terminal electricity should be equipped with suitable leakage protector and be connected to ground by customers. Professionals should tighten and check main circuit connections, power lines, controller wirings, burner wiring regularly. Electricity must be cut when maintaining and repairing boiler.

※ To ensure the normal operation of the burner, oil boiler equipment should use specified oil, the use of poor quality oil and inconsistent oil are prohibited, do regular cleaning for tank, piping, filters, and pumps. Gas boilers should use natural gas or liquefied petroleum gas to meet the requirements. The gas pipelines should be equipped with regulator valves (reducing valves), pressure gauges. Flow and pressure of the burner should be met to ensure the efficient operation of the boiler burner.

※ Pls. discharge safety valves by hand every week, otherwise any consequence is none of manufacturer's business.

※ Boiler should conduct blow down twice every day below pressure 0.15Mpa. Blow down pipes should be connected to safety place. To avoid boiler operating in negative pressure, after blow down, do not shut down blow down valves before starting boiler again.

※ Washing water level gauge (when pressure is blow 0.15Mpa), electrode, water tank regularly.

※ When environment temperature is below 0 °C, take care of feeding water line to avoid damage. After operation, pls. discharge the rest water in water pump.

※ When shift boiler, do make sure shift documents together with boiler.

※ There will be no particular notice when boiler technology is improved and state's regulations are changed.

There will be some difference between products and the manual, pls. operate as detailed parts manual and state updated regulations.

※Any consequences caused by incorrect operation of equipment, or ways not mentioned in the manual, are not under manufacturer's responsibility.

※Before operating boiler, pls. apply permission from local institution.

2. Installation description

1. Preparation work before installation

Check the completeness of the boiler accessories according to the packing list and the general drawing of the boiler. Check whether there are any damage and deformation. If there is a need to lift the large boiler parts, lifting capacity should be greater than the total weight of the boiler, one should use the top lugs for lifting. Any damage to the heat insulation layer should be avoided.

1.1 Organization and personnel

Boiler should be in the charge of special personnel, boiler operators, pipe fitters, fitters, lifting operators, cold worker, qualified welders and assistants.

1.2 Study

In order to let the relevant persons know and master the relevant items of installation, lifting, running operation and so on, they should be organized to study to be familiar with the following documents: standard of "Supervision Regulation for the Safety Technology of Steam Boiler", boiler drawings, installation and operation manual.

1.3 Installation place

1.3.1 The best installation place should be close to the steam supply, so as to shorten steam pipelines, decrease the construction fees, decrease the differential pressure and heat loss.

1.3.2 The equipment of oil storage and transferring should comply with the relevant requirements.

1.3.3 Feeding and draining water should be very convenient.

1.3.4 The path should be very smooth while installing and transporting the boiler.

1.3.5 The arrangement of boiler room should meet the relevant regulations of 《Safety Technical Supervision Regulation for Steam Boiler》, chapter 8 issued by Labor and Human Ministry of the People's Republic of China.

1.4 Preparation for foundation

According to foundation sketch, prepare the installation foundation for boiler and pre-fabrication plate of ladder.

1.4.1 After boilers arrive in site, check all parts according to the packing list. Re-check the completeness of boiler set according to the general drawing. Check whether there are any damages or deformation during transportation of the large boiler components.

1.4.2 When unloading the boiler large components, place 8 to 10 tubes below the steel plates of bedplate's two sides, pull it with steel rope and make the large components move slowly on the rolled tubes. At this time pay attention to the location for placing steel ropes, and avoid any damages to any part.

2. Installation of boiler large components

After the boiler is placed on the two strip foundation, it will tilt, the fore end of axis centerline will be higher than back end for about 10 to 25mm (according to different foundation drawing). It is very convenient for blowing down. After checking the level, add cement to boiler bed support and two wall foot.

3. Installation of chimney

The chimney height should accord with the user's requirements.

3.1 While assembling chimney, add asbestos rope between flanges, check the perpendicularity of chimney through hanging perpendicular line, if there is error, adjust it by backing piece at the connecting location of flange.

3.2 Steel cable can be strained by screw. Three pieces of steel cable is uniform distributed around a circle. Pay attention to making three steel cables have the same strain force roughly.

4. Installation for pipelines, valves and instruments

4.1 Install the pipelines, valves and instruments according to drawings. Water pump is connected to water tank, and user can provide spare water pump with additional requirements,.

4.2 Safety valves must be assembled after hydraulic testing and connected to the tube for dumping steam so as to dump the steam to safety place. The section of dumping steam pipe should not be less than the section area of the safety valve outlet, the pipelines should be arranged to minimize the resistance of blow down to keep draining water smoothly.

4.3 The blow down pipe should be connected to blowing down tanks or other safety places. In order to avoid accidents in moving or burns, the pipelines must be fixed.

4.4 All steam pipelines, except for main steam valve, should be assembled by user, there is at least one elbow at the main steam pipeline, otherwise add telescopic tube. The pipelines must be insulated.

4.5 The pipes for draining water at the lower position of water level and water level automatic controller must be connected to safety place. The cock of water level gauge can rotate quickly and have no water leakage. The water level gauge must be assembled with lighting device.

4.6 The dial panel of pressure gauge should be marked with red line to indicate the highest working pressure available. The cock of pressure gauge should rotate quickly and have no water leakage. The drainage of water should be very smooth. The insulation of pressure gauge is forbidden.

5. The other parts installation

5.1 The oil pump unit should be installed on the bedplate (if oil-fired pump is installed inside burner, it means oil-transferring pump).

5.2 The electrical control box should be installed at the position convenient for observation burner.

5.3 The burner will be connected to electrode nozzle of boiler.

6. Hydraulic testing

After finishing the installation of boiler pipelines, valves, instrument and so on, check and clean the inside surface of boiler, close manhole and hand-hole, conduct hydraulic testing according to the stipulation of the item 7 of this operation manual.

3. Introduction for boiler structure

1. Boiler body structure

1.1 The boiler heating surface is arranged as three returns structure. The horizontal and longitudinal furnace is the first return, the front section is corrugated furnace which can decrease the bad influence to the boiler body because of heat expansion. The smoke tube bundle welded between front & back tube plate forms the second and the third return that can reduce the exhaust gas temperature.

1.2 The upper part of boiler drum is steam space. In order to improve steam quality, there are steam-water separating unit inside upper part. The middle and lower part is water space, even at the low water level, all tubes of the highest heating surface can be ensured to be immersed into water.

1.3 The boiler front and back smoke box can be disassembled easily, so it is very convenient for cleaning & removing ash, overhaul and maintenance.

1.4 There is fire observe hole at the back end of boiler for the convenience of checking the burning status.

1.5 Boiler accessories and their functions

- a. Main steam valve ---- on the top of boiler, which can transfer the steam from boiler to steam main pipe or steam cylinder.
- b. Safety valve ---- on the top of boiler, which can discharge all the steam at full load when the boiler is over pressure and can decrease the boiler pressure.
- c. Water level gauge and water level controller ---- on the steam/water interface, which is used for boiler water level indication and for the supervision by boiler operator. The water level controller is used for transmitting the value of boiler water level. The control system will control the running of feeding water pump and burner emergency stop according to the received signals.
- d. Feeding water stop valves and check valves ---- on the shell side for feeding water.
- e. Blow down valve ---- at the bottom of boiler for draining of the boiler's deposition and dirt.
- f. Gauge valve ---- on the top of boiler, used for connecting the instruments with steam inside boiler.

