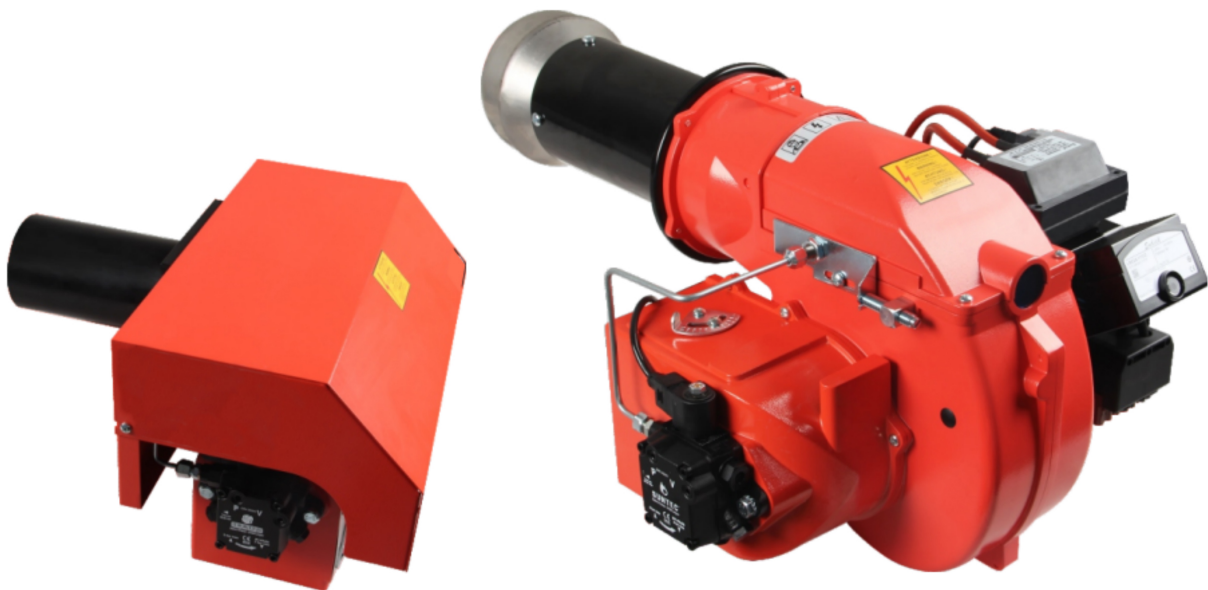




OPERATION MANUAL
LIGHT OIL BURNER
BT14LW BT14-18-26-35L
BT14LRW BT14-18-26-35LR



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1. BRIEFNESS

BT14-18-26-35L is full automatic one stage fire light oil burner;

BT14-18-26-35LR is full automatic two stage fire light oil burner;

These burners could be used for many heating devices: like hot water oven, steam boiler and air heater etc.

Fuel:

Light oil - heating value: $H_i=42.7\text{MJ/kg}=10200\text{kcal/kg}$

Burner has fan motor which provides enough air to support fuel burning well by enough high and stable pressure.

Supply fuel oil(light oil)Max. viscosity $1.5^0\text{E}@20^{\circ}\text{C}$.

Oil should be filtered before going to burner pump. Max. gridding is $125\mu\text{m}$.

light oil input pressure was set by supplier; please refer to the «Pump» section.

Burner adjustment ratio is 1:2(except BT18.26.35L).

Max. supporting-combustion air flow: Need 15m^3 air per 1kg.

Burner controller detects burner work all times.

Boiler temperature/pressure controls burner load.

IP20

Control voltage: 230V (-15%...+10%)50/60HZ, Single-phase electricity

Supply voltage: 230V/50HZ ,

The prerequisite of burner operation: Ambient temperature is $0...+40^{\circ}\text{C}$.

Check below items before first start burner:

- Connection(motor turning direction)
- Adjustment and controlling system set
- Boiler and other equipments under working.
- Burner can get enough air
- Open supply valve
- There has enough oil in oil tank
- Enough oil temperature, its viscosity is $4-12\text{mm}^2/\text{S}(\text{Max.}+60^{\circ}\text{C})$
- Take burner and boiler supplier`s instruction for reference.

2. ANNOUNCEMENTS

2.1. Introduction

The instruction manual supplied with the burner:




- Is an integral and essential part of the product and must not be separated from it; it must therefore be kept carefully for any necessary consultation and must accompany the burner even if it is transferred to another owner or user, or to another system. If the manual is lost or damaged, another copy must be requested from the Technical Assistance Service of the area;
Is designed for use by qualified personnel;
- Offers important indications and instructions relating to the installation safety, start-up, use and
- maintenance of the burner.

Symbols used in the manual:



In some parts of the manual you will see triangular DANGER signs. Pay great attention to these, as they indicate a situation of potential danger.









2.2. General dangers

The dangers can be of 3 levels, as indicated below.

 DANGER	Maximum danger level! This symbol indicates operations which, if not carried out correctly, cause serious injury, death or long-term health risks.
 WARNING	This symbol indicates operations which, if not carried out correctly, may cause serious injury, death or long-term health risks.
 CAUTION	This symbol indicates operations which, if not carried out correctly, may cause damage to the machine and/or injury to people.


2.3. Other symbols

 DANGER	DANGER: LIVE COMPONENTS This symbol indicates operations which, if not carried out correctly, lead to electric shocks with lethal consequences
	DANGER: FLAMMABLE MATERIAL This symbol indicates the presence of flammable materials.

	<p>DANGER: CRUSHING OF LIMBS This symbol indicates the presence of moving parts; danger of crushing of limbs.</p>
	<p>WARNING: MOVING PARTS This symbol indicates that you must keep limbs away from moving mechanical parts; danger of crushing.</p>
	<p>DANGER: EXPLOSION This symbol signals places where an explosive atmosphere may be present. An explosive atmosphere is defined as a mixture - under atmospheric conditions - of air and flammable substances in the form of gases, vapours, mist or dust in which, after ignition has occurred, combustion spreads to the entire unburned mixture.</p>
	<p>PERSONAL PROTECTION EQUIPMENT These symbols indicate the equipment that must be worn and kept by the operator for protection against threats against safety and/or health while at work.</p>
	<p>OBLIGATION TO ASSEMBLE THE COVER AND ALL THE SAFETY AND PROTECTION DEVICES This symbol signals the obligation to reassemble the cover and all the safety and protection devices of the burner after any maintenance, cleaning or checking operations.</p>
	<p>ENVIRONMENTAL PROTECTION This symbol gives indications for the use of the machine with respect for the environment.</p>
	<p>IMPORTANT INFORMATION This symbol indicates important information that you must bear in mind.</p>
	<p>This symbol indicates a list.</p>

2.4. Guarantee and responsibility

The manufacturer guarantees its new products from the date of installation, in accordance with the regulations in force and/or the sales contract. At the moment of the first start-up, check that the burner is integral and complete.

	Failure to observe the information given in this manual, operating negligence, incorrect installation and carrying out of non authorised modifications will result in the annulment by the manufacturer of the guarantee that it supplies with the burner.
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In particular, the rights to the guarantee and the responsibility will no longer be valid, in the event of damage to things or injury to people, if such damage/injury was due to any of the following causes:

- Incorrect installation, start-up, use and maintenance of the burner;
- Improper, incorrect or unreasonable use of the burner;
- Intervention of unqualified personnel;
- Carrying out of unauthorised modifications on the equipment;
- Use of the burner with safety devices that are faulty, incorrectly applied and/or not working;
- Installation of untested supplementary components on the burner;
- Powering of the burner with unsuitable fuels;
- Faults in the fuel supply system ;
- Continuation of use of the burner when a fault has occurred;
- Repairs and/or overhauls incorrectly carried out;
- Modification of the combustion chamber with inserts that prevent the regular development of the structurally established flame;
- Insufficient and inappropriate surveillance and care of those burner components most likely to be subject to wear and tear;
- Use of non-original components, including spare parts, kits, accessories and optional;
- Force majeure.

The manufacturer furthermore declines any and every responsibility for the failure to observe the contents of this manual.

3. SAFETY AND PROTECTION

3.1. Introduction

The burners have been designed and built in compliance with current regulations and directives, applying the known technical rules of safety and envisaging all the potential danger situations. It is necessary, however, to bear in mind that the imprudent and clumsy use of the equipment may lead to situations of death risk for the user or third parties, as well as the damaging of the burner or other items. Inattention, thoughtlessness and excessive confidence often cause accidents; the same applies to tiredness and sleepiness.

It is a good idea to remember the following:


- The burner must only be used as expressly described. Any other use should be considered improper and therefore dangerous.

In particular:

it can be applied to boilers operating with water, steam, diathermic oil, and to other uses expressly foreseen by the manufacturer;

the type and pressure of the fuel, the voltage and frequency of the electrical power supply, the minimum and maximum deliveries for which the burner has been regulated, the pressurisation of the combustion chamber, the dimensions of the combustion chamber and the room temperature must all be within the values indicated in the instruction manual.

- Modification of the burner to alter its performance and destinations is not allowed.
- The burner must be used in exemplary technical safety conditions. Any disturbances that could compromise safety must be quickly eliminated.
- Opening or tampering with the burner components is not allowed, apart from the parts requiring maintenance.
- Only those parts envisaged by the manufacturer can be replaced.

 WARNING	<p>The manufacturer guarantees safety and proper functioning only if all burner components are intact and positioned correctly.</p>
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3.2. Personnel training

The user is the person, body or company that has acquired the machine and intends to use it for the specific purpose. He is responsible for the machine and for the training of the people working around it.

The user:

- undertakes to entrust the machine exclusively to suitably trained and qualified personnel;
- undertakes to inform his personnel in a suitable way about the application and observance of the safety instructions. With that aim, the user undertakes to ensure that everyone knows the use and safety instructions for his own duties.
- Personnel must follow all the danger and caution indications shown on the machine.
- Personnel must not carry out, on their own initiative, operations or interventions that are not within their province.
- Personnel are obliged to inform their superiors of every problem or dangerous situation that may arise.
- The assembly of parts of other makes, or any modifications, can alter the characteristics of the machine and hence compromise operating safety. The manufacturing company therefore accepts no responsibility whatsoever for any which may result from the use of non-original parts.

