

Installation & Operation manual

LNE Compact Hot Water Boiler

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1 Safety Specifications

Follow this instruction manual carefully, it is a very important part of our warranty. Ignoring this manual may cause expiring of the warranty.

This instruction manual is only valid to our delivery, for parts delivered by a third party, a user manual must be supplied by its manufacturer or his representative.

- For transport and erection purposes, only the mountings for lifting points/lugs on the vessel may be used.
- Depending on the local regulations the vessel must be earthed after erection.
- After erection the vessel shall be equipped with a proper strengthened drain- and blow off piping which are routed to a safe location where the pressure can be release safely.
- No additional forces or moments are allowed on the vessel or its connecting points caused by reaction- or supporting forces by connecting piping.
- The vessel must be equipped with one or more pressure safety devices according to AD-Merkblatt A2, TRD 721 or ASME section IV whichever is applicable set at the max. design pressure of the vessel. Local safety regulations must be adhered to. The safety device or devices are to be designed to blow off the complete capacity of the boiler.
- The boiler must be equipped with a water level control device according to local regulations. In case of problems / malfunctions with the level control switch, contact the manufacturer forthwith and take the vessel out of operation
- The boiler must be equipped with a modern burner which avoids accumulation of flammable or explosive gasses and avoids fire back draft.
- This boiler has been constructed and tested according to the PED Directive or ASME section IV (whatever is applicable) and may not be put into operation before local approval by the inspection authorities.
- If during transport or erection the pressure vessel has been damaged, it is not allowed to take the vessel into operation. Warn the manufacturer, HKB, at once.
- The boiler is only designed to produce hot water up to the value and pressure as given on the nameplate and may be used for this purpose only. The water cannot be used for drinking water.
- The boiler must be insulated when put into operation to avoid personal injury. In case the vessel is erected outdoors, the vessel must be protected against freezing, for example by means of electrical tracing or stand-by heating. If the boiler is put out of operation for a long period, empty the vessel or protect the boiler with chemicals.
- For operation and maintenance of the boiler and its equipment, the attached water requirements for hot water boilers are applicable.

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- Qualified personnel shall carry out operation and maintenance only, which is familiar with the local safety requirements. All personnel will require proper training.
- To avoid internal corrosion and chemical attack or erosion the attached water requirements are applicable and shall be adhered to. Special precaution must be taken against O₂ and CO₂ corrosion. The water quality must be checked regularly (min. once a month)
- Do not open the vessel or disconnect parts of it during operation.
- Not insulated parts and inspection hatches of the vessel can be very hot. Do not touch uninsulated parts during operation.
- After commissioning check tension bolts and nuts regularly to avoid leakage.
- The vessel must be checked and supervised according to local requirements and authorities every several years, depending on local regulations. Regulating – and safety devices must be tested, and the vessel inspected.
- With regards to warranty and claims nothing shall be altered or welded on the boiler without prior notice and approval of HKB and the inspection authorities.
- The return temperature may never during any load of the burner be lower than 65°C with gas firing and 70°C with oil firing.
- The difference between supply- and return water temperature must never exceed 40°C, because of thermal tension within the boiler
- Burner must be commissioned by the burner manufacturer or its competent representative. The input capacity may never exceed the value as given on the nameplate. The length of the burner flame must never be longer than 75% of the furnace of the boiler
- During the warranty period only HKB or its representative may carry out maintenance at the boiler. If third parties perform works on the boiler the warranty may expire.
- The boiler must be installed in a boiler room according local requirements with enough air venting, light, escapes doors and routes. A fire extinguisher must be available in the boiler room. In case of (fire)alarm, the operator must take immediate and proper action.
- The boiler must be inspected once a year. If the boiler is located outside, it must be inspected twice a year. . The inspection must be done by HKB or by someone with the necessary equipment and experience, otherwise warranty expires.