1.6 There are necessary manhole and hand-hole on the boiler drum for internal inspection.

1.7 The outside surface of boiler shell and smoke box is packed with insulation material and cold-rolled plate to reduce heat loss of boiler and surface temperature.

2. Burning system

2.1 Oil-fired system: The actual working pressure should accord with the regulations of burner instruction.

2.2 Gas-fired system: The system working pressure will be confirmed according to different gas source.

2.3 Burner

2.3.1 Oil-fired burner: it is mechanical pressure burner by the way of direct ignition, which consists of ignition transformer, ignition electrode, magnetic valve, oil gun and so on. The wind quantity can be controlled by damper adjustment unit located at the inlet position of fan. It is permitted that the inlet oil pressure can have some changes at the precondition that ensures atomizing quality and oil-injection quantity, but in general condition, the oil-inlet pressure should not be less than 0.98Mpa.

2.3.2 Gas-fired burner: please refer to instruction.

3. Automatic control

The automatic control system consists of following items: water level control, pressure control, process control, safety protection and so on. If the automatic system has troubles, manual operation mode can be started.

3.1 Water level control

The water level control system consists of electrode, relay, control circuit and so on. There are electrodes with different sizes (long or short) inside water level controller and water level alarm unit. When water level changes, the electrode will contact with water or separate from water to control water pump start or stop running through the relay and control circuit, so as to realize the function of automatic feeding water, shut off water at too high water level, alarm and stop running boiler at too low water level.

3.2 Pressure control

The pressure control consists of many (3 to 4) pressure controller and magnetic valve. Working pressure can be controlled by multiple ways, which can control the burning status according to different loads outside. Adjusting the differential and set point of pressure controller can change its dynamic property.

Now take rated steam pressure 0.8Mpa as an example:

- 0.83 Mpa (safety valve open);
- 0.75 Mpa (alarm for high temperature, stop burning);
- 0.7Mpa (stop burning);
- 0.65 Mpa (run at low fire);
- 0.60Mpa (run at low & high fire);

3.3 Process control

For the process control, please refer to operation manual of burning unit.

3.4 Safely ignition protection

During boiler starting control, once pre-purging is finished, it will enter into ignition process. Ignition will continue for five seconds, if still flame can't be established inside furnace because of some reasons, the photo resistance can't sense light. It will stop burning and send out acoustical & light alarm, then continue post purging (for gas-fired boiler) before boiler stops working. Check and find out causing reasons and remove the troubles before starting boiler again.

3.5 Flameout protection

In running boiler, flameout inside furnace may happen because of some reasons, the value of photo resistance will become larger, oil and gas supply will be cut off, and acoustical & light alarm will be sent. It then continues post purging (for gas-fired boiler) before boiler stops working. The boiler can start again only after removing the troubles.

3.6 Too low water level protection

In running boiler, while water level drops to the limit too low water level, it will stop burning and send out acoustical & light alarm.

3.7 High water level protection

When boiler gets to over high water level because of some reasons, acoustical & light alarm will be sent out. Causing reasons must be checked in time.

3.8 Too high steam pressure protection

When steam pressure gets to 98% rated steam pressure or gets to 100% rated steam pressure, the boiler stops burning and send out acoustical & light alarm.

3.9 Photo resistance failure protection

The photo resistance is one of very important units in burning control system, its property will directly affect the safety for running boiler. So this control system has safety protection measures.

When the value of photo resistance becomes small or when the photo switch is broken, the relay contact inside control box will be off, and burning can't continue normally.

In addition, when stop running boiler or flame can't be established, if the indication lamp of burning is on, it means that the photo resistance or photo switch has been broken, a new one should be changed.

3.10 Loss voltage protection

In normal running boiler, the electric network may have no power or the voltage is dropped suddenly because of one certain reason, boiler will stop running. When electric network returns back to normal condition, the boiler

unit will not start operation automatically. Now push the burning start button again, then boiler can continue running again so as to avoid bad consequences.

3.11 Valve leakage protection

When there are leakages inside gas pipeline, it can ensure no start of the burner.

3.12 Low gas pressure protection

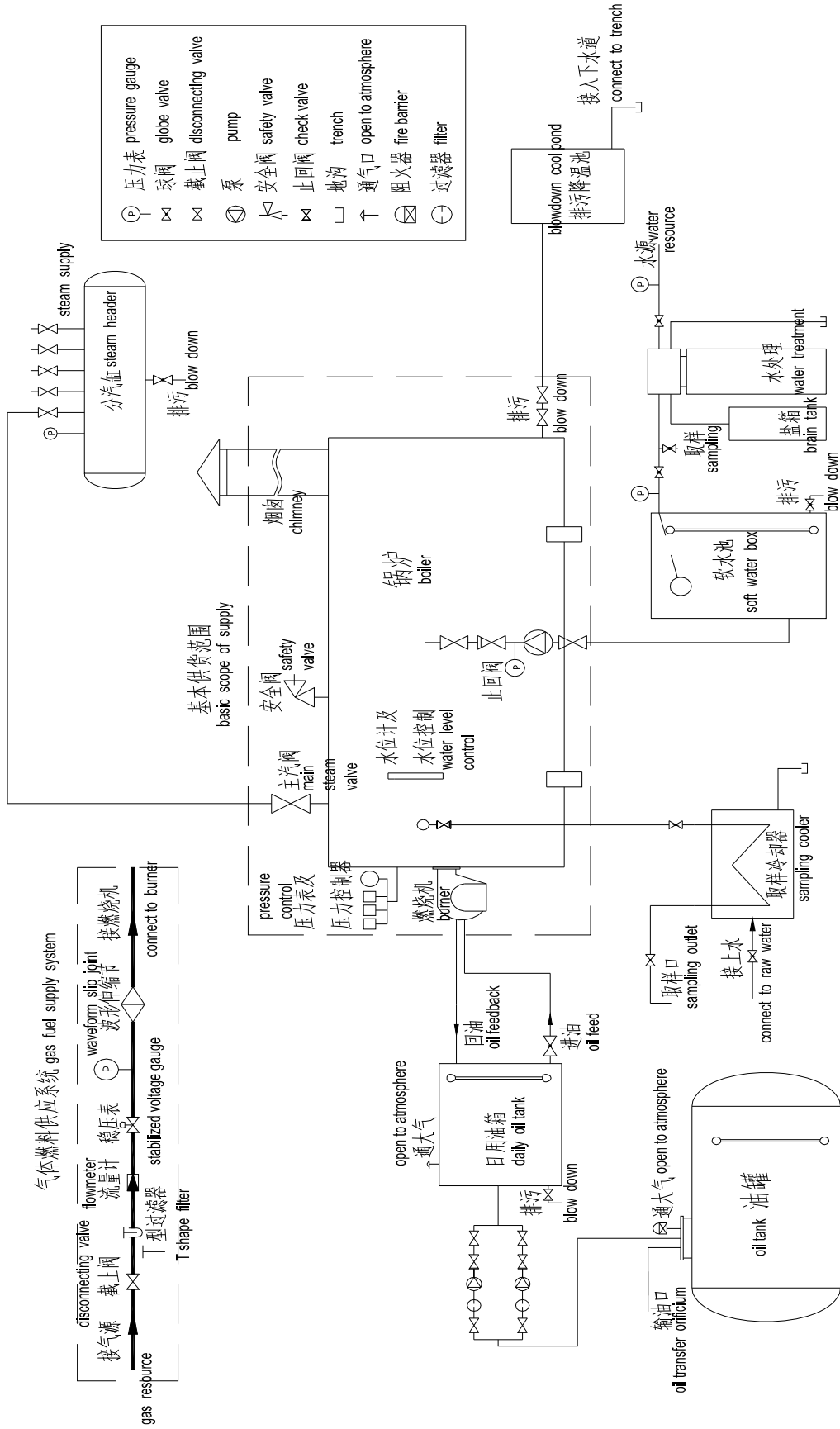
When the gas pressure inside pipeline is lower than set point, it can ensure no start of the burner.