In addition:

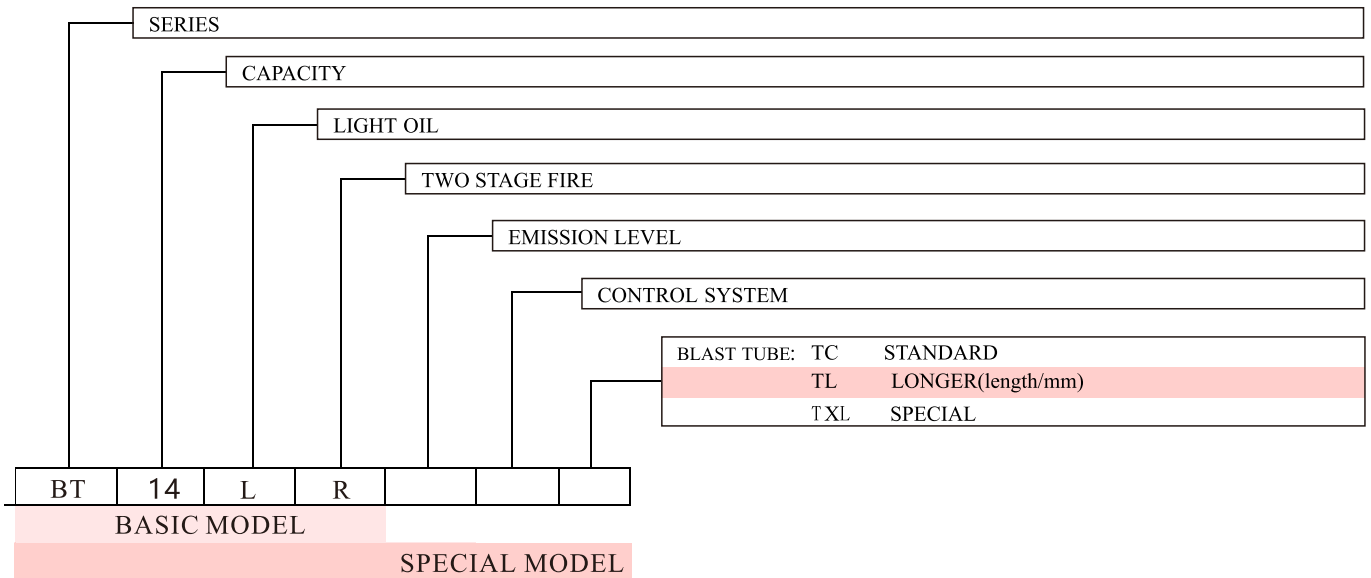


Must take all the measures necessary to prevent unauthorised people gaining access to the machine;

- The user must inform the manufacturer if faults or malfunctioning of the accident prevention systems are noticed, along with any presumed danger situation;
- Personnel must always use the personal protective equipment envisaged by legislation and follow the indications given in this manual.

4. BURNER TECHNICAL DATA

4.1. Summary



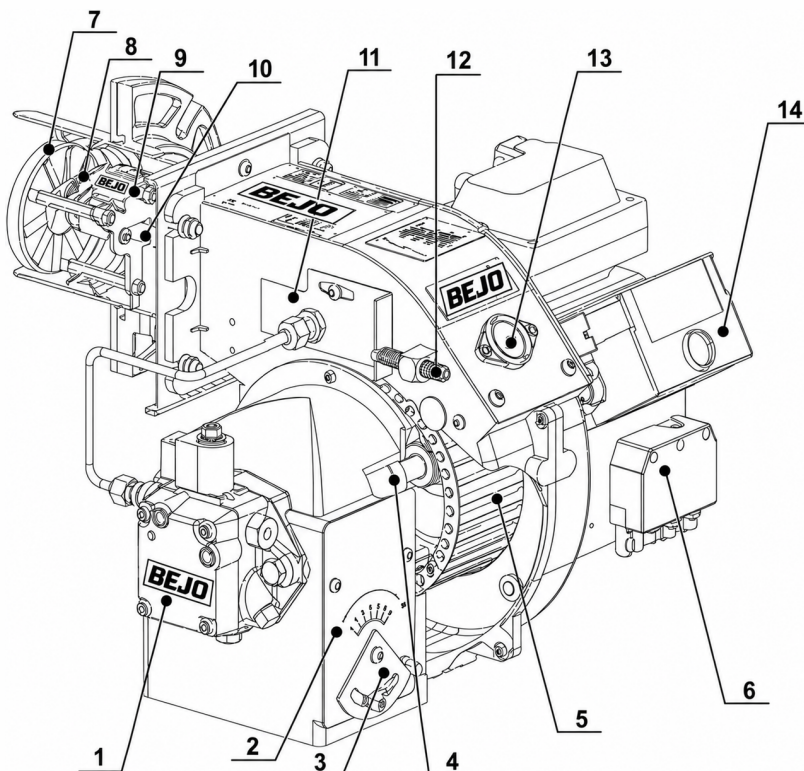
- Burner :one/two stage fire.
- Mechanical pressure atomization.
- Two stage fire burner using hydraulic cylinder to adjust the flow .
- Burner is one completed with controller .
- Photocell detects flame
- Motor IP40.

4.2. Technical Data

BURNER	BT14L/LW	BT14LR/LRW	BT18L	BT26L	BT26LR	BT35L	BT35LR
Capacity/kW kg/h	89-172 7.5-14	89-172 7.5-14	90-213 8.0-18	154-308 13-26	154-308 13-26	178-391 15-35	178-391 15-35
Motor Voltage	230V-50HZ	230V-50HZ	230V-50HZ	230V-50HZ	230V-50HZ	230V-50HZ	230V-50HZ
Motor kW Rpm	0.15 2850	0.15 2850	0.37 2850	0.37 2850	0.37 2850	0.37 2850	0.37 2850
Controller	LMO24...	LMO24...	LMO24...	LMO24...	LMO24...	LMO24...	LMO24...
Photocell	QRB1	QRB1	QRB1	QRB1	QRB1	QRB1	QRB1
N.W/kg	11.5	12	16.5	16.5	17	17.5	18

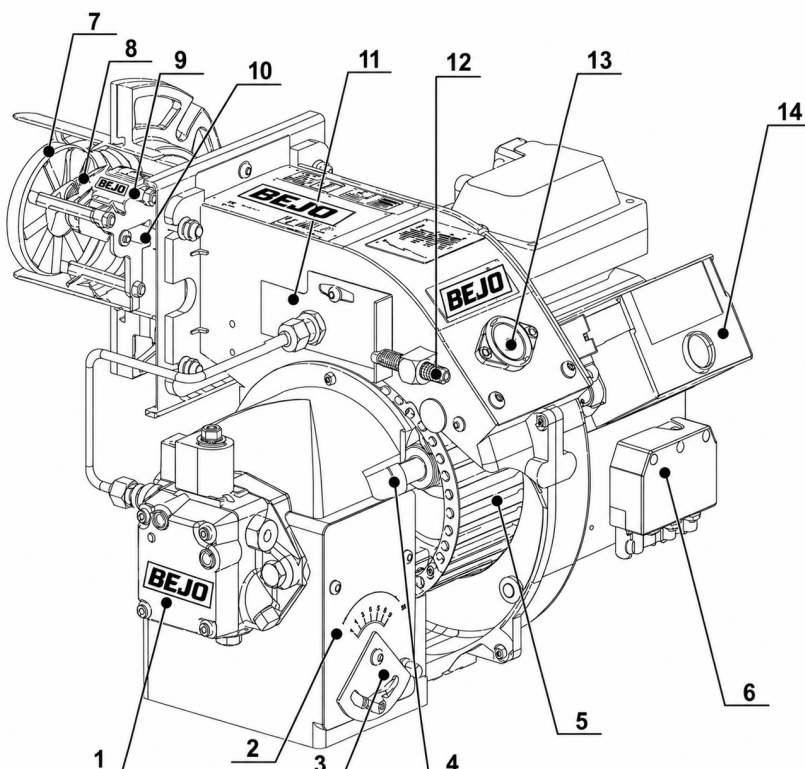
4.3. BT14 L/LR Fitting Drawing

Model: BT14L



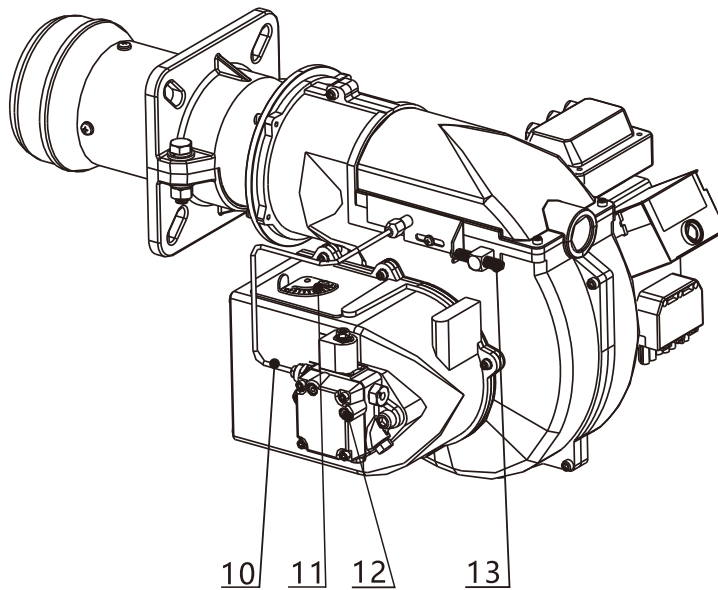
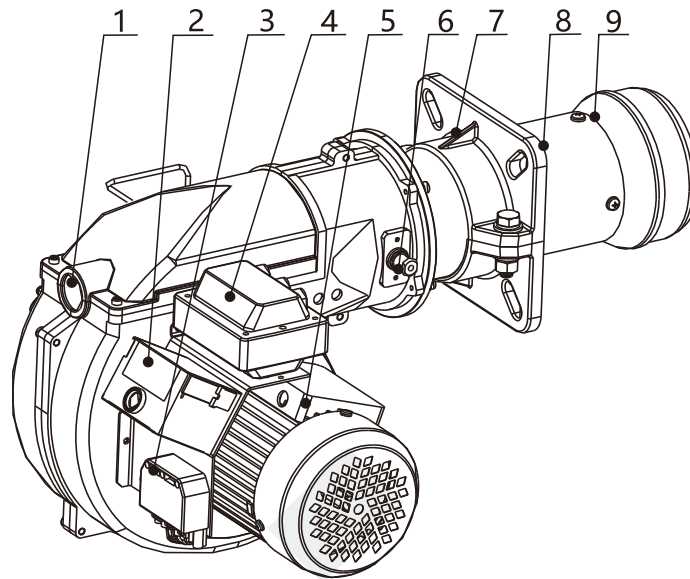
1. Oil pump
2. Air damper indicator
3. Air damper regulating mechanism
4. Coupling
5. Impeller
6. 7pins sockets
7. Air diffuser
8. Burner head
9. Electrode
10. Oil hose
11. Oil line mounting plate
12. Adjustment rod
13. Watch mirror
14. Controller

Model: BT14LR



1. Copper line
2. Oil pump
3. Air damper hydraulic top rod
4. Adjustment rod
5. 7pins sockets
6. Blast tube
7. Mounting flange
8. Solenoid valve V1
9. Solenoid valve V2
10. Transformer
11. Watch mirror
12. Controller

4.4. BT18-26-35L Fitting Drawing

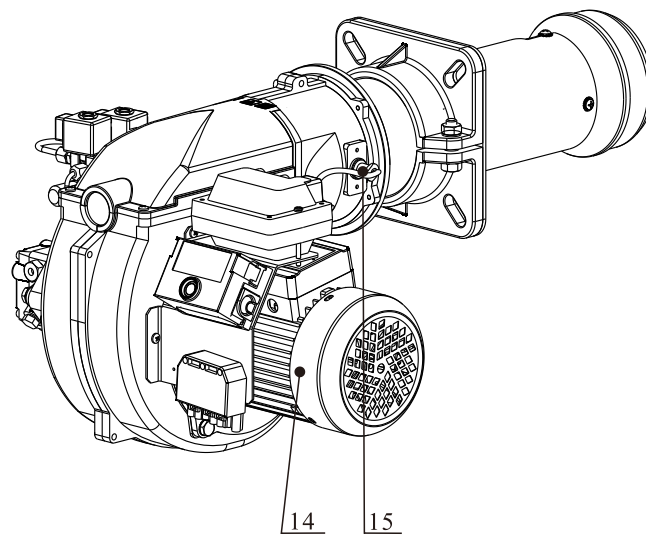
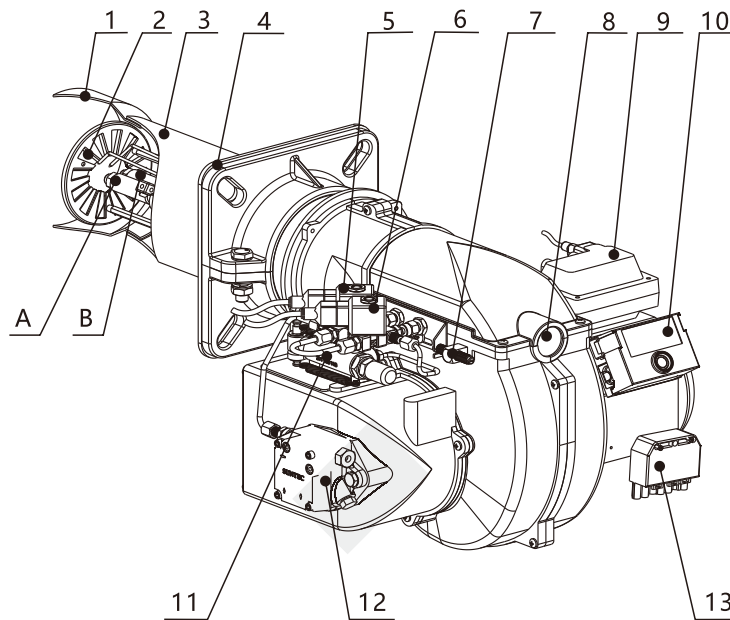