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1.1 Function of the boiler

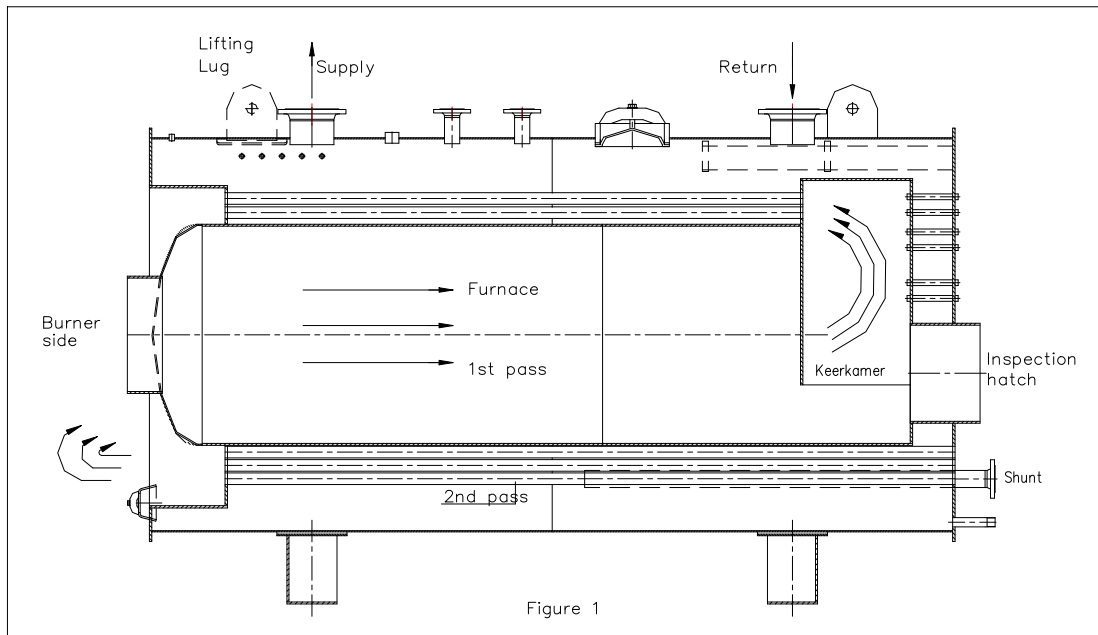
The Compact hot water boiler is a horizontal three pass hot water boiler of simple, successful and efficient design and construction which has proved itself by years of experience.

The combustion takes place in a spacious furnace, which allows the low-nox burner to meet the needs of the low NOX exhaust. A complete water-cooled rear return chamber will lead the flue gases into the second pass of flue gas tubes. Then the front return chamber will lead the flue gasses into the third pass. After this the flue gasses will leave the unit by the flue gas outlet.

During the manufacturing of the boiler all measures have been taken to make sure that the quality and the reliability of the boiler is of the highest level. This is done by means of testing and inspection of notified bodies. The boiler has been successful pressure tested with water in our workshop. A good working of the boiler can only be guaranteed when the installation and control prescription and the maintenance recommendations in the boiler-manual are observed, read carefully before using the parts. Ignoring this manual may cause expiring of warranty.

Attention!

This instruction manual is only valid to our delivery, for parts delivered by a third party, a user manual must be supplied by its manufacturer or his representative



1.2 Technical data and type plate

The technical data are specified in the order confirmation.

The parameters given on the type plate may not be exceeded. A type plate is attached to the boiler.

2 Transport and storage

2.1 General

When transporting the systems, suitable protective measures should be taken, which will depend on the type of transport chosen. If necessary, the manufacturer will advise you on the choice of suitable protective measures. In any case, transport must be carried out with due caution. Unnecessary loads on the components should be avoided. If required, and for a charge, the delivery can be packed for transport by the manufacturer and delivered with the appropriate protection.