3.13 Low wind pressure protection

When the fan has over low wind pressure because of a certain reason, it will cut off burning automatically or ensure no start of the burner.

WNS 系列燃油(气) 锅炉系统图

System Flowchart for WNS Series Oil—fired (gas) Steam Boiler



4. Boiler work principle

The boiler tubes of heating surface and furnace absorb the heat of firing oil, transfer it to the boiler water, and when the water is changed to steam because of heating, steam will go up and enter into the vapor space because its gravity is reduced, and the left space will be made up by the water with more heavy gravity, so this process will form a natural steam-water circulation. When the water level becomes lower because water is changed into the steam continuously, the water pump will feed water into the boiler so as to keep it at the normal water level. As the above-mentioned process continues, heat will be continuously transferred to boiler water to produce steam.

5. Burner using methods

Operation Manual of oil fired boiler

1. The Running of the Burner

- 1.1 Confirm that there is sufficient oil in tank, all the valves are fully open, to ensure no blocking of the return line, or seal rupture of oil pump.
- 1.2 Check the impeller of the blower to see whether it can turn flexible or freely, and see whether there is mechanical noise.
- 1.3 Adjust the blower structure to a proper position, screw down the compress bolt (it is fixed leaving the factory, there is no necessary to re-adjust in general).
- 1.4 Ensure a clean and dark electric eye, or it cannot ignite.
- 1.5 Put through the electric power source, the burner will start running. Motors, oil pumps, ignition electrode work, the solenoid valve on the oil pump provides oil after 20 seconds, atomized oil goes through a nozzle into the hot zone arc for burning. After 5 seconds the ignition electrode stops working .
- 1.6 If the ignition is unsuccessful after the injection nozzle, the indicator lights on the controller will be on, then the controller goes into the protected status, burner stops working.
- 1.7 If flameout occurs suddenly in normal burning, the burner will re-start to work immediately and automatically. If automatic start of ignition fails, the controller will still enter to the protective state and the indicator light is on.
- 1.8 When the controller enter into the protective state, press the reset button(the red indicator button) and the controller will re-start working.
- 1.9 If start of ignition fails for several times, the professional person who is familiar with the burner should be asked to check and remove the troubles.

Note: Please do not light the burner with any open fire.

2. Adjustment of the burner

2.1 Adjustment of the air door

When there is smoke in the exhaust pipeline, it means the air is insufficient, one should open the air door smoothly until it stops smoking. The discharge pipeline is going to be blocked if smoking for a long time, and burning efficiency will be affected and the burner is going to be in trouble.

2.2 Adjustment of the oil pressure

When the throttle is adjusted to the maximum, but there is still black smoke in the exhaust pipe, oil pressure should be addressed to "-" to adjust the amount of oil to reduce the oil injection, a small amount of rotation should be done to observe smoke, if it can't work, repeat the above adjustment several times until it produces no black smoke. Please note the DANFOSS or SUNTEC pumps, see Figure 4 for regulators location.

Note: The settings of the air door and the oil pump is fixed leaving the factory, there is no need to re-adjust in general. If necessary, please refer to the requirements of 2.1,2.2 in this chapter for the details.

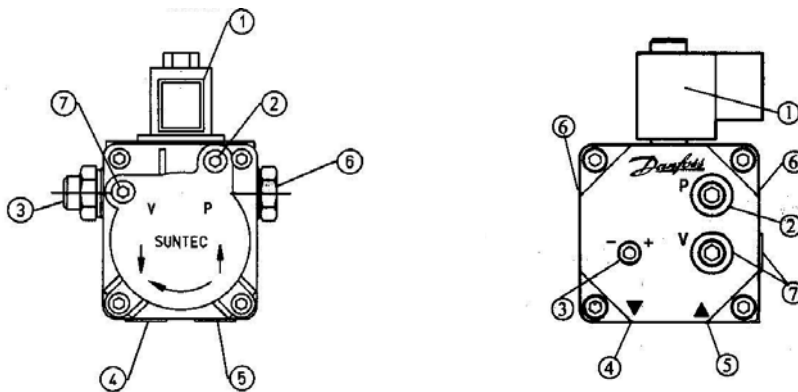


Fig.4

- ①Solenoid valve ②Gauge connector ③Oil pressure regulating place ④Oil return opening
⑤Oil inlet port ⑥Nozzle interface ⑦Vacuum gauge interface

3.Maintenance of the burner

3.1 To ensure the burner's working surrounding is clean, and to prevent the dust from entering the air inlet to damage the impeller.

3.2 Keep the machine shell clean. When cleaning it, cut off the electric power source first then shut it down. Please do not wash it directly with water in order to prevent water entering into the electric wiring elements.

3.3 Regular cleaning of electric eyes:

Electric eyes (also known as photosensitive or light eyes) is a safety device to monitor the ignition of the oil injection. Blackened photoelectric surface will influence light sensitivity, and disable control device.

Cleaning method: Carefully set aside photocell, use a clean, soft cloth to wipe the glass cover. Glass cover should be reloaded toward the nozzle direction.

3.4 Periodically clean the oil

3.4.1 Clean up the oil filter:

- Unscrew the oil filter on both cover, remove the filter, gasket.
- Use kerosene, clean diesel to clean or clean and puff the filter with compressed air, check the filter for damage or perforation, the filter must be replaced if broken.
- Clean with kerosene, under both cover and gasket.
- Recover the oil filter as assembled.

3.4.2 Clean up the oil pump strainer:

- Unscrew bolt 8 of the oil pump DANFOSS or side four bolts 9 of SUNTEC pump, remove the inside filter, see Figure 4 for location.
- Clean according to the requirements of this chapter 4.4.1.2
- Recover the oil pump as assembled.

3.4.3 Nozzle cleaning:



Fig.5

- Use a clean, soft cloth to wipe the dirt on the nozzle, and a 16mm socket wrench to remove the nozzle.
- Put the nozzle head on the sleeve, pinch the screen side, unscrew the filter, if it can't work, use grip pliers to unscrew the end, note that one should not destroy the filter, or else then nozzle will be useless, then use 4mm Allen wrench to unscrew the bottom screws, pour the small cone. See Figure 6.
- Clean according to the requirements of this chapter 4.4.1.2, and then recover as assembled.
- Mount the filter, and then put back the nozzle in nozzle seat and tighten.