- 1. Watch glass
- 2. Controller
- 3. Power socket
- 4. Transformer
- 5. Fan motor

- 6. Photocell
- 7. Mounting flange/gasket
- 8. Blast tube
- 9. Burner head

- 10. Copper hose
- 11. Air damper scale board
- 12. Pump
- 13. Second air adjustment screw

4.5. BT26-35LR Fitting Drawing

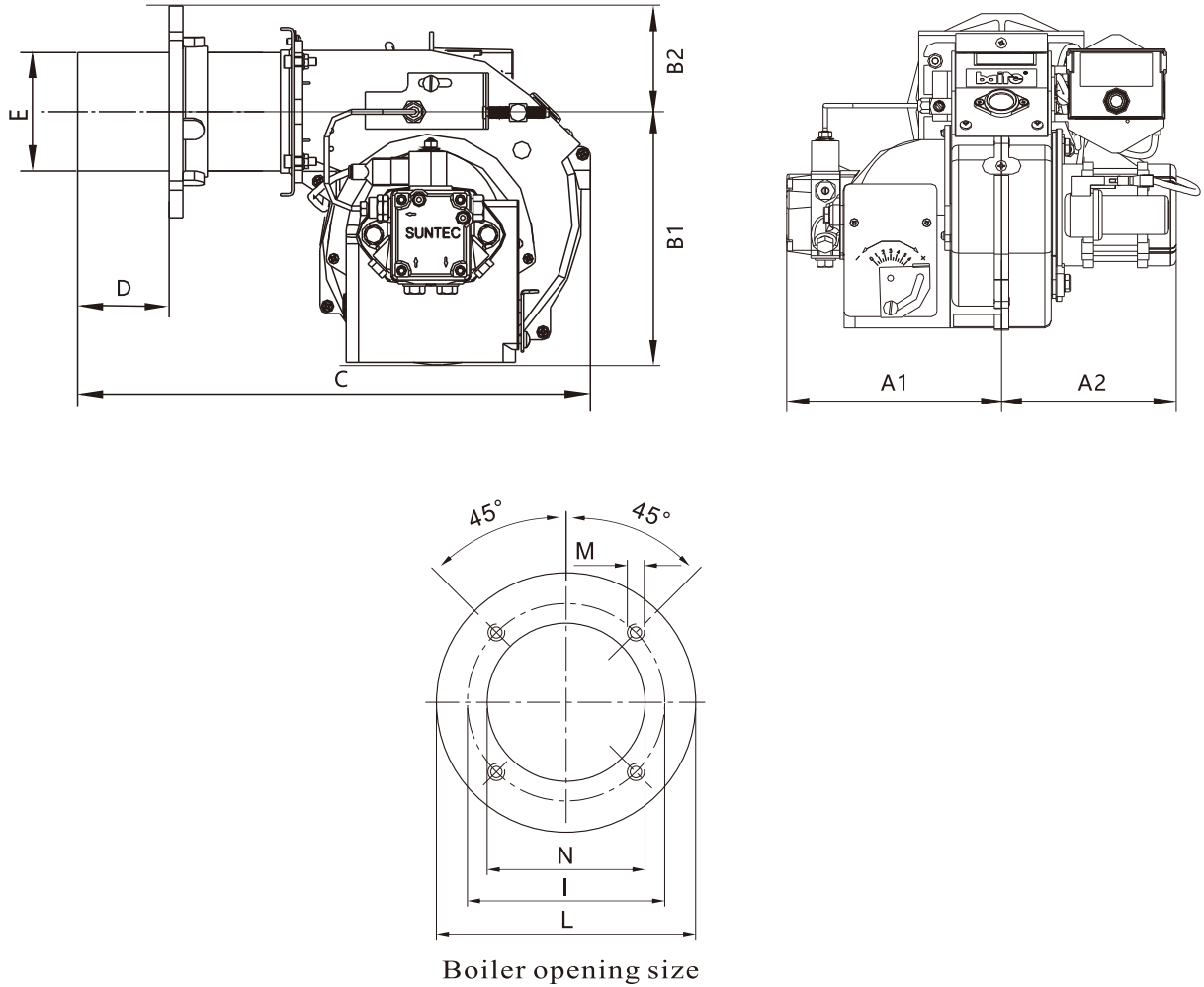


- | | | |
|--------------------|--------------------|-----------------------|
| 1. Burner head | 6.Solenoid valveV1 | 11. Hydraulic top rod |
| 2.Air diffuser | 7.Adjustment screw | 12. Pump |
| 3.Blast tube | 8.Watch glass | 13. Power socket |
| 4.Mounting flange | 9.Transformer | 14. Fan motor |
| 5.Solenoid valveV2 | 10. Controller | 15. Photocell |

Notice!

Position A is small size nozzle in one stage fire,Position B is big nozzle in two stage.

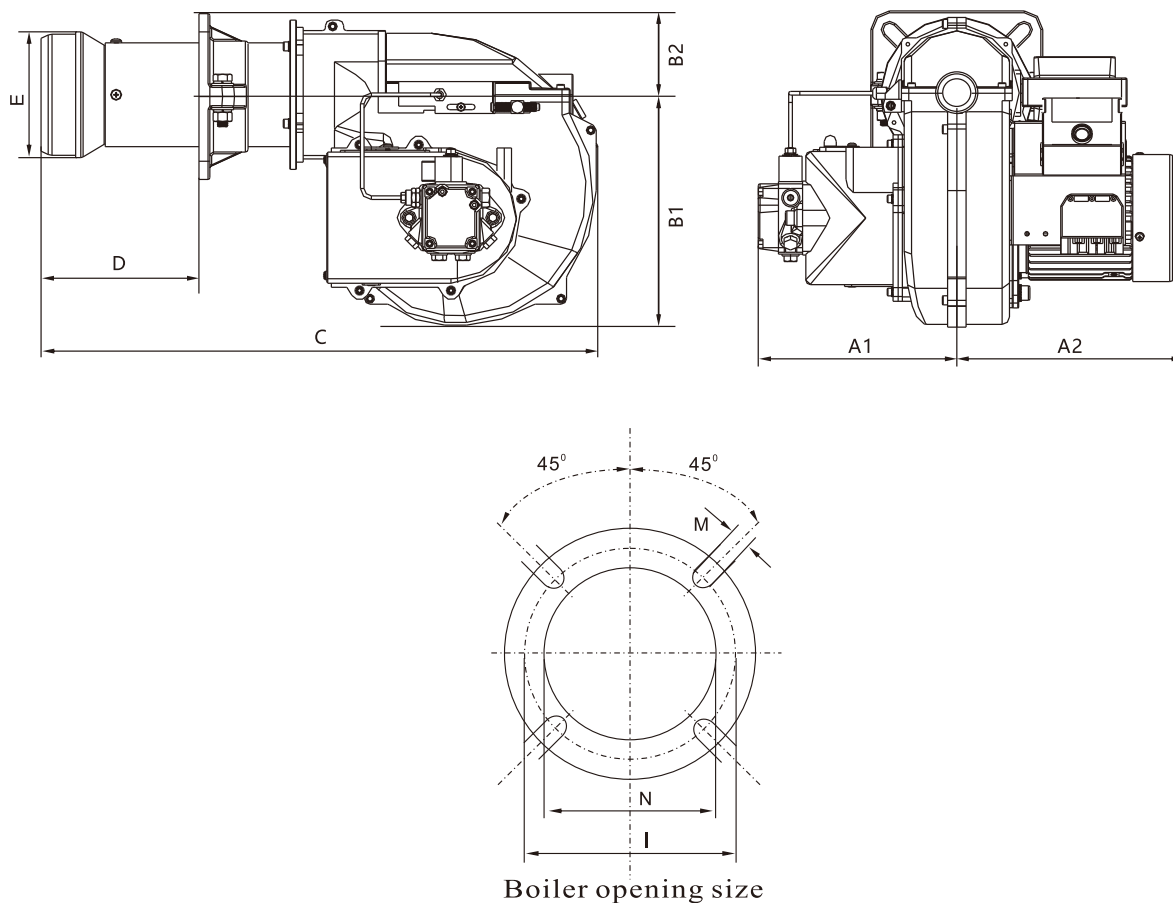
4.6. BT14L/LR Outlook Drawing



Model	A1	A2	B1	B2	C	D	E	N	I	L	M
	mm	mm	mm	mm	mm	mm	Φmm	Φmm	Φmm	Φmm	M
BT14L/LW	195/200	171/195	203	85	424	80~110	95	100	130~155	170	M8
BT14LR/LRW	195/200	171/195	203	85	424	80~110	95	100	130~155	170	M8

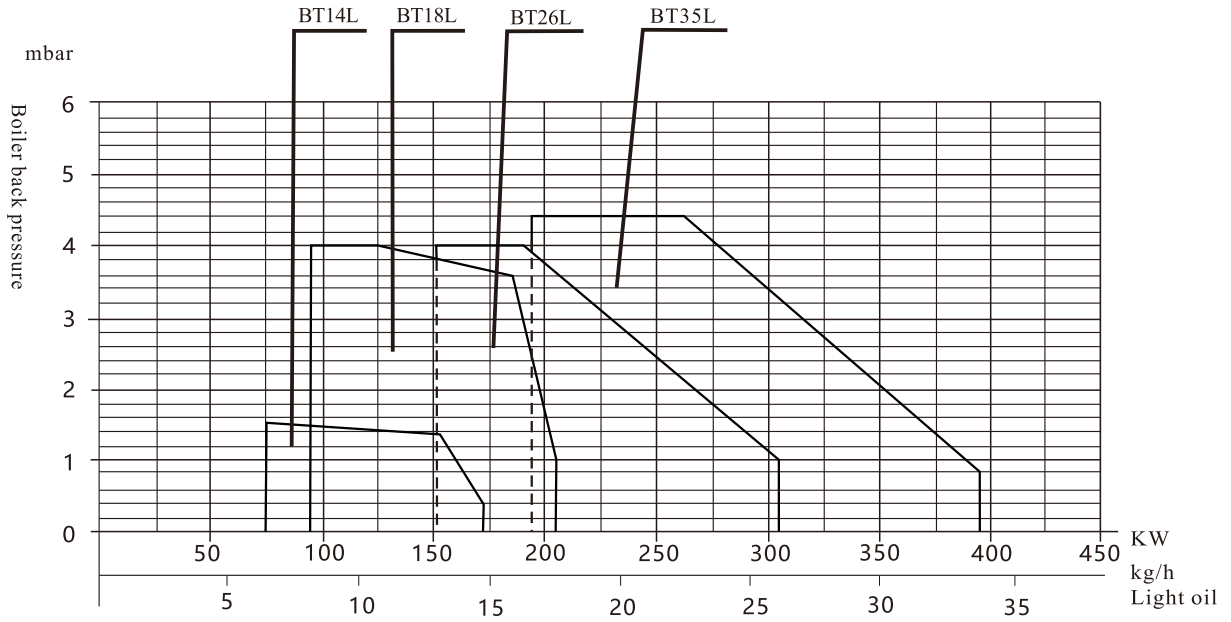
Note: "N" is boiler door hole size .
 "W" is waterproof cover .