Caution! *Incorrect lifting can seriously damage the equipment. Lifting equipment and lifting tackle should only be attached at the specified lifting points. Only fix lifting equipment at the marked points. You should only use lifting equipment and lifting tackle that can take the weight imposed.*

- If a crane is used, the vessel may only be lifted at the marked lifting lugs at the cylinder attached to the boiler part; it is essential that all the lifting lugs affixed to the cylindrical part be used.
Important! The angle of inclination of the lifting accessories must be $\leq 60^\circ$.
- If the location of the vessel has to be changed, the vessel may only be lifted at the lifting jacks, which are attached to the vessel feet. Small boilers (transport weight < 4 t) may be lifted by suitable means (e.g. conveyor vehicles, lifting equipment) at the points where the vessel feet are fixed to the base frame.

Important! *For floor-level vessel transport, means of transport under the base frame may exclusively be placed below the vessel feet.*

The use of "tank steel rollers" below the base frame is inadmissible for floor-level transport. Danger of base frame deflection!

- If the location has to be changed towards the direction of the vessel longitudinal axis even just slightly, you may exclusively use the lower bores at the holding rings.
- Attachment points on buildings or parts of buildings for pulling the plant must be suitable to take the forces arising and may only be used if they have been approved beforehand by the plant manufacturer.
- If the boiler, because of the situation on site, cannot be transported as described above, it is essential that the manufacturer is consulted.

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2.2 *Transport instructions*

The following instructions must be followed:

- Avoid wet or damp situations
- When transporting insulated systems or system components on open vehicles, suitable packaging should be provided to protect the equipment from the effects of water and weather.
- Avoid vibrations as far as possible.
- Do not under any circumstances expose the systems or system components to temperatures below -20 °C (danger of embrittlement fractures). If refractory has been applied, never expose to temperatures below 0 °C.
- For transport by sea, use suitable packaging (overseas containers). If the system is packed in a wooden crate, it may not under any circumstances be transported on deck.
- Make sure that enough suitable corrosion protection is provided whatever form of transport is chosen.
- Transport vehicles must be fitted with pneumatic or hydraulic suspension to prevent vibration cracking.
- The vessel is provided with lashing eyes or openings in the support, so it can be securely fixed to a transport vehicle. This will prevent sliding of the vessel.

2.3 *Storage instructions*

If the components must be stored, the following instructions must be followed:

- Store in a dry (humidity < 60%), dust-free place.
- Temperature change in the store < 10 K/h.
- Never expose the system to temperatures below -50 °C. Restrictive applies: Items of equipment, sensors and the control cabinet should never be exposed to temperatures above 40 °C and below -20 °C. If refractory has been applied, never expose to temperatures below 0 °C.
- If the components are stored insulated and covered with the protective wrapping provided for transport, the protective wrapping should be cut open at the base for the full length to prevent condensation and thus oxidation on the insulation surface.

3 Locating the boiler

3.1 General

Competent personnel must carry out the installation of the compact hot water boiler in accordance with all relevant safety regulations. It is their responsibility to ensure that these regulations are complied with.

3.2 Delivery

The boiler is delivered by HKB including manometer, thermometer, flue gas cleaning device, heat resistant stamp cement for installation of the burner, heat resistant insulation blanket and sight glass. Before commissioning the boiler, the user/installer must take care that the following fittings and mountings are placed and wired: Safety valves, burner, max. pressure/temperature control and regulating controls, low water alarm, supply and return valves, shunt valve, drain valve, and a shunt pump. The burner must be adjusted to maximum capacity of the boiler as indicated on the nameplate of the boiler; all safety devices must comply with the applicable local safety precautions.

The boiler is insulated to prevent unnecessary loss of heat and to protect against burning on the hot surfaces.

CAUTION!!!! Not all parts of the boiler are insulated, the boiler door and the inspection openings get hot during use, do not touch these hot parts during operation.