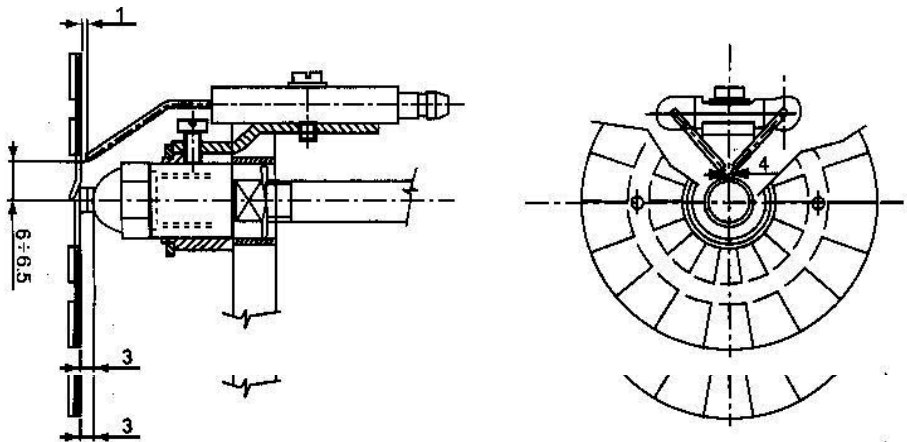
Note: Do not damage vent holes and the edge of the nozzle holes in the disassembly process, do not damage the oil seal ring and threaded end surface of the nozzle seat. Note: Clean once every two weeks generally, if the oil is dirty, then it should be cleaned once a week, in the cleaning process if filter is relatively clean, one doesn't need to clean filter and oil injectors,.

3.5

- a. Unload flame tube, then unload the light-fire electrode and subassembly of flame-steady cover one by one.
- b. Nozzle cleaning, in accordance with the requirements of this chapter 3.4.3.
- c. Abrade the ash in the flame-steady cover smoothly with the “—” shape screwdriver, pay attention that the manger in the flame-steady cover should not be out of shape.
- d. Clear the accumulated charcoal on the light-fire electrode.
- e. Recover the subassembly of the flame-steady cover and the light-fire electrode.

Recover the flame tube.

Note: one must make sure the space between two discharge ignition electrode is less than that between them and any point on the burner, otherwise it will misfire. Slight coke on combustion components is a normal phenomenon, one do not have to clear.



3.6 The accumulated ash on the impeller must be cleared periodically if the burner is used in the surrounding with much dust .

3.6.1 Unload the fixed screw that connect the flange and the shell, lift down the electric motor and the flange and the impeller.

3.6.2 Clean the accumulated ash on the laminate with the bamboo sheet. Pay attention not to making the laminate and the impeller out of shape. At the same time, examine the impeller to see whether the impeller is fixed on the electric motor axis securely, if not, screw the close-fix bolt.

3.6.3 Recover the connecting axis, impeller, motor according the original assembly, turn the impeller by hand to examine if it can turn flexibly and freely, friction with the shell or other parts is not allowed.

3.7 Add oil once a year to the motor bearings.

3.8 If the burner is not used for a long time, anti-rust oil must be injected within the oil pump (open suction pump).

3.9 Before re-use of the burner after a long-time unused, examine whether there are some looses at each connection, if the electric wiring line is dropped off, then one can use it after there is no abnormal situations.

3.10 Oil tanks and oil feeding systems:

3.10.1 LWS series use: kerosene or diesel, kerosene is better in cold zone, the use of gasoline is prohibited. Waste oil or seepage water must not be injected, otherwise it will affect the ignition and combustion.

3.10.2 Oil tank or barrel port position should be at or above the appropriate level of the burner pump.

3.10.3 Always check whether there is leakage (seal processing or reinstallation should be done if there is any leakage).

3.10.4 Oil tanks or barrels must be cleaned regularly (depending on the oil quality used).

4. The troubles of the burner and the removal methods

Phenomenon	Causing reasons	Removal methods
The electric motor does not work	<ol style="list-style-type: none"> 1 Power supply is not normal, the controller power lines have no electricity 2 The controller is protected, the indicator light of the controller is on 3 Motor goes wrong 4 The boiler has reached set pressure 5 Oil pump drive shaft is stuck 	<ol style="list-style-type: none"> 1 Unplug the controller body, check fuse, replace it if broken 2 Press the reset button, so that the controller is ready for operation 3 Replace the motor 4. Adjust correctly 5 Professional repair or replacement of the pump
Motor rotates but does not ignite	<ol style="list-style-type: none"> 1 Oil tank and the oil system have no oil 2 Oil pipeline system is not sealed 3 Filter in oil pipeline system (including pump filter) is clogged 4. Pump solenoid valve coil is broken 5 Controller is broken 6 No spark between the ignition electrode <ol style="list-style-type: none"> a. ignition electrode position is incorrect b. ignition electrode and ignition transformer high-voltage lead is in poor contact c. ignition transformer is broken 	<ol style="list-style-type: none"> 1 Add oil 2 Examine every section to exclude 3 Clean or replace the filter 4 Replace the coil or solenoid valve 5 Replace the controller 6. <ol style="list-style-type: none"> a. correctly adjust according to chapter 4.5.5 b. examine to exclude c. replace the ignition transformer
Can be fired, but then shut down	<ol style="list-style-type: none"> 1 Electric eyes contamination or damage 2 Way inlet pipe is not sealed 3 Air door is too large 4 Controller is broken 	<ol style="list-style-type: none"> 1 Clean or replace electric eyes according to chapter 4.3 2 Check to exclude 3 Adjust air door according to Chapter 2.1 4 Replace the controller
Can be fired, but the flames are unstable and flameout	<ol style="list-style-type: none"> 1 Water is in the oil 2 Oil feeding system is in leakage or blockage 3 Nozzle part is blocked 	<ol style="list-style-type: none"> 1 Replace Oil 2 Check to exclude 3 Clean or replace nozzle according to chapter 4.4.3
Black smoke in exhaust	<ol style="list-style-type: none"> 1 Air door opens small 2 Impeller is dirty 3 Air flow channel in burner is in blockage 4 Exhaust flue is in blockage 	<ol style="list-style-type: none"> 1 Appropriately open the air door 2 Clean the impeller according to chapter 4.6 3 Exclude foreign body 4 Check other parts

Note: To ensure the normal operation of the burner, oil boiler equipment should use specified oil, the use of poor quality oil or inconsistent oil are prohibited, do regular cleaning for tank, piping, filters, and pumps.

Gas-fired Burner Using Methods

1. The Running of the Burner

1.1 Make sure that all the circuit connected to the burner is grounded according the wiring diagram, there is no leakage in the gas feeding pipe. The air discharging pipe goes through measurement point, check pressure.