4.7. BT18-26-35L Outlook Drawing



Model	A1	A2	B1	B2	C	D	E	I	N	M
	mm	mm	mm	mm	mm	mm	Φmm	Φmm	Φmm	
BT18L	215	248	253	93	620	105~200	118	170-210	130	4-M10
BT26L	215	248	253	93	620	105~200	138	170-210	145	4-M10
BT35L	215	248	253	108	620	105~200	150	200-245	165	4-M12
BT26LR	215	248	253	93	620	105~200	138	170-210	145	4-M10
BT35LR	215	248	253	108	620	105~200	150	200-245	165	4-M12

4.8. Working range curve diagram



Comparing with burning output of combustion chamber pressure that is the Max.value under ideal test. All data is base on 20°C air temperature and 500meters altitude .

5. BURNER INSTALLATION

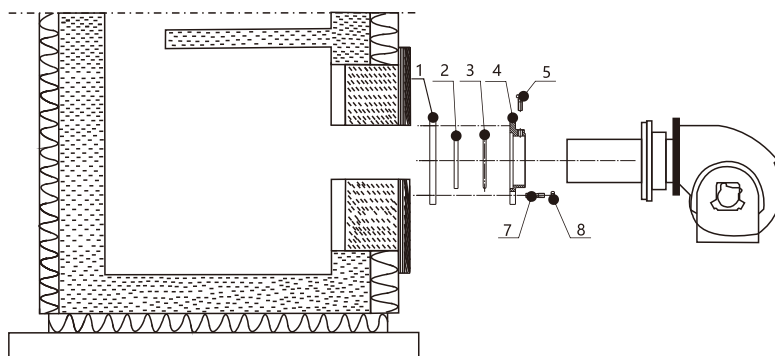
5.1. Burner Installation

Preparation before installation

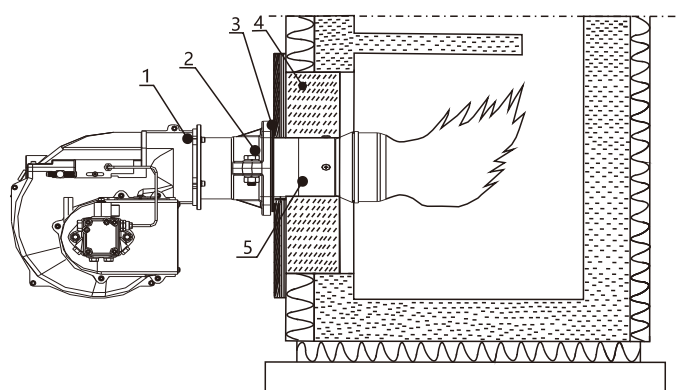
1. Check chimney (sectional area and height).
2. Voltage and frequency.
3. Oil system and dimension, there must have ball valve switch pipeline accessory before oil pipeline filtering system.
4. Check burner accessory.
5. There has filter in oil intake pipe.
6. Rust clear inside pipe.

Installation

1. Put gasket inside boiler between mounting board and flange, use double head bolt and six angle screw to fasten. After taking burner head and tube into combustion chamber, fasten the bolt, fix burner. There must be seal among boiler board, gasket and mounting flange. no air leak in case that the heating smoke will reduce heating reaction or damage spare parts during running.
2. Connect fuel oil to pump refer to supply oil return system diagram.
3. Connect circuit.



1. Asbestos gasket
2. Steel washer
3. Asbestos rope
4. Mounting flange
5. Six angle screw
6. Nut
7. Double screw bolt



1. Burner blast tube connecting flange
2. Mounting flange
3. Asbestos gasket
4. Fire-proof material
5. Burner blast tube

Note: Installation board must have standard burner mounting flange "M" thread hole dimension, please install burner refer to diagram.

5.2. Flange-joint burner shell

Open burner top cover and take burner head oil gun set out to maintenance.

5.3. Circuit connection

Burner must follow the supplier wiring diagram to connection, Abide by standard and local principle.

5.4. Oil pipeline connection

Burner has two pipeline system: oil supply and oil return.

Oil supply pipeline must have filter system.

Note! There must install manual stop valve before adjustment equipment.

Oil pipe exhausts

Connect flexible hose,open oil supply ball valve,make oil flows to filer and pump inlet.

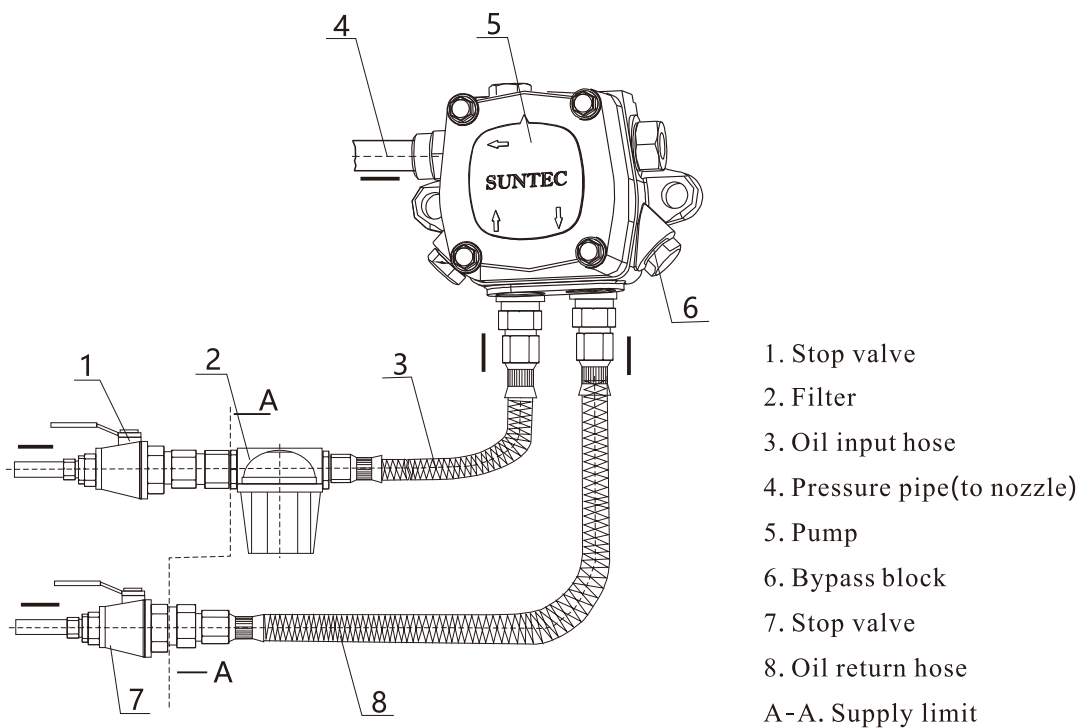
Start burner.When exhaust,loose pump "P" screw or filter waste screw,until gas flow well.

then fasten the screw.

5.5. Oil pipe

Burner has two pipeline system: oil input and oil return.

NOTE! Not allowed to remove sideline block in the pump!

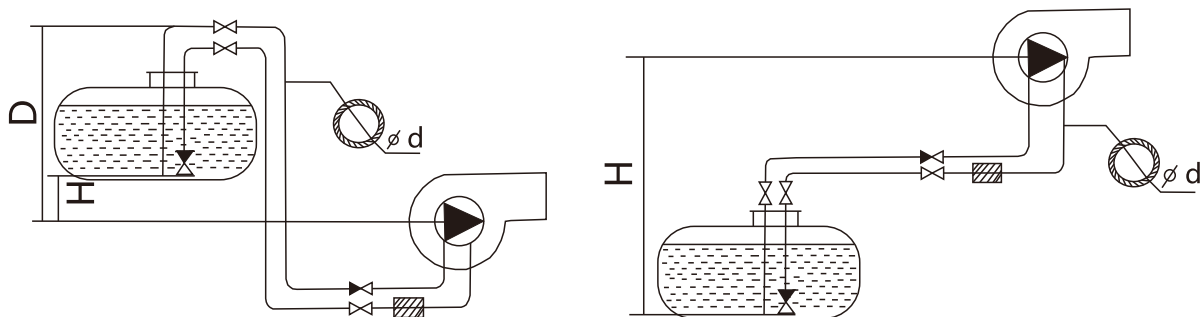


5.6. Oil supply diagram

Oil tank and hose must be installed and avoid to cool oil below coagulation point. Oil coagulation point is depended on oil quality. If oil cools to point, then valve and filter will be blocked. the best oil temperature is +15...+25°C.

Note! Burner input oil viscosity must be 4-12mm²/S(cSt).

Other viscosity Max. pipeline length can be reached by proportion formula. Such as in the table, the viscosity is 20mm²/S(cSt), the pipe length, then the range value multiplies by 20, divide viscosity, The pipe must be fastened before installed. if oil leaks, it will spray to boiler. so it suggests to use ball valve, oil inlet must locates above 15cm from oil cylinder bottom



Top cylinder

H m	SUNTEC AS / AN (Φdmm)			
	Φ10 mm	Φ12 mm	Φ14 mm	Φ16 mm
0	11	24	46	80
0.5	12	27	51	90
1.0	14	30	57	99
2.0	17	36	68	118
3.0	20	42	79	136
4.0	22	48	90	155

2850 rpm, 20mm²/s(cSt)
Dmax = 15m
(D-H)max = 4.5m

Down cylinder

H m	DANFOSS BFP21R3 / 5(Φdmm)		
	Φ6 mm	Φ8 mm	Φ10 mm
0	17	53	100
0.5	19	60	100
1.0	21	66	100
2.0	25	79	100
3.0	29	91	100
4.0	33	100	100

2850 rpm, 20mm²/s(cSt)
Hmax = 4.5m

H m	DANFOSS BFP21R3 / 5(Φdmm)		
	Φ6 mm	Φ8 mm	Φ10 mm
0	17	53	100
0.5	15	47	100
1.0	13	41	99
2.0	9	28	68
3.0	5	15	37
4.0	1	3	6

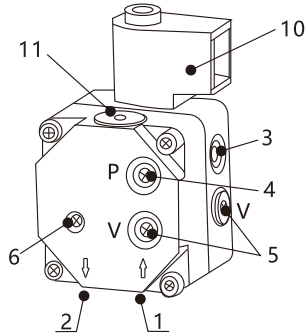
2850 rpm, 20mm²/s(cSt)
Hmax = 4.5m

H m	SUNTEC AS/AN (Φdmm)			
	Φ10 mm	Φ12 mm	Φ14 mm	Φ16 mm
0	11	24	46	80
0.5	9	21	41	71
1.0	8	18	35	61
2.0	5	12	24	42
3.0	2	6	13	24
4.0	0	0	2	5

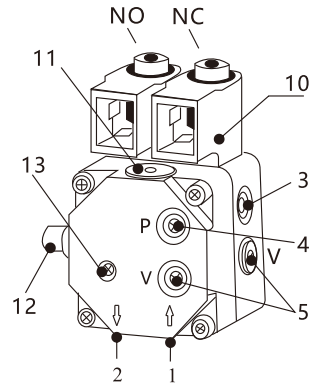
2850 rpm, 20mm²/s(cSt)
Dmax = 15m
(D-H)max = 4.5m

5.7. Pump

Danfoss PUMP

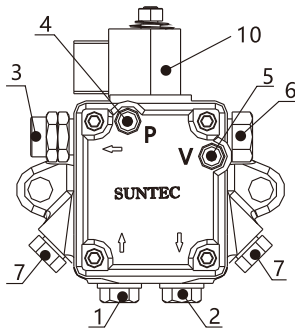


BFP 21R type

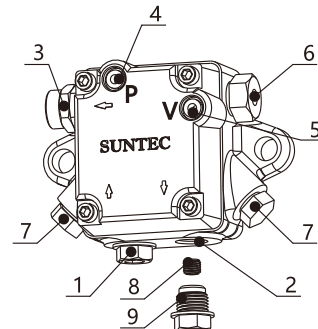


BFP 52E type

SUNTEC PUMP



AS47A type



AN67A type

- | | | |
|--|-------------------------------|---|
| 1. Oil inlet | 5. Vacuum gauge terminal | 10. Solenoid valve |
| 2. Oil return terminal | 6. Pressure adjustment screw | 11. Filter net |
| 3. Oil outlet | 7. Clear air vent | 12. The second fire pressure adjustment screw |
| 4. Pressure gauge terminal G1/8"/exhaust | 8. Internal circulation screw | 13. The first fire pressure adjustment screw |
| | 9. Filter net | |

Note: "1" "2" follow the arrow direction indication.