3.3 Erection and boiler locating.

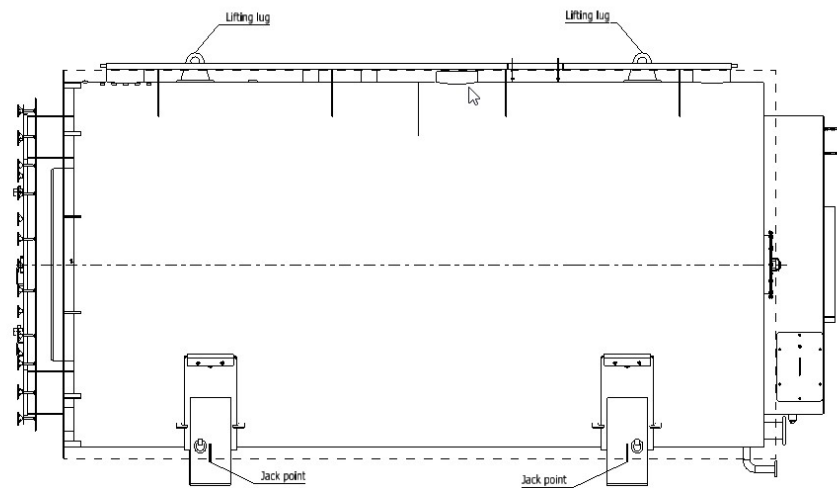
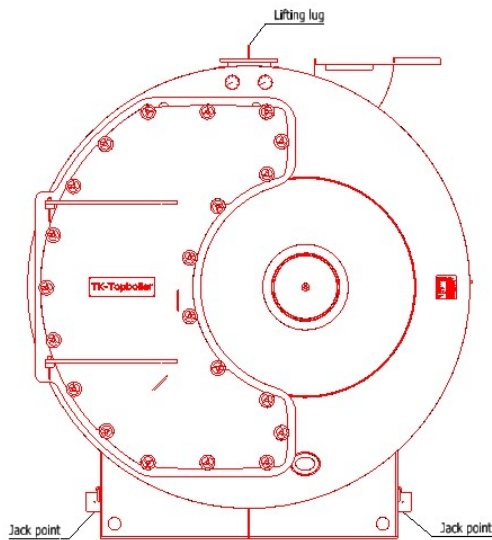
When locating the boiler, make sure that there is enough space around the burner and the operating side to maintain the boiler properly. Also take care that the boiler house is clean and tidy, this can prevent accidents. The boiler house should be ventilated sufficiently in compliance with current regulations. Insufficient ventilation can cause the buildup of toxic / explosive gas mixtures in the boiler room or combustion with insufficient air, resulting in hazardous, anti-economical and polluting operation or burner failure.

Do not store any chemicals in the boiler house, chemical fumes can damage the boiler or mountings and cause burner failure. Keep the burner room clean and free of solid volatile substances that could be sucked into the fan and clog the internals or the burner or boiler or combustion air ducts. The boiler must be located in a boiler room according local requirements with sufficient air venting, light, escapes doors and routes. A fire extinguisher must be available in the boiler room. When the alarm sounds its essential that the operator will notice this at ones and can take proper immediately action. Keep the escape route always clear. The flue gas ducting and connecting shall be tight fitted.

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3.4 Transport

For transport and erection purposes only the mounted lifting points / lugs on the vessel may be used. (See pictures below)



CAUTION!! Never use the burner or any other mountings for lifting!

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Lifting lugs



Jack point

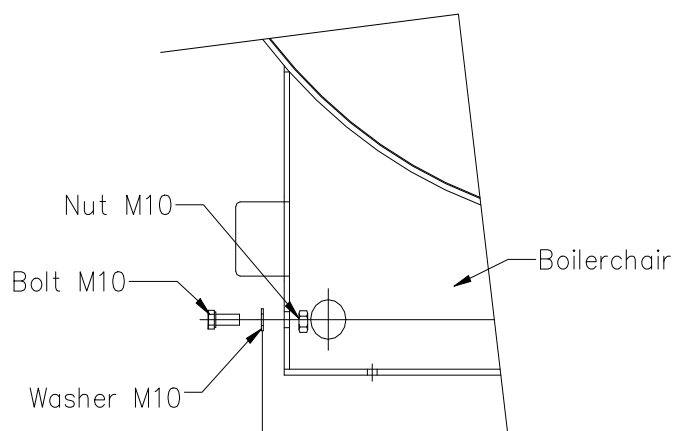
Once the boiler is placed, it should be positioned on a load-bearing floor to both length and width. Use filling plates if necessary using a level gage.