- 1.2 Check the impeller of the blower to see whether it can turn flexibly or freely, and to see whether there is mechanical noise.
- 1.3 Adjust the blower structure to a proper position, screw down the compress bolt(it is fixed when leave factory, ordinary there is no necessary to re-adjust).
- 1.4 Put through the electric power source, the burner will start running. The burner is about to puff and sweep for 45 seconds, then the light-fire transformer lights a fire, three seconds later, open the gas valve of one stage fire, the gas feeding quantity is controlled by the gas flow meter and adjust on the gas valve.
- 1.5 If fire is not lit, the burner is about to stop running in 2 seconds. When running flameouts, it will stop in less than one second. If there is no pressure or the pressure is decreased, then the floor level pressure switch is about to cutting off the expire valve.
- 1.6 If flameout occurs suddenly in normal burning, the burner will re-start to work immediately and automatically. If automatic start of ignition fails, the controller will still enter to the protective state and the indicator light is on.
- 1.7 When the controller enters into the protective state, press the reset button(the red indicator button) and the controller will re-start working.
- 1.8 If start of ignition fails for several times, the professional person who is familiar with the burner should be asked to check and remove the troubles.
- 1.9 Examine the gas supply system

The surroundings leakage may cause poison and the explosion accidents in the working place, so high attention must be paid to. Firstly, make sure the pipelines are sealed. Examine the leakage periodically, discharge all the dangerous reasons then use the machine again; Secondly, avoid the concentration that causes poison or explosion, the ventilation of the working place is a must: install a ventilation hole and forcible ventilation equipment; Additionally, the fireworks are forbidden and electrical components should be anti-explosive in working place.

Warning: Please do not light the burner with any open fire.

2.: Adjustment of the burner

2.1 Adjustment of the air door

When there is smoke in the exhaust pipeline, it means the air is insufficient, one should open the air door smoothly until it stops smoking. The discharge pipeline is going to be blocked if smoking for a long time, and burning efficiency will be affected and the burner is going to be in trouble.

2.2 Adjustment of the air pressure switch

In normal burning, adjust the air pressure switch until the burner shuts down, then anti-adjust one circle to the final position in a anti-clockwise direction.(If the air pressure switch is too loose, it may cause no light-fire process, if it opens too slowly, there may cause troubles alarming.)

2.3 Adjustment of the gas flow rate

3.Maintenance of the burner

3.1 To ensure the burner's working surrounding is clean, and to prevent the dust from entering the air inlet to damage the impeller.

3.2 Keep the machine shell clean. When cleaning it, cut off the electric power source first then shut it down. Please do not wash it directly with water in order to prevent water entering into the electric wiring elements.

3.3 Clean spares subassembly inside the flame tube

3.3.1 Unload flame tube, then unload the light-fire electrode and subassembly of flame-steady cover one by one.

3.3.2 Abrade the ash in the flame-steady cover smoothly with the “—” shape screwdriver, pay attention that the manger in the flame-steady cover should not be out of shape.

3.3.3 Clear the accumulated charcoal on the light-fire electrode.

3.3.4 Recover the subassembly of the flame-steady cover and the light-fire electrode.

3.3.5 Recover the flame tube.

3.4 The accumulated ash on the impeller must be cleared periodically if the burner is used in the surrounding with much dust .

3.4.1 Unload the fixed screw that connects the flange and the shell, lift down the electric motor and the flange and the impeller.

3.4.2 Clean the accumulated ash on the laminate with the bamboo sheet. Pay attention not to making the laminate

and the impeller out of shape. At the same time, examine the impeller to see whether the impeller is fixed on the electric motor axis securely, if not, screw the close-fix bolt.

3.4.3 Recover the connecting axis, impeller, motor according the original assembly, turn the impeller by hand to examine if it can turn flexibly and freely, friction with the shell or other parts is not allowed.

3.5 Add oil once a year to the motor bearings.

3.6 Before re-use of the burner after a long-time unused, examine whether there are some looses at each connection, if the electric wiring line is dropped off, then one can use it after there is no abnormal situations.

4. Faults and removal for the burner

Phenomenon		Causing reason	Removal methods
The electric motor does not work or work not normally		<ol style="list-style-type: none"> 1. The connection is loose or disconnected 2. The ac contactor is in trouble, the loop or the adherent point is burnt out 3. The fuse is damaged 4. The zero curve is discontinued 5. The bearings of the electric motor is damaged or the loop is burn out 6. The blower is locked by other things 7. The circuit of the control is disconnected 8. The gas transmission is broken, the pressure power switch is shutdown 9. The controller is out of control 	<ol style="list-style-type: none"> 1. Re-connect 2. Replace the ac contactor 3. Replace 4. Repair 5. Replace or repair 6. Clear other things 7. Find out the disconnection point, then connect them or cut the controller or monitor 8. Open the ball valve, tell the gas administrative organization when the gas fuel is insufficient for a long time 9. Replace or repair
The air is insufficient	The electric motor is running but shutdown after the pre-blow & sweep	<ol style="list-style-type: none"> 1. The air pressure power switch is out of control 2. The pressure power switch is polluted and the pipeline is blocked 	Replace and clear
	The electric motor is running but shutdown in the pre-blow & sweep	<ol style="list-style-type: none"> 1. The adherent point of the pressure switch does not connect with the operating position (the air pressure is too low) 2. The air fan is polluted 	<ol style="list-style-type: none"> 1. Adjust the pressure switch correctly, if necessary, replace it 2. Clear and clean
The electric motor is running but either light no fire or shutdown		<ol style="list-style-type: none"> 1. The air pressure switch is too loose, and it does not reset 2. The process controller is damaged 	<ol style="list-style-type: none"> 1. Re-adjust the air pressure switch 2. Detect and replace the process controller
The fire fails for ignition: The electric motor is running but can't light fire, and shutdown after a short while		<ol style="list-style-type: none"> 1. The electrode of light-fire or the electric line is connected to ground 2. The light-fire transformer is out of control 	<ol style="list-style-type: none"> 1. Exclude the ground connection, replace the damaged electrode or cable 2. Replace the light-fire transformer
The flame does not shape	1. The electric motor is running and the light-fire is normal but shutdown after a short while	The solenoid valves do not open, because the loop is damaged or the cable is broken	Replace the solenoid valves or exclude the troubles caused by the differences of the current

	2. The electric motor is running and the light-fire is normal but shutdown after a short while (without troubles showing)	Because of the blockage of the filter, the pressure falls down when opening the solenoid valves	Clean or replace
Shutdown after the flame has shape ; the flame is shaped , but shutdown in case of running at rated load		1.The filter is polluted 2.The gas gauge is out of control, or the deep pipeline is in water	1.Clean the filter 2.Tell the gas administrative organization
In the process of ionization, the flame monitor is in trouble, the electric motor is running and the light-fire sound can be heard; the flame shapes normally, but shutdown for troubles after a short while		1. The current of the ionization is not steady, it is too low 2. The zero curve and the live wire are anti-connected 3.The adjustment of gas/air is not proper, the spark of the light-fire affects the current of the ionization	1.Change the position of ionization current 2.Adjust the position of the zero curve and the live wire 3.Re-adjust the junior loop of the light-fire transformer, replace the phase line and the midline

6. Operation requirements

1. Preparation before operating

Before operation, please check all boiler parts carefully, the details are as follows:

- 1.1 Whether the manhole and hand-hole are sealed, whether the fitting parts is safety.
- 1.2 Whether the front and back smoke box, manhole door are sealed.
- 1.3 Whether the damper is very agile.
- 1.4 Whether the steam pipeline, water feeding pipelines, fuel oil & gas pipelines are complete.
- 1.5 Whether all control switches of control box are set on the location “OK”.

2.Boiling out for boiler

After finishing installation & inspection for all boiler parts, confirm they are all safe for starting, then can do boiling out for boiler.

2.1 In general, the boiling out for new boiler should be performed before starting the unit, mainly to remove the impurity and oil dirt inside boiler. While boiling out for boiler, some suitable chemical medicine should be dosed to make boiler water become alkaline water and remove oil dirt and impurity.