Oil pump pressure and nozzle size decides burner thermal output, there has inner pressure adjustment in pump. when full load, oil pressure is (=12Bar).

Pump oil intake pressure: 1-5bar, viscosity: 4-12mm²/S(cSt)

Pump pressure adjustment

Adjusting oil pressure by pressure adjustment screw (standard value is 12bar), rotate clockwise = increase pressure, anticlockwise = reduce pressure.

Pump exhaust

Loose exhaust screw block (4) or pressure meter terminal. after burner runs a while, air bubble comes from port, until no bubble goes out, fasten the screw plug, be careful not to pull the plug out of the hole.

Notice!	<p>1. If use single pipe connection, must remove pump inner recycle screw, build pump oil return inner recycle.</p> <p>2. AS pump inner recycle is in oil return terminal (2), BFP21 type pump is in side vacuum gauge inlet (5). After removing the screw, refasten the block in outlet.</p> <p>3. Design and produce oil pipeline, follow supplier's order.</p>
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5.8. Burner head adjustment

Burner head air rate adjustment

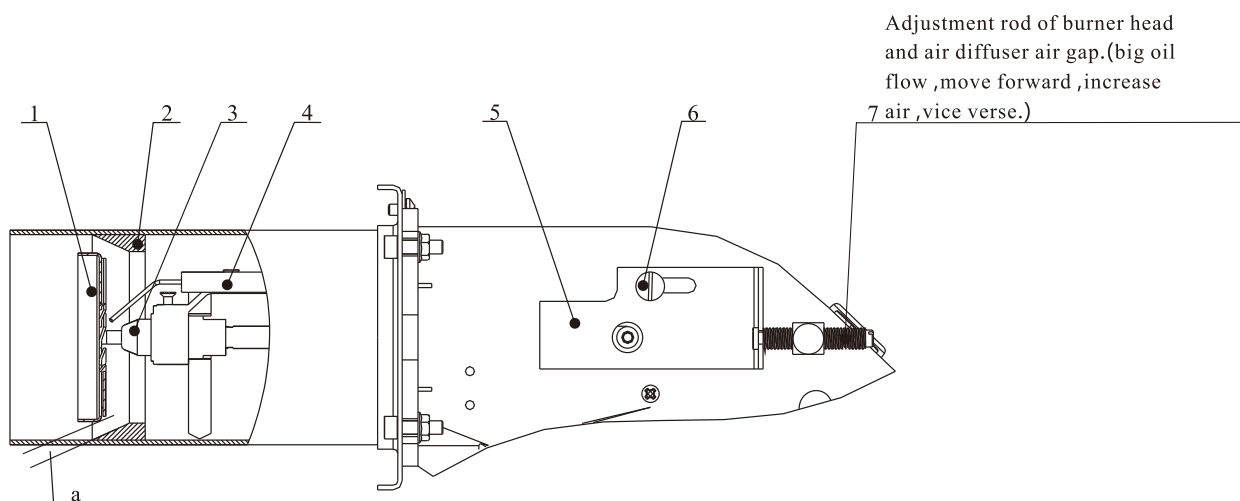
By rotating loosely adjustment nut(6),it makes air diffuser(1) moves backward.Change the edge gap distance(a)

between blast tube and air diffuser(1)to adjust air rate and air consumption,If air diffuser(2) is so close to "-" direction,

then burner blast tube air rate will be higher that lead to hard ignition or no enough combustion supporting air to burn.

If diffuser(1) close "+",air rate will be lower that lead to bad burning quality(high CO content).

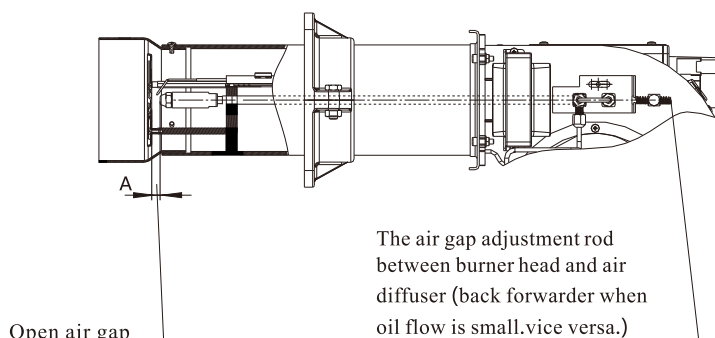
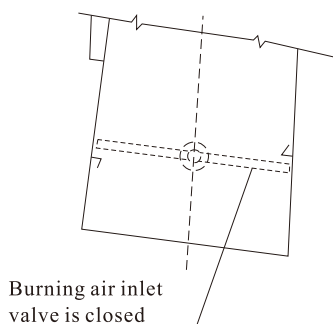
Use smoke analysis device to check burning value in adjustment.In real use,diffuser(2) and blast tube(1)should be in middle position.



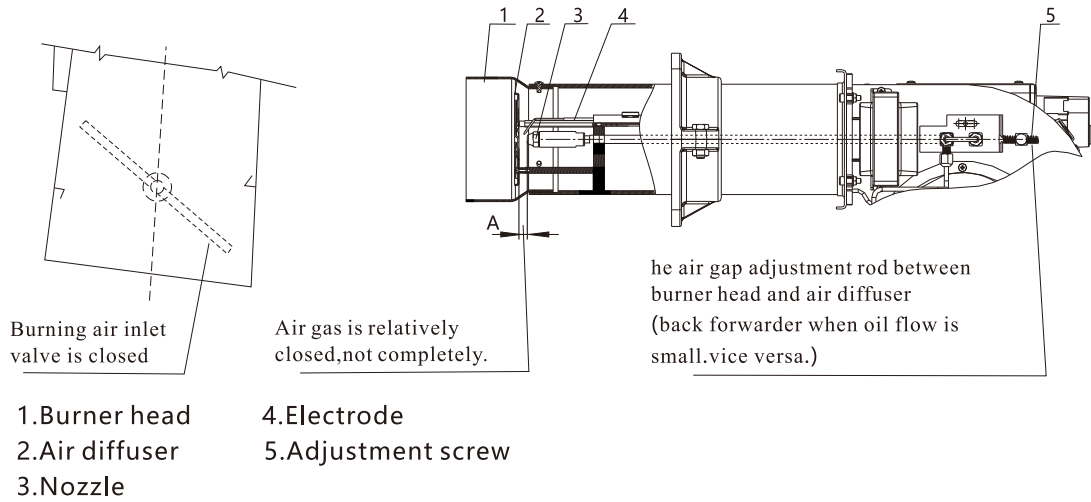
- | | |
|---------------------------|-------------------------|
| 1. Air diffuser | 5. Oil pipe fixed plate |
| 2. Burner head inner ring | 6. Fasten screw |
| 3. Nozzle | 7. Adjustment rod |
| 4. Electrode | a. Air gap |

Burner head air rate adjustment by rotating loosely adjustment nut(5),It makes air diffuser(2) moves along adjustment indication (7).Change the edge gap distance(a)between blast tube(1)and air diffuser(2)to adjust air rate and air consumption,If air diffuser (2) is so close to "-" direction,then burner blast tube air rate will be higher that lead to hard ignition or no enough combustion supporting air to burn.If diffuser(2) close "+",air rate will be lower that lead to bad burning quality(high CO content). Use smoke analysis device to check burning value in adjustment.In real use,diffuser(2) and blast tube.

Wrong adjustment



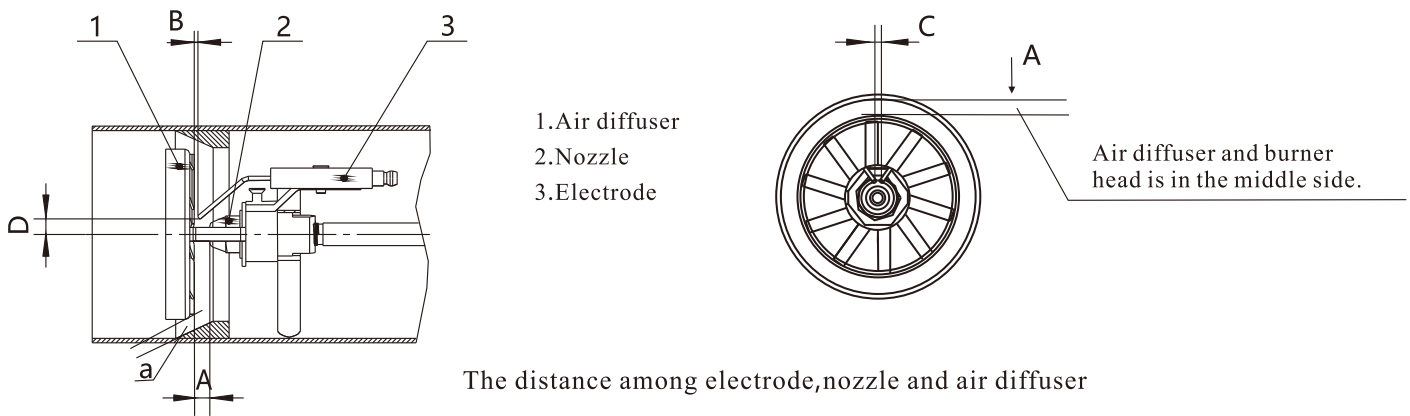
Right adjustment



Note!	If the air diffuser position has changed, then causes the air rate change. Use smoke analysis to check burning value. If necessary, adjust enough burning air consumption.
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5.9. The setting of nozzle, electrode and diffuser positions

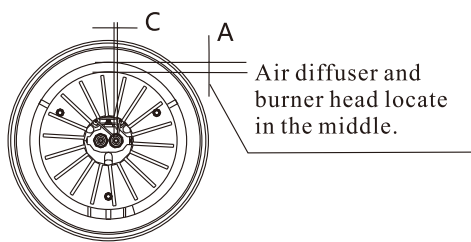
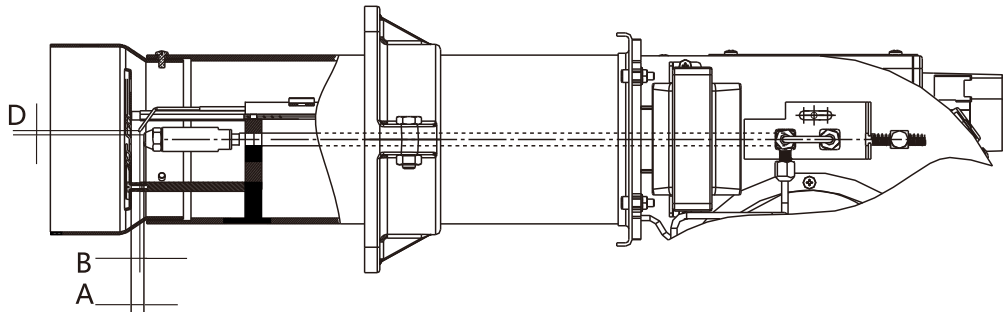
Setting the distance between nozzle(2) and air diffuser(1) and nozzle angle must abide by diagram at the same time, the distance between electrode(3) and air diffuser(1) is set as the diagram. Wrong distance will cause hard ignition..