After positioning, the front boiler chair (this is the one on the burner side) should be attached to the floor, to prevent leakage's in the gas- or oil train because of expanding / shrinking of the boiler
If the boiler is located on a floor, which is regularly wet, we recommend putting the boiler on a platform.

After locating, the boiler should be connected to the earth, to do so, there is a earth connection on both sides of the front boiler chair (see figures below) (To prevent static discharge which can be dangerous in combination with gas and oil smoke).

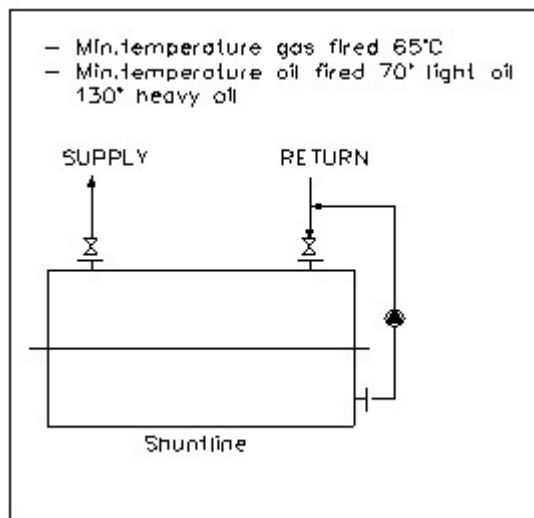


Earth connection



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3.5 *Shunt piping*



A shunt line is necessary to maintain an even temperature distribution within the boiler during operation, standstill or decreased water flow to and from the users.

The return water is preheated with the water out of the boiler and makes sure that there is enough circulation within the boiler.

The shunt capacity shall be at least 3x times the water volume of the boiler

Additionally, it decreases the thermal tensions within the boiler when the difference in temperature between supply and the temperature of the returning water return is big. (thermal shock)

Also, it decreases the possibility of condensation of flue gasses. It diminishes thermal tensions within the boiler.

Following conditions should be avoided at all times:

- The difference in temperature between supply and return nozzle is more than 40°C. (thermal shock)

This will lead to damage of the tubeplate in the water-cooled reversal chamber at the end of the furnace

- The temperature of the returning water may never during any load of the burner be lower than 65° C with gas firing and 70°C with light oil firing.

For heavy oil the min. return temperature shall be at least 130° C

Low water return temperatures will lead to condensation of flue gasses causing corrosion within the boiler.

3.6 Flue gas outlet

- 1 The flue gas diameter must be the same or larger than the flange of the boiler.
- 2 Avoid the use of 90° elbows, these cause pressure loss which could lead to increasing the diameter of the flue gas piping to compensate the pressure loss.
- 3 The allowable height and type of chimney depend on the local regulations and rules.
- 4 The minimum diameter of the flue gas piping is that of the flue connection bore on the boiler.
- 5 Too much resistance in the flue gas outlet may cause adjustment or capacity problems with the selected burner.
- 6 The flue gas ducting shall be sloped towards the boiler, avoid locations where flue gas or condense water can stand still or soot can build up
- 7 Flue gas ducting shall be tight to avoid leakages of flue gasses into the boiler room.

3.7 Mountings and fittings

All mountings and fittings should be appropriate for the use on the boiler. Make sure all mountings and fittings comply with the national / local rules and regulations.

3.8 Feedwater supply

The quality of the boiler water is of influence on the life span and performance of the boiler. Before using the boiler, we recommend you to get in touch with a reliable company for the treatment of the boiler feedwater. No water treatment can cause serious damage to the boiler. The water quality must be checked regularly (min. once a month and catalogued)

Also read appendix A and B, Specifications for water quality and the feed water supply requirements. We advise you to keep records of the water quality reports and date and quantity of the fresh feed water, which is, supplied into the heating system.