2.2 Boiling out for boiler can use the chemical medicine of Na_2CO_3 or $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$, compound. Make the above medicine blend with water to be uniform solution with 20% concentration. It is not allowed to add the solid medicine into boiler directly.

Medicine name	Dosing quantity (kg/m ³)	
	The rust is very thin	The rust is very thick
NaOH	2~3	3~4
Na ₃ PO ₄ ·12H ₂ O	2~3	3~4

Note:

- ① The medicine quantity is calculated according to 100% purity.
- ② If no Na₃PO₄·12H₂O, Na₃PO₄ 1.5 times the quantity of Na₃PO₄·12H₂O can be used .
- ③ If Na₃PO₄ is the only medicine used, 6kg Na₃PO₄ should be added in every 1m³ water.

2.3 Before adding medicine, keep water level at limit low water level. The chemical medicines should be completely solved in the water before added into the boiler through water feeding pump, keep it close to high water level while boiling out for boiler.

2.4 At the early time of boiling out, start the burner, burn it at low load to keep the steam pressure up to 0.35Mpa for about 12 hours. At the end time of boiling out, keep boiler pressure at the 75% working pressure for about 12 hours.

2.5 Keep the alkaline of boiler water, analyze the boiler water periodically, if the alkaline is less than 1.5 mol/C, medicine should be added. If the alkaline concentration has no change for two times in sample analyses, the boiling out for boiler is finished.

2.6 Drain water under pressure after finishing boiling out for boiler. Wash the water discharge valve in contact with the medicine for no plugging for blown down valve.

2.7 After finishing above-mentioned process, inlet water and blow down by turns until water quality meets the required standard, then stop running boiler, open blown down valve, drain off boiler water.

2.8 After the boiler becomes cold, open manhole, hand-hole, wash the inside surface of boiler with clean water, check it again, if there still exists oil and dirt, boil out for boiler again according to above-mentioned way.

3. Running boiler

3.1 Start running boiler normally.

3.1.1 Open the air vent valve on the top of boiler or lift the valve core of safety valve.

3.1.2 Start burner, start running boiler unit according to the requirements of operation manual of control box.

3.1.3 Check the water level gauge, if the water level is too high because of heat expansion, drain water through blown valve to the normal water level.

3.1.4 When steam spurt from the air valve, close this valve, make boiler pressure go up slowly.

3.1.5 Check the water feeding valve, blow down valve, water level gauge, external connecting pipeline of drain off valve on water level controller. If they are cold, then there are no leakage.

3.1.6 Open the main steam valve step by step and supply steam.

3.1.7 In order for normal running and safety of boiler unit, boiler operator should often observe and see whether the boiler pressure, water level and burning are in normal condition in running boiler.

3.1.8 If boiler unit fails suddenly, stop running immediately and check it. Only after removing all failures then boiler can be re-started.

3.2 Stop running boiler

3.2.1 Push the button “burning stop”, boiler stops burning, switch all control switches to the position of “stop”.

3.2.2 Cut off power switch on the control box.

3.2.3 Close all the relevant inlet & outlet valves of water pump, oil pump.

3.2.4 Close steam valve.

3.3 Adjustment for the quantity of wind and air

3.3.1 The axis of the air damper at burner air suction side is connected through one piece of rod, so as to make air damper run at the same direction driven by servo-motor at the same pace. The span of air damper is adjusted through servo-motor.

3.3.2 The span of gas butterfly valve should be at the same step with air damper, and its micro-adjustment can be realized through changing the curvature radius.

4. Adjustment for safety valve

The safety valve should be adjusted for the first time. For the details, refer to the requirements stipulated on the table 6-3, 6.1.9 of the standard 《Safety & Technical Supervision Regulation for Boiler》 .

4.1 Safety valve open pressure

Rated steam pressure	Safety valve open pressure	
0.7Mpa	0.73Mpa	0.75Mpa
1.0Mpa	1.04Mpa	1.06Mpa
1.25Mpa	1.3Mpa	1.325Mpa

4.2 Safety valve adjustment method

Disassemble the pin, remove top cover, loose the hexagon nut, screw the regulating rod, make the spring loose or tight and get the required discharging pressure for safety valve. After finishing adjustment, tight the hexagon nut and the other parts.

4.3 All safety valves can't be moved freely after adjustment.

4.4 Do not knock any part of safety valve. Only use control rod to open safety valve.

4.5 It is not allowed to run boiler with no calibration for safety valve.

4.6 After calibration, safety valve should be locked or sealed with lead.

5. Supply steam

When the steam pressure inside boiler is close to working pressure, supply steam to outside. Before supplying steam, the water level inside boiler should not be over normal water level. While supplying steam, open main steam valve slightly, let some steam warm tube, at the same time open the drain valve on the pipeline and drain condensed water. The time for warming tube should be consistent with the length & diameter of pipeline, steam temperature and so on. In general, it should not be less than ten minutes. After the tube is heated, open the main steam valve slowly, at the same time note all parts whether there is some abnormal sound. After finishing supplying steam, check all fitting parts, valves, instruments once again to see whether there is water & steam leakage, to see whether all parts are in normal working conditions. In order to avoid water in steam, keep water level never over glass board.

6. Boiler daily maintenance

In order to ensure boiler safely & economical running, one should do daily maintenance.

6.1 Water feeding requirements

It should be make some treatment for boiler feeding water, the water quality should comply with the regulation of the standard of GB1576 《Water Quality for Pressure Boiler》 .

6.2 Boiler water level

Pay attention to observing the boiler water level all the time, boiler water level can't be higher than limit high water level and limit low water level. In general, the water level inside water level gauge should have some slight shaking, if the water surface has no change, the water level gauge may be plugged, and should be washed immediately.

6.3 Water level gauge

Every shift should at least wash water level gauge for one time. If there is steam or water leakage, packing material should be added. If the glass board is not clear, or the water level line is not clear, replace it after washing without being clear.

6.4 Feeding water equipment

In changing shift, check to see whether all feeding water equipment are in normal condition, if repair it immediately if there is any failure.

6.5 Steam pressure

Pay attention to the pressure change, ensure the steam pressure is lower than the allowable highest working pressure.

6.6 Pressure gauge

The bending tube of pressure gauge should be washed one time every shift. Check to see whether the pressure is in normal condition. If pressure gauge is broken, one should stop running boiler and repair it or change for a new one immediately. The pressure gauge should be at least calibrated once every half year to assure the correctness of pressure gauge. If the error is over regulated allowable error, repair it or change for a new pressure gauge.

6.7 Safety valve

Pay attention to the normal function of safety valve. In order to prevent the sticking between valve disk and valve seat, pull the lifting handle of safety valve to do discharging steam test. This kind of testing can be done one time every 2~4 weeks for checking safety valve.

6.8 Atomizing plate

The atomizing plate inside oil injector can only be cleaned by soft cloth, it is not allowed to clean it with hard things. Otherwise, it may damage the precision of atomizing plate and affect its quality.

6.9 The photo resistance should be removed for examination & testing every three months to measure the values of bright & dark resistance.