The distance between nozzle and diffuser	A	9-10
The distance between electrode and diffuser	B	1-2
The distance between two electrode	C	3-4
The height difference from electrode and nozzle center	D	5-6

Notice □	1. Nozzle is in the middle position of adjustment ring. 2. (a) If it is adjusted to wrong distance, it will cause bad burning, air diffuser over heated, then damage the parts.
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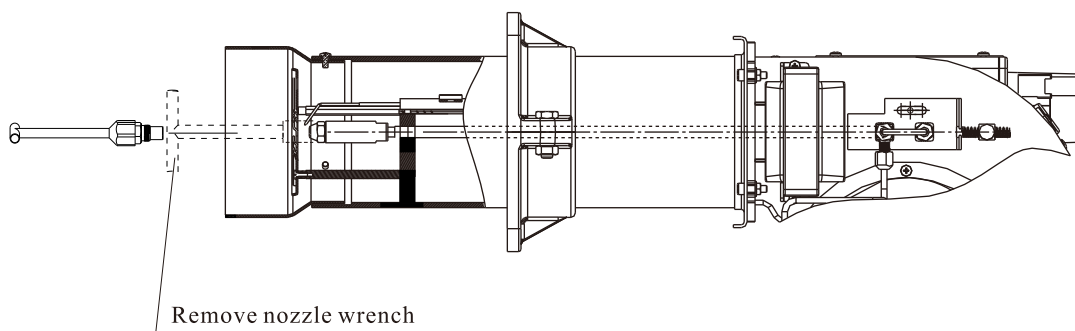
The distance from electrode to air diffuser ,between electrodes should follow the diagram.



The distance among electrodes, nozzle and air diffuser.

Model	A	B	C	D
BT18~35L	9~10	1	3~4	5~7
BT26~35LR	9~10	1	2~4	6~7

5.10. Disassembly nozzle



Notice!	Nozzle is in the middle position of adjustment ring.
---------	--



6. BURNER OPERATION

6.1. Control panel

There has control switch and fault light connecting outside burner, but fault reset button is in the burner controller. Open power switch, start process begins. then comes the prepurge process air damper is fixed the position. at the same time. motor runs.

When prepurge is finished, oil solenoid valve opens. nozzle oil is sparked by arc, controller controls ignition time, burner works. controller works from start to end.

If there has no flame in safe time, controller will lock in flame failure time, burner stops. controller fault light is on. after 15s, press fault reset button (burner will not start if controller does not reset). Burner will run in first stage fire in case that boiler moisture or pressure exceeds second stage control equipment setting value.

When boiler moisture or pressure is lower than setting value. burning air flow increases, solenoid valve 2 (second fire) opens, air damper cylinder movement starts at the same time. the board moves to second fire position. burner will run in second fire.

When boiler moisture or pressure exceeds second fire setting value, burner turn to first fire.

When boiler moisture or pressure exceeds first fire setting value, burner closes.

Setting second fire equipments lower than first fire ones. if second ones is higher than first one, burner will run in first stage, but stops in second fire.

Power on -off
Burner will cut off power automatically, burner stops work.

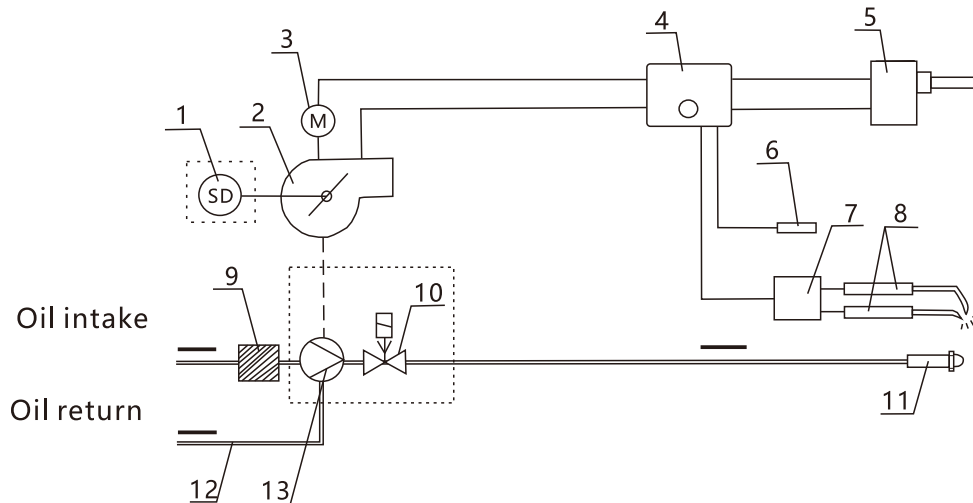
Reset--control
Burner will restart running when fault occurs.

Fault light
Alarm on

Note!	BT18/26/35 power connection by plug socket
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6.2. One stage fire burner BT14-18-26-35L principle

When load controller requests heating, burner starts, control system(4) begin start indication (photocell(6) detects). motor (3) runs (time delay/LMO24). Here comes the prepurge. transformer(7) works after finishes the prepurge process. arc forms in electrodes(8), solenoid valve (10) opens, pump pressure make oil to nozzle(11), fire comes out. burner runs under load controller(5) and controlling system(4) watching. please refer to the 《Controlling system》 section.



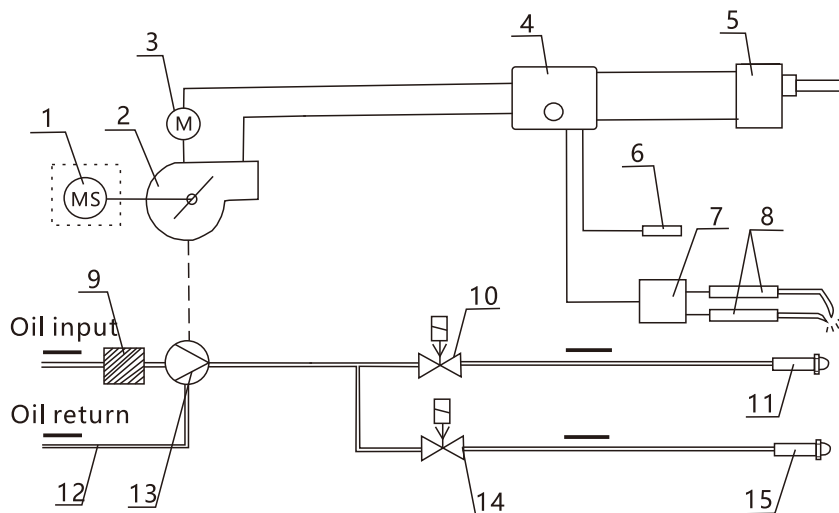
- | | | |
|----------------------|----------------|---------------------|
| 1. Manual air damper | 6. Photocell | 10. Oil valve V1 |
| 2. Fan motor | 7. Transformer | 11. Nozzle |
| 3. Burner motor | 8. Electrodes | 12. Oil return pipe |
| 4. Controller | 9. Oil filter | 13. Oil pump |
| 5. Load controller | | |

Notice	Pump oil return will have oil flow when fan motor starts. It must follow oil supply diagram to connect the fuel system.
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Note:	There has solenoid valve in pump, BT18L, 26L, 35L In one stage fire burners, Air damper is adjusted manually.
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6.3. Two stage fire burner BT14-18-26-35LR principle

When load controller (5) requests heating, burner starts, control system (4) start signal releases, (photocell (6) works), burner motor (3) runs (time delay/LMO24) prepurge opens. After finishing pre-purge process, transformer (7) works, arc forms between electrodes (8), one stage fire oil valve (10) V1 opens, pump (13) pressure transfers oil to nozzle (11), (photocell (6) keeps watching), After 10s of igniting second fire, hydraulic air damper (1) runs to full load position. second fire oil valve (14) V2 opens. big fire starts. During burner working, load controller adjusts control system (4) and oil valve (10, 14), pump pressure drives hydraulic air damper, adjusting damper board between part load and full load, following load request. If burner is closed, oil valve (10 and 14) shutdown, air damper stops in small fire position. Control system (4) controls it from start to end. burner running is under load controller (5) and control system (4) watch. please refer to the 《Controlling system》 section.



- | | | |
|-------------------------|------------------|-------------------------|
| 1. Hydraulic air damper | 6. Photocell | 11. Nozzle (small fire) |
| 2. Burner fan motor | 7. Transformer | 12. Oil return pipe |
| 3. Burner motor | 8. Electrodes | 13. Oil pump |
| 4. Control system | 9. Oil filter | 14. Oil valve V2 |
| 5. Load controller | 10. Oil valve V1 | 15. Nozzle (big fire) |

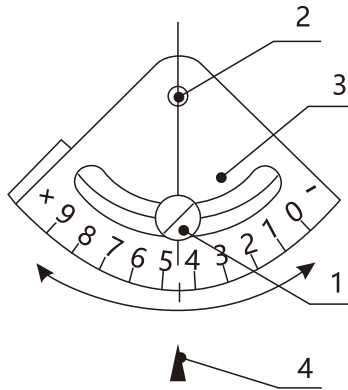
Notice	Pump oil return will have oil flow when fan motor starts. It must follow oil supply diagram to connect the fuel system.
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Note:	There have 2 pcs solenoid valves in pipeline in 26LR, 35LR, Air damper is hydraulic controlled.
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6.4. Urning air adjustment

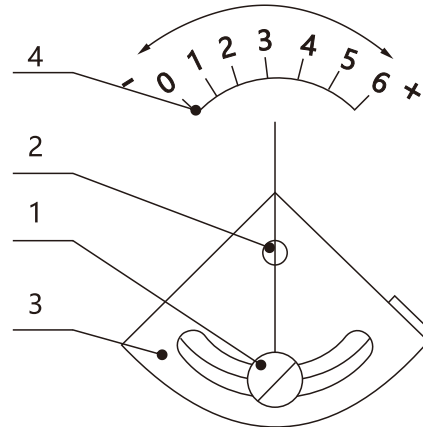
6.4.1. One stage fire burner

Model: BT18L. 26L. 35L



- 1. Fasten screw
- 2. Air damper shaft

Model: BT14L



- 3. Air adjustment rotate button
- 4. Point signal

Loose fasten screw(1), rotate adjustment rotating button(3) along + direction = increase air flow. - direction = reduce air flow. Screen will show the position of rotating button. When air flow is right, refasten the screw(1).