3.9 Gas supply

- 1 Check whether the burner is suitable for the kind of gas that is being fired and if the gas pressure corresponds with the requirements.
- 2 Take care that the piping from the gas meter has the right diameter.
When installing the gas piping, choosing the right diameter must be performed by a qualified installer, in conformity with the national applicable rules / regulations. To prevent pressure loss, avoid using unnecessary elbows in the piping between the gas meter and the burner.
- 3 Make sure that the gas cock is inserted in the gas piping, between the burner and the gas meter. One safety shut off valve must be located outside of the boiler room.
- 4 Prior to supplying fuel to the unit, clean burner pipes thoroughly to prevent residues from impairing proper operation.

3.10 Oil supply

1. Check whether the burner is suitable for the kind of oil that is being fired.
2. Take care that the piping from the oil tank to the burner has the right diameter. When installing the oil line, choosing the right diameter must be performed by a qualified installer, in conformity with the national applicable rules / regulations. To prevent pressure loss, avoid using unnecessary elbows in the piping between the oil tank and the burner.
3. Make sure that a check valve is inserted in the oil line, between the burner and the oil tank. One safety shut off valve must be located outside of the boiler room.
4. Prior to supplying fuel to the unit, clean burner pipes thoroughly to prevent residues from impairing proper operation

3.11 Electrical requirements

An alarm must be mounted outside the boiler room, if the alarm sounds this must be audible for a qualified person, so that this person can act.

Make sure the unit is connected to an efficient earth system in compliance with current safety standards. When in doubt, have the electrical system checked by a licensed electrician. Never use gas pipes for earthing electrical installations.

The electrical system and all cable sections must be adequate to deliver the maximum absorbed power value. If the mains power cable is found to be faulty, have it replaced an authorized technician. Never change internal wiring of the boiler or the burner without consulting HKB or its representative.

3.12 Before commissioning

We recommend having the following procedure carried out by a representative of HKB or by someone with the necessary equipment and experience. Not only to ensure that the boiler installation is carried out in the right way, but also to insure an efficient use of the boiler.

3.13 Check points

1. Check if the boiler hasn't been damaged during transport.
2. Check the boiler for pollution on the water and flues side and remove if necessary.
3. Check if all security devices have been mounted and function properly.
4. Check if the burner is suitable for the kind of gas/oil that is being fired.
5. Check if all electrical connections have been installed properly according local regulations.
6. Is the boiler operator qualified and properly trained
7. Drain and safety valves have to be connected and properly fixed and routed towards a safe location for exhaust.
8. Flue gas ducting and connecting installed and flue gas tight.

4 Operation and start up

4.1 General

The following instructions are meant as guidance and information for the operator of the Compact unit, and to make sure that the boiler is safely put into use, without any health risks.

Do not let the boiler be operated by unqualified and untrained personnel.

We advise you to keep the boiler, if possible, at working temperature, avoid on / off operation and frequently “cold” start-ups of the boiler.

4.2 Temperatures

It is advised to record the temperatures at the water outlet, water inlet and flue gas from the boiler. The difference between supply- and return water temperature may never exceed 40°C, because of thermal tension within the boiler

4.2.1 Water temperature

The temperature at the water outlet from the boiler can be controlled by adjusting the temperature switches on the boiler, the minimum temperature should be approximately 70 °C. The max. allowable temperature depends on the type heating system / boiler (look at boiler nameplate) and more-over on local regulations.

The temperature of the return water to the boiler should be related to the dew point of the flue gasses. To avoid condensation from the flue gasses in the boiler and chimney. The return water temperature of the water to the boiler may not be less than 70°C when firing light fuel oil, and not less than 65°C when firing natural gas. The gas must be free of sulphur. **At low load operation) approx. 25 % of the full load ensure continues operation to avoid condensation and damage of the boiler unit. On/off operation always has to be avoided.**

4.2.2 Flue gas temperature

The dew point of the flue gasses depends on the kind of fuel that is fired and it's composition. The outlet temperature from the flue gasses shall be that high, that in the boiler, flues ducts, or chimney no condensation arises.

To avoid cold spots at these places, the ducts must be insulated. Also soot, dirt and dust cause condensation spots. Keep all surfaces clean.