Photo resistance type:	MG41-100A
Rated power capacity:	100MW
Bright resistance value:	<100kΩ
Dark resistance value:	>50MΩ

6.10 The boiler room should be kept clean, water level gauge and pressure gauge should have good light.

6.11 Relevant work should be well conducted for changing shift.

6.12 In order to ensure normal running of boiler and lengthen its service life as long as possible, one should do daily maintenance work well & carefully, for details, please refer to the following table:

Daily Management

No.	Description	Period						Requirements	
		H	D	W	M	S	Y		
1	Test	Abnormal flameout protection			1				In burning, close shut off valve of oil (gas) injector, stop oil (gas) spraying
2		Too low water level protection			1				In burning, stop feeding water, open blow down valve to decrease water level
3		Protection for unable light fire			1				Before starting boiler automatically, close shut off valve so that there is no oil spraying in lighting fire. Counter
4	Check	Oil (gas) pressure	1						Refer to indication of oil (gas) inlet pressure gauge
5		The quantity of oil spraying and atomizing quality			1				Take out the oil injector, spray oil under cold condition.
6		Inspection for photo resistance	1						Refer to the indication signal on the control box.
7		Pressure regulator operation			1				Check pressure control range
8		Magnetic valve operation; see whether there is leakage			1				After stop running boiler, watch whether fire inside furnace remains.
9		The time set point of all sequence		1					Purging time, safe ignition time etc.
10		The fire lighting status		1					Observe the spark strength or take out oil injector to stop oil injection for check
11		Whether there is carbon deposition for burner		1					Including oil injector and flame cover
12		Burning state		1					Observe the color of exhaust smoke
13		Whether there is shedding of refractory		1					Conduct at the same time with item 11
14		Running status of all auxiliary machine and motor							Whether there is oil leakage of oil pump, whether the feeding water pressure is at normal condition (check frequently)
15		Analysis & treatment of boiler water							The consequence can be made according to requirements; operation method can refer to the relevant manual.

16	Wrap and clean the photo resistance & observer glass	2						The installation location should be correct, removing the dirt and carbon deposit can be conducted at the same time with item 11.
17	Wipe and clean the electrode for lighting fire	1						By means of abrasive paper.
18	Clean all relays, contactors & contacts of regulators					1		By means of abrasive paper.
19	Clean the overflow valves					2		After disassembling, clean it with light oil
20	Clean oil filter	1						Refer to oil quality and experience.

Note: Letter “H” means hour; Letter “D” means day; Letter “W” means week;

Letter “M” means month; Letter “S” means season; Letter “Y” means year;

7. Blow down of boiler

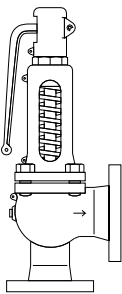
In general, the feeding water contains mineral matter. After the water enters into boiler the mineral matters will be deposited after vaporization. In order to avoid damage to boiler because of scale and slag, the quality of boiler water should be ensured. When the boiler water quality is over qualified water standard, blowing down should be done. The blowing down can be conducted periodically according to actual condition, once every shift is sufficient in general.

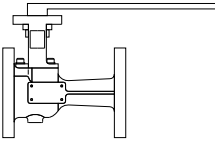
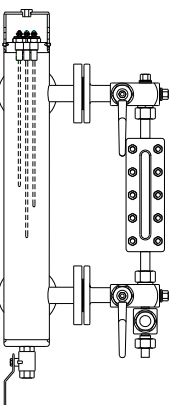
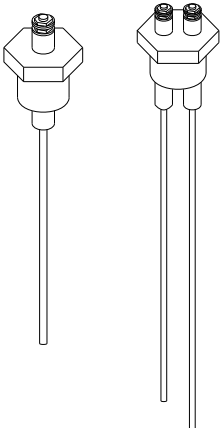
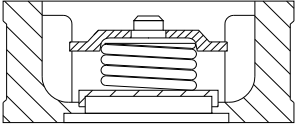
7.1 If two or over two boilers are used with one blowing down main pipe and all branch tubes are not equipped with check valves (pay attention to the discharging direction in installation of check valves), be very careful for blowing down. It is not allowed that two boilers conduct blowing down at the same time.

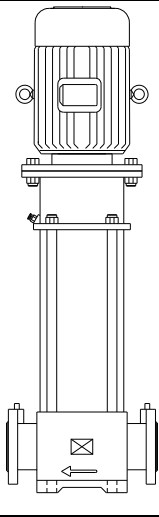
7.2 The blowing down should be conducted at the state of low load and high water level. At the same time attention should be paid to boiler water level. It will be suitable to decrease water level for about 25~50mm every time in blowing down.

7.3 If the blowing down tube end is not connected to the inside space of blowing down tank or well, and there is no any protection equipment, blowing down should be down only after confirming there is no any person close to blowing down tube end in order to avoid any accidents.

7. Daily Maintenance

1		<p>Safety Valve</p> <p>The safety valve should be calibrated by the department approved by local safety supervision division. Calibration should be done at least once every year.</p> <p>In order to avoid the sticking between disk and seat of safety valve, draining test by hand should be done every week.</p> <p>It is not allowed to increase the set pressure of safety valve by every means, or safety valve will be out of efficiency.</p>
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<p>2</p> 	<p>Blow Down</p> <p>The operation is very important, because the scale and the mineral composition will generate in the boiler even with soft water or the scale dissolver. The blow down can delay the generation of the scale in the boiler mural, and it can also prolong the life span of the boiler, so it must be carried out at least twice a day with pressure (0.1-0.15MPa) after the work is finished. Blow down pipes should be fixed to safe place</p>
<p>3</p> 	<p>Water level gauge clearing</p> <p>It is located on the right side of boiler, and connected to boiler by loose joint nut, with clear ball valve equipped in the lower part to display water condition and fluctuation in boiler operating. It could enhance testing validity.</p> <p>After long time working, pipes will be blocked by scale, electrode will be affected. To avoid electrode out of use and ensure boiler operate safety, check water level gauge regularly (if water quality is poor or it is used continuously, clean it every day together with blow down). Open ball valve (pressure 0.1-0.15mpa) to clean.</p> <p>Cleaning pipe should be connected to safe place.</p>
<p>4</p> 	<p>Electrode Cleaning</p> <p>Whether the feeding water system can work automatically and stably depends greatly on the probe of the high-low water electrode inside the boiler, so the probe must be cleaned once every two to three months. If the local water quality is poor, it should be cleaned once every half month.</p> <p>Cleaning ways: after boiler pressure is discharged totally, remove water level gauge top cap, remove electrode wiring (mark it), and turn electrode in counter-clockwise, clear scale. If scaling is serious, use rubber to polish electrode surface. Resistance between multimeter test metal rod and outside shell should be higher than 500KΩ, the higher the better.</p>
<p>Note: 3. and 4. can be conducted at the same time according to boiler running and water quality.</p>	
<p>5</p> 	<p>Cleaning the check valve</p> <p>If there back water in the boiler, dismantle the check valve in time, and remove all scale and impurity, shake the check valve. If the baffle plate inside the check valve can move freely, it means that is well sealed. But if it can't be cleaned, change for a new one.</p>