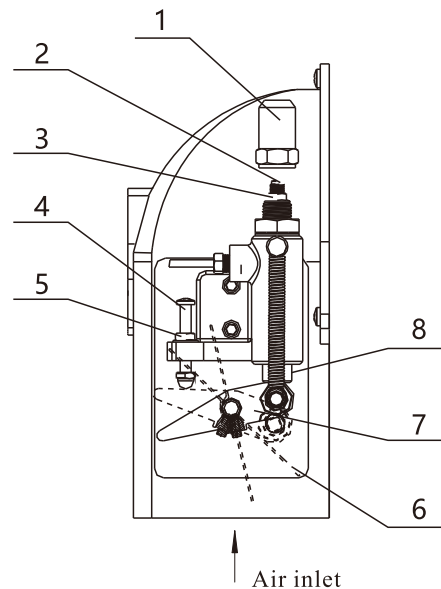
6.4.2 Two stage fire burner hydraulic air damper adjustment

One stage fire burning air adjustment:

Take cap(1) out, loose nut(3), using A screwdriver to adjust rod(2) downward clockwise. pushing piston (8) to move downside. force pendulum rod(7) rotates clockwise across the air damper. then with damper rod, the air damper will be open. Adjustment rod(2) downward distance is to control air damper openness, that means it can control the air flow in first stage burning. After finishing adjustment, fasten nut(3), cover the cap.

Two stage fire burning air flow adjustment:

Loose fasten nut(5), rotate adjustment rod(4) upward some distance. when oil valve(solenoid valve) opens. oil goes into hydraulic cylinder, piston keeps moving downward under oil pressure, pushing pendulum rod rotate clockwise until adjustment rod(4) against. Air damper is open bigger and bigger along pendulum rod rotating clockwise. Adjustment rod(4) upward moving distance decides pendulum rod angle. then the air damper openness. repeat it and choose best air and oil ratio, fasten nut(5).

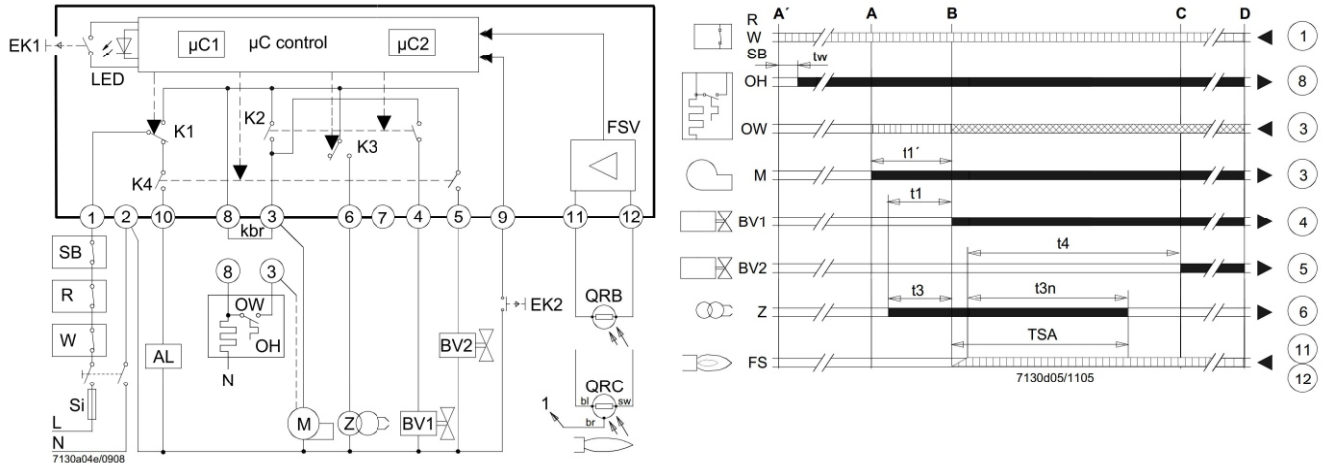


- 1. Cap
- 2. One stage fire air adjustment rod
- 3. Fasten nut
- 4. Two stage fire air adjustment rod
- 5. Fasten nut
- 6. Air damper
- 7. Pendulum rod
- 8. Piston

7. CONTROLLING SYSTEM

7.1. LMO24...controller

Timing sequence diagram(control process)



Code name

AL	Alarm device	TSA	Ignition safety time
BV...	Fuel valve	tw	Waiting time
Ek1	Alarm device	t1	Prepurge time
Ek2	Remote lockout reset button	t1'	Purge time
FS	Flame signal	t3	Preignition time
FSV	Flame signal amplifier	t3n	Postignition time
K...	Contacts of control relay	t4	Interval from flame signal to release of fuel valve 2 (Bv2)
kbr	Cable link (required only when no oil preheater is used)	A'	Start of startup sequence with burners using an oil preheater (OH)
LED	3-color signal lamp	A	Start of startup sequence with burners using no oil preheater (OH)
M	Burner motor	B	Time of flame establishment
OW	Release contact of oil preheater	C	Operating position
OH	Oil preheater	D	Controlled shutdown by control thermostat or pressurestat ®
QRB...	Photo resistive flame detector	■	Control signals
QRC...	Blue-flame detector bl = blue, br = brown, sw = black	▨	Control signals
R	Control thermostat or pressurestat	▩	Perm. input signals
SB	Safety limit thermostat	μC1	Microcontroller1
Si	External primary fuse	μC2	Microcontroller2
W	Limit thermostat or prossure switch		
Z	Ignition transformer		

Function

Preconditions for startup

- Burner control is reset
- Reset button «EK1» or «EK2» not used
- All contacts in the line are closed and there is demand for heat
- No undervoltage
- Flame detector is darkened and there is no extraneous light

Undervoltage

- Safety shutdown from the operating position takes place should mains voltage drop below about AC 165V($U_N=AC\ 230V$) or AC 75V($U_N=AC\ 120V$)
- Restart is initiated when mains voltage exceeds about AC 175V($U_N=AC\ 230V$) or AC 95V($U_N=AC\ 120V$)

Time supervision oil preheater

If the oil preheater's release contact does not close within 10 minutes, the burner control will initiate lockout.

Controlled intermittent operation

After no more than 24 hours of continuous operation, the burner control will initiate automatic controlled shutdown followed by a restart.

Control sequence in the event of fault

If lockout occurs, the outputs for the fuel valves, the burner motor and the ignition equipment will immediately be deactivated (<1 second). In the event of lockout, the LMO... remains locked and the red signal lamp (LED) will light up. The burner control can immediately be reset. This state is also maintained in the case of mains failure.

Cause	Response
Mains failure	Restart
Voltage has fallen below the undervoltage threshold	Safety shutdown, followed by restart
Extraneous light during prepurge time(t_1), 5 s before fuel valve(BV1) release	Lockout at the end of prepurge time(t_1)
Extraneous light during waiting time(t_w)	Prevention of startup, lockout after 40 seconds at the latest
No flame at the end of safety time(TSA)	Lockout at the end of safety time(TSA), blink code 2
Loss of flame during operation	Max. 3 repetitions, followed by lockout
Oil preheater's release contact does not close within 10 minutes	Lockout

Resetting the burner control

When lockout occurs, the burner control can immediately be reset. To do this, press the lockout reset button for about 1 second (<3 seconds). The LMO... can only be reset when all contacts in the line are closed and when there is no undervoltage.

Ignition program with LMO14.113×2 and LMO24.113×2

If the flame is lost during safety time(TSA), the burner will be reignited, but only until the end of safety time(TSA). This means that several ignition attempts can be made during safety time(TSA) (see Control sequence).

Limitation of repetitions

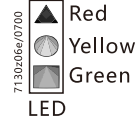
If the flame is lost during operation, a maximum of 3 repetitions can be made. If the flame is lost for the fourth time during operation, the burner will initiate lockout. The repetition count is restarted each time controlled switching on by control thermostat or pressurestat(R) takes place.

Operation,display,diagnostics

Operation



Lockout reset button 《EK》 is the key operating element for resetting the burner control and for activating/deactivating the diagnostic functions.



The multicolor signal lamp(LED)in the lockout reset button is the key indicating element for both visual diagnostics and interface diagnostics.

Both 《EK》 and LED are located under the transparent cover of the lockout reset button.

There are 2 diagnostic choices:

1. Visual diagnostics:Operational status indication or diagnostics of the cause of fault.
2. Interface diagnostics:With the help of the interface OC1400 and PC software ACS400/ACS410 or flue gas analyzers of different makes .

Visual diagnostics:

In normal operation,the different operating states are indicated in the form of color codes according to the color code table given below.

Operational status indication

During startup,status indication takes place according to the following table:

Color code table for multicolor signal lamp(LED)		
Status	Color code	Color
Waiting time 《tw》 ,other waiting states	○.....	Off
Oil preheater on	●.....	Yellow
Ignition phase,ignition controlled	●○●○●○●○●○●○	Flashing yellow
Operation,flame o.k.	□.....	Green
Operation,flame not o.k.	□○□○□○□○□○	Flashing green
Extraneous light on burner startup	□▲□▲□▲□▲□▲	Green-red
Undervoltage	●▲●▲●▲●▲●▲	Yellow-red
Fault,alarm	▲.....	Red
Error code output(refer to 《Error code table》)	▲○ ▲○ ▲○ ▲○ ▲○	Flashing red
Interface diagnostics	▲▲▲▲▲▲▲▲	Red flicker light

Legend

..... Steady on
○ Off

▲ Red
● Yellow
□ Green

CONTROL FUNCTION IN FAILURE

Extra brightness/early flame signal

Pre-purge process /pre-ignition process does not allow to have the flame signal.If there happens oil valve leaks,extra brightness, photocell or its coil will short circuit.flame amplifier failure etc ,these conditions will release signal,then controller will lock in prepurge failure time.oil valve will not open .

No Flame Signal

There has no flame signal when stable time is finished,controller will lock immediately.

Flame shut off during running

Controller will cut off fuel supply and try to restart it by itself when flame shuts off,"t4"finishes,controller runs all start process.

Along lock control output 3to 8,terminal 11 will reduce pressure in 1s,lock remote signal terminal 10 receives voltage,reset control after locks.at least 50s.

Low voltage protection

Electrical protection equipment prevents low voltage,make sure that when main return line in low voltage(\square 165V)shows dangerous fault lead to controller closing burner and stop new start.

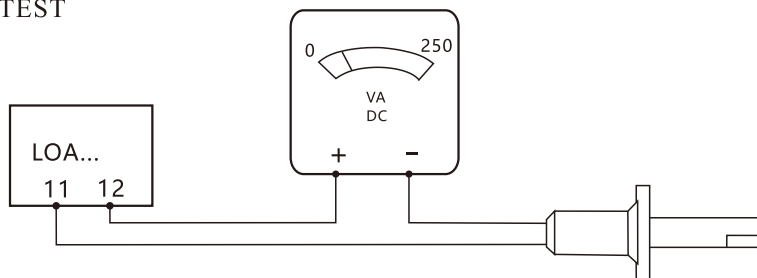
Controller technical parameters

Supply voltage	220 VAC-15%...240VAC \pm 10%
Low voltage protection	\square 165 V
Frequency	50-60 Hz, \pm 6%
External fuse	max. 10A
Allowed combient temperature	-20...+60°C

Flame detection current

Photocell QRB	220 VAC	240 VAC
Min.requested photocell current as flames being on	65 μ A DC	75 μ A DC
Max.requested photocell current as flames being off	5 μ A DC	6 μ A DC
Max.requested photocell current as flames being on	200 μ A DC	220 μ A DC
d.c.Measurement equipment resistance	max. 5kOhm (+terminal12)	

FLAME SIGNAL TEST



	<p>Warning! This system is complete one ,not allowed to change it !</p>
--	--

8. MAINTENANCE



Warning! Cut off power before burner maintenance, also close oil supply pipe manual stop valve. When checking, close burner power, but open oil supply pipe manual stop valve.