4.3 Required controls and safety devices

The following control/safety devices on the boiler must be provided and placed by the installer/user. They are essential for the proper use and operation of the boiler.

All used devices should be appropriate for the use on the boiler. Make sure they comply with the national / local rules and regulations.

The installer/user or HKB (depending on contract) should provide the following equipment according local regulations:

1 Low water protection

The low water protection shuts down the burner if the water level in the boiler decrease to a low level. This should take place by means of a reliable float or electrode level protection according local regulations.

2 Max. temperature protection

This protection shuts down the burner/boiler if the max. boiler temperature is reached. (Max. temperature may not exceed the value as given on the nameplate) To restart push button on the boiler or on the temperature control itself.

3 Temperature control switch

The temperature control switch controls the burner on / off and/or large / small flame status. The control switch turns the burner off if the desired temperature is reached and switches it back on if the temperature decreases beneath a certain level.

4 Safety valves

The safety valves should be able to blow off the total amount of energy produced by the burner. Depending country of erection and its local regulations, one or more safety valves must be mounted upon the boiler. Safety valves are very important guard equipment. The safety valves remove the pressure upbuilding when the pressure is over the maximal allowed pressure. It is necessary to handle carefully with the safety valves for a reliable working of the safety valves. Also, no changes may be made on the safety valves, it might affect the working of the valve. In such case this happens, all guarantee agreements fall and H.K.B. b.v. dissociate from all the consequences that might follow.

The safety valve should be set at the maximum design pressure of the system or the value as given on the boiler name plate. The piping shall be properly fixed, and the outlet shall be routed to a safe location for personnel, outside the building is preferred. A drainpipe must be fitted on the blow off piping, when the blow off piping is horizontal. The diameter must be at least the diameter of the connection diameter of the ending of the safety valve. At long blow off piping with several elbows there is a increased counterpressure that decreases the capacity of the safety valve. The blow off piping must be protected against frost.

The safety valve must be revised at the annual checkup of the boiler and its equipment. Please follow the recommendations of the safety valve as described in its operating and maintenance manual.

5 Shunt pump and valves

The use of a shunt line is mandatory.

The shunt pump has as function of providing enough circulation and diminishing thermal tensions within the boiler.

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A shunt pump must be provided with a capacity of at least 3 times the water volume of the boiler to ensure enough circulation within the boiler and mixture or the return flow to the boiler. For maintenance valves are required.

6 Drain

A drain piping shall be fitted to the boiler, properly fixed and lead towards a drain vessel or pit to ensure safe exhaust of the hot water.

7 Venting

A venting valve shall be fitted at the highest point of the connecting piping to remove the air out of the heating system.

8 Max. pressure switch

Because of the heating up of the water, the water volume will change. Therefore, a maximum pressure switch on the boiler or the expansion vessel is required which shuts the system down when pressure rises to an unsafe level.

9 Expansion vessel

Because of the heating up of the water, the water volume will change. Therefore, an expansion system is required.

4.4 Startup of the boiler

Check the following points before starting the boiler

1. Make sure there is enough water and pressure in the boiler.
2. Open all required valves on the water- and flue side.
3. Make sure that the circulation pumps are switched on and functioning.
4. Make sure that the gas/oil valve is opened and there is enough supply and pressure.

Main switch on boiler and burner on.

If all mentioned requirements are for filled the boiler/burner will automatically start up.

At the first use of the boiler, and at a "cold" start, fire the boiler slowly and carefully with the burner on the low stage. This reduces the possible thermal tensions and cracking of the refractory and boiler when quickly heated up.

Always heat the boiler to normal operating temperature with low load before allowing the burner to high load.

CAUTION!! DURING THE FIRST WEEKS OF OPERATION TIGHTEN ALL BOLTS OF VALVES AND INSPECTION OPENINGS, THIS PREVENTS LEAKAGE.

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4.5 Shut down of the boiler

We advise you to keep the boiler, if possible, at working temperature, avoid on / off operation and frequently “cold” start-ups of the boiler. In this way you prevent corrosive condensation of the flue gasses and Thermal tensions during start-up of the boiler.