<p>6</p> 	<p>Water pump</p> <p>Pump inlet is connected to water tank, outlet is connected to boiler water inlet through check valve. When running water pump for first time or re-start pump again after stopping for a long time, the vane rotation of water pump may be not so well or may be blocked. Turn the vane behind the motor through cover hole with screw driver until water pump is running well. (This work must be done when there is no electricity)</p> <p>Loose the screw for discharging air (adding water plug), when running water pump for first time or re-start pump again after stopping for a long time. After water is full, screw and tight the adding water plug (spot starting water pump can help adding water).</p> <p>Under cold weather, pay attention to the frozen ice inside pump.</p>
<p>7 Periodical fixtures</p> <p>The screw cap of flange and joint bolt of heating tube should be tightened periodically. The scale will be formed on the heating tubes easily, so remove the scale about every 2 to 3 months. Often check the running status of main parts of power line, cool pressure terminals, breaker, contactor, electric heating tubes and water feeding pump, electric control box, pressure switch, safety valve and so on, find the faults and remove them if any.</p>	
<p>8 Softener</p> <p>During operating, unqualified water will affect boiler safety. Scale, which has low conductive factor, will cause higher electricity consumption and non-safety working. So, softener is a must to eliminate the damages to the boiler brought by scale, which can save energy, prolong boiler service life and make better operation.</p> <p>According to boiler water quality required by national water quality rules in 《Low pressure water quality》, boiler should use soft water, which has deleted Ca^{2+}, Mg^{2+} outside of boiler. Ionic resin ways are generally used to soften water.</p> <p>NOTE: Please refer to the Installation & Operation Manual of the water softener.</p>	

1. In order to lengthen boiler using life, stop running for overall check and overhauling every 3 to 6 month.

1.1 Stop running boiler method

After boiler stops burning and when the boiler water temperature is lower than 50°C, then drain all boiler water, but at the same time open main steam valve and make boiler connect with atmosphere. If there is need to shorten cooling time, add cold water from feeding water tube and drain off hot water through blowing down pipe at the same time, but the water level should not lower than the normal water level.

1.2 Inspection, cleaning and maintenance

1.2.1 If there are leakages of water level gauge, valves and pipeline flange, do the repairing.

1.2.2 Open burner installation nozzle, hand-hole cover on the top of boiler, remove all ash.

1.2.3 Remove the ash and oil residue inside furnace.

1.2.4 Remove the scale and mud, wash with clean water.

1.2.5 Check the internal & external surface of boiler. For example, check whether there are corrosion on the weld of pressure part and steel plate. If there are serious defaults, then repair them in time. If the faults are not so serious, repair them next time while stopping the boiler. If there are some problems which have no influence on

safety, make records for later reference.

1.2.6 If necessary, disassemble all cover shell and insulation layer to do throughout inspection. If there are some serious damages, repair them before use. At the same time, make records for the checking & repairing.

2. Apply paint to the cover shell and boiler bedplate at least once a year.

3. If necessary, remove all residual ash inside chimney.

4. There are two methods of wet & dry maintenance for long-term protection of boiler. If boiler stops for over one month, use dry maintenance, and use wet maintenance if less than one month.

4.1 Dry maintenance

Stop running boiler, drain off all boiler water, remove all dirt inside boiler and clean it, bake it by faint fire. Place 10~30mm quicklime inside boiler drum, and do not make quicklime in contact with metal. The weight of quicklime is calculated by 1~2 kg per cubic meter. Then close all hand-holes and valves of pipeline, cut it off from the outside atmosphere. Check once every other month. If the lime is crushed into powder, replace it immediately. When the boiler runs again, take out all the lime.

4.2 Wet maintenance

Stop running boiler then drain off all boiler water, remove all dirt inside boiler and clean it thoroughly, re-add the treated water until full of water, then heat it to 100°C, let the gas inside get out of furnace, close all valves. The wet maintenance is not allowed to use under cold weather or place to avoid damages to the boiler because of freezing.

8. Inspection & hydraulic testing for pressure parts

1. Do periodical inspection to internal space & external surface of boiler according to the stipulation of "Safety & Technical Supervision Regulation for Steam Boiler". In general, do internal inspection every two years, do hydraulic testing to boiler once every six years.

2. Except for above mentioned periodical inspection in item 1, if one of following cases occurs, internal & external inspection and hydraulic testing should be done:

2.1 New installing, re-installing and moving and installing boiler.

2.2 Re-starting running boiler after it stops for over one year..

2.3 After repair or change of some important pressure parts and re-running boiler for one year.

2.4 According to the boiler running status, when there is a need for equipment inspection.

3 Before inspection, remove all the internal scale and external smoke dirt thoroughly, if necessary, disassemble the external cover and insulation layer. The inspection key points are as follows:

3.1 Check the boiler drum, furnace weld and tube-hole to see whether they are normal, whether there is leakage.

3.2 Whether the boiler steel plates have corrosion, bulb or deformation.

3.3 Whether there is scale or slag on water side of pressure parts.

3.4 Whether there are faults at the connecting position between water feeding pipes, water draining pipes and boiler drums.

4 If there is serious corrosion, check the strength calculation before hydraulic testing.

5 Testing pressure

The testing pressure should comply with the table 4-3 requirements of 4.5.6.2.1 in “Safety & Technical Supervision Regulation for Boiler”.

6 Hydraulic testing procedure

6.1 The hydraulic testing should be conducted under the condition of the surrounding temperature upper than 5°C, if the temperature is lower than 5°C, should take some anti-freezing measures. The temperature of testing water should be higher than surrounding dew point temperature so as to prevent dew on the boiler surface; but too high temperature also is not suitable, because it may cause vaporization or too large stress of temperature difference, in generally, it should be 20°C~70°C.

6.2 After the boiler is filled with water, raise the pressure step by step to 0.4Mpa, do tightness inspection one time, if necessary, tighten the stud of flange, manhole cover and hand-hole cover for one time.

6.3 Hydraulic testing should be continued slowly, when water pressure is up to working pressure, stop raising pressure, check to see whether there are leakage or abnormal phenomena, and then raise the pressure to testing pressure. Keep it for 20 minutes, if the pressure doesn't drop, make inspection after it drops to working pressure. In inspection the pressure should kept for no change.

If there is any leakage make records for later repairing when the pressure drops to atmosphere.

7 After hydraulic testing, the components meeting the following requirements will be considered qualified.

7.1 No any water drop or water fog on the metal wall and weld.

7.2 No any residual deformation can be observed by eyes.

8 Safety measures and attention items

8.1 It is not allowed to tighten flange stud when the pressure is over than 0.4 Mpa.

8.2 In order to avoid dangers because of crowd, make special marks while conducting hydraulic test.

8.3 Do not stand in front of weld hole, flange and valves when there is pressure.

9. Attention for users

The pipeline connected with this boiler should comply with the requirements of national standard of 《Safety Supervision Regulation for Special Equipment》.

① If the customer needs to read the relevant technical documents of WNS type full automatic oil (gas)-fired boiler or gas boiler, please indicate the contact NO. and the general drawing NO. If the customer needs to consult the boiler quality, please indicate the boiler serial NO.. If there is a shift of boiler, transfer all relevant documents at the same time.

② Sometime the actual product may have some difference with this operation manual because of continuous improvement and the alteration of national rules & regulations. For the details, please refer to the submitted operation manual for all parts and the latest edition of national rules & regulations. We are sorry for no additional notice.

③ If there are any malfunction or injury to anybody, which is caused by the maintenance the manual never mentioned or by false running, our company will not be responsible.

☆The Company reserves the rights for improvement, without further notice. ☆