BURNER MAINTENANCE

- *To make sure the good working, it should clean the ignition and check their set.
- *Check photocell position and status.
- *If necessary, clean the filter (at least once per year).
- *If nozzle damages, change it.
- *Clean dirty and float waste, keep burner clean.
- *Regularly do the smoke measurement to check burning speciality.
- * Check burning value by smoke analysis (such as after full oil cylinder or once per year)

HEATING EQUIPMENTS CONTROL

- *Keep boiler clean and door closed
- *Guarantee heating system has enough water pressure
- *Clean fire oven and chimney regularly
- *Check smoke board adjustment regularly
- *Avoid water spray into burner
- *Boiler must open vent fan
- *Clean the oil tank, at least once per 4-5 years
- *Check boiler work

9. FAILURE AND MEASUREMENT

Failure, firstly check below items :

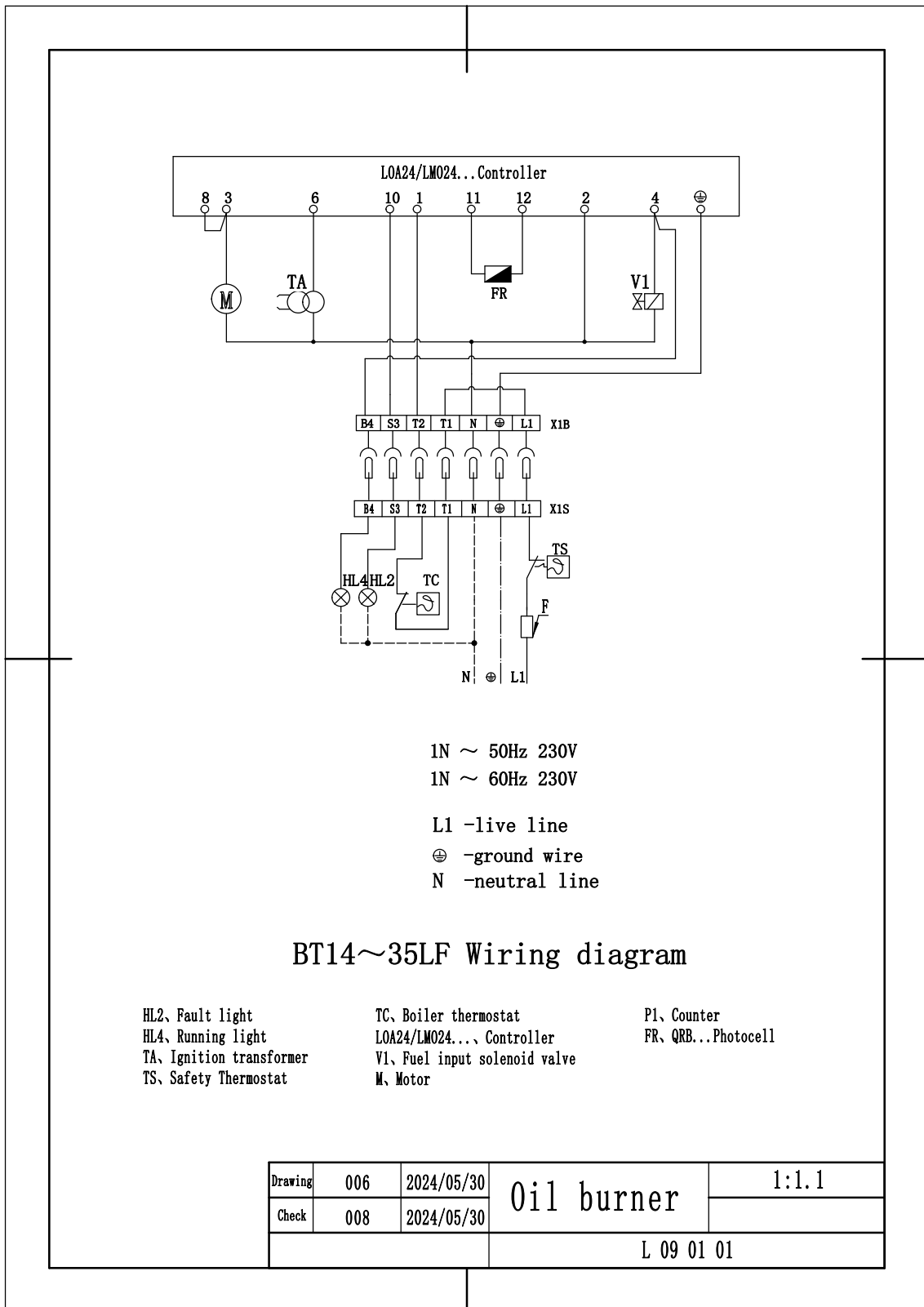
1. Check circuit(control and supply voltage)
2. Check valve leakage detector (Yellow light is ok)?
3. Check all adjustment device and controller installation.
4. The working of safe devices.
5. Check the burner if has fuel and fuel pipe valve is open or not ,oil tank has oil or not.If failure isn't caused by above items, have to check each part function.If controller is on "Lock"(signal light is on), need to reset. When controller turns to start position ,burner opens. watch burner function. Indicator signal show some failure kind.

Notice	Cause	Measurements
1.Start failure		
Motor does not start.	Main oil return closed Motor overload relay releases or failure Fuse broken Motor contactor failure Motor control return line cut off: -controller failure Photocell short circuit	Find out the cause and amend. Check and set ,reset or start. reset or change Change Change Repair or change
2.Ignition failure		
Motor starts, there has control voltage from controller to transformer ,no ignition. after a while, lock happens.	Electrode is dirty or old, insulation part cracks. Wrong position of electrode ignition cable damages Transformer failure Controller failure Transformer cable loosen or damage	Clean and change adjustment change change change change or repair

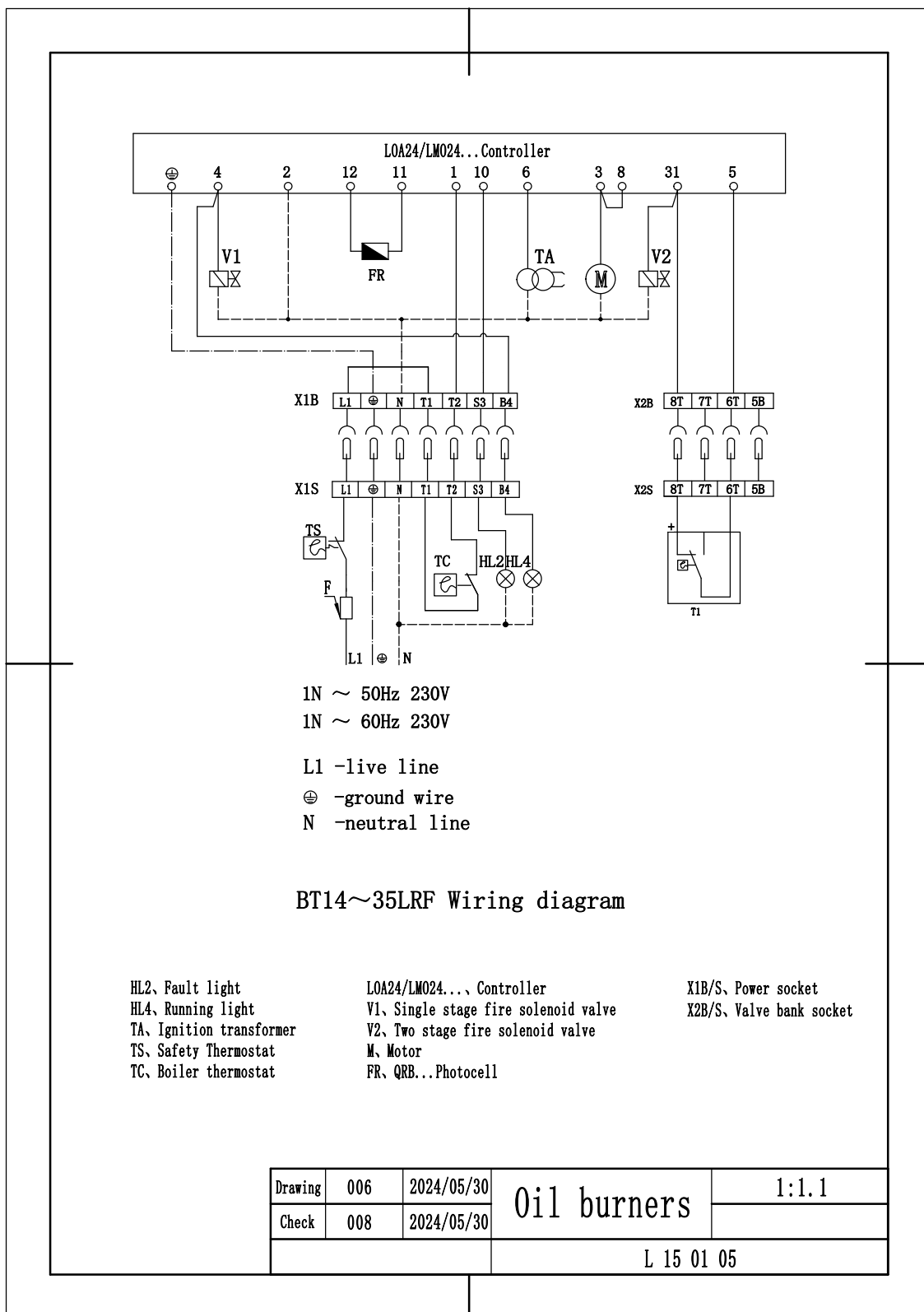
Notice	Cause	Measurement
3.no flame establishment		
Burner motor statrm,spark comes out,after a short while,lock. Nozzle no oil	Solenoid valve not works ·Solenoid valve or coil failure, cable damages ·Controller failure ·Hydraulic top rod incorrect setting Oil atomizing pressure is too low Nozzle blocks or damages	Change damaged parts Adjustment Please refer to the 《 Pump》 section
4.Oil pump		
No supply oil or atomizing pressure is too low. Nozzle no oil. Big mechanical noise	Filter dirty Oil intake pipe leaks Pump load reduces ·Pumps failure or damage valve does not open to nozzle ·Solenoid valve(AS47A) does not close ·Solenoid valve(other pump)does not open	Clean Seal Change Change Change solenoid valve coil or pump Fasten connector
5.Lock after flame is built		
Lock happens after burner runs serval seconds.then restart.	Wrong burner adjustment Dirty filter Nozzle block Solenoid valve failure	Correct adjustment Clean Change Change
6. Too early of flame signal		
Motor starts ,then lock occurs	Oil valve leaks	Clean or change

Notice	Cause	Measurement
7. Photocell failure(lock)		
Burner motor starts, flame comes out, then lock happens. Lock in prepurge process Lock in close process	Wrong photocell position Dirty photocell Weak flame brightness Photocell failure Controller failure There has heavy oil or heavy carbon deposit in burner head Photocell failure or damages Controller failure Extra brightness cause wrong flame signal	Adjustment Clean Burner adjustment Change change clean and adjustment change change find out and amends.
8. BURNER HEAD		
Inner over oil or heavy carbon deposit	Wrong distance between air diffuser and nozzle Wrong adjustment of combustion supporting air There has no vent in boiler Wrong nozzle size or model Old-aged nozzle Wrong adjustment ring position	Correct adjustment Adjustment Increase air supply Change nozzle change Adjustment

10. WIRING DIAGRAM



Warning: Thermostat or pressure controller cable must be non voltage switch signal cable, follow wiring diagram.



Warning:Thermostat or pressure controller cable must be non voltage switch signal cable,follow wiring diagram.

Serving Global Heating Technology