Switch of the main power of the boiler and the burner.
Open the boiler at the flue gas side. Clean heating surfaces thoroughly with a brush to avoid standstill corrosion. Close water valves and stack valve. Avoid after conservation air circulation in the boiler.

4.6 Conservation at long stops.

The treatment of boiler feed water nowadays must be perfect. The biggest danger for heating boilers is the penetration of oxygen in the boiler water during long periods of standing still.
During start-up, but also during shut downs, oxygen acts very corrosive. We recommend keeping the boiler in use as much as possible, and not to unnecessary shutting down the boiler for short periods of time.

Should the boiler be put out of use for a long time, then it's necessary to carry out some sort of conservation to prevent corrosion.

The flues side the flue gas pipes, smoke collection box reversal chamber could be cleaned especially with oil firing

On the waterside one can choose between wet and dry conservation.

- Wet conservation binds all oxygen with the water in the boiler and consists of filling the boiler completely with water, the PH-value of the water is raised sufficiently and further a oxygen binding substance is added.
Contact your local water treatment company.

- Dry conservation means that the boiler is completely emptied, so the steel can't corrode. The boiler is completely emptied and dried, all waterlines must be cut off. A water binding solvent is put in the boiler, after which all boiler openings are opened. The water binding solvents will further absorb all the remaining water.
Watch out for vacuum when draining the complete boiler.

5 Maintenance

5.1 General

To ensure the efficiency of the boiler, carry out the regular maintenance instructions as detailed below.
Before starting the maintenance, works be sure that the boiler and burner has been taken out of operation.
Closed the fuel supply.

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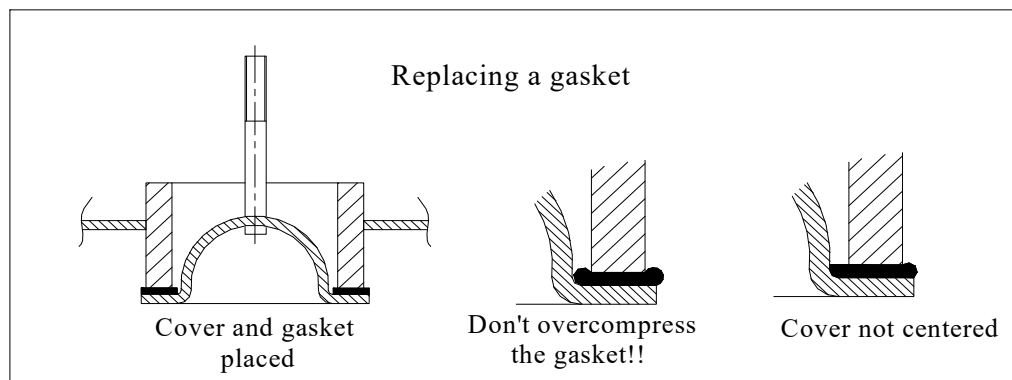
5.2 Check points

Check the boiler regularly for leakages on the water sides and check and clean the smoke gas side regularly. The water conditions must be equal to those, which are included in the appendix. Check the inside of the boiler whether there is a buildup of residue on the furnace and flue gas piping. Is this the case contact HKB or your local water treatment company immediately. Clean with a brush the flue gas tube and remove soot and dirt out of front reversal chambers, rear smoke collection box and internal furnace reversal chamber.

5.3 Manholes, Hand- and Head Holes

The HKB Boilers are fitted with Gaskets in all the inspection holes of the boilers. The inspection holes consist of a steel ring, which is welded into the boiler shell, a cover with bolts and nut(s), crab(s) and a gasket. The manhole cover will be pressed inside the manhole ring by the internal pressure.

For a good closure we advise you to hold the boiler on pressure. When you want to cool down the boiler release the pressure by letting water out. Be sure that there is no vacuum during the cooling down by opening the air inlet. When there is still a vacuum it is possible that the inspection-opening gasket will be damaged. If this happens, the gasket can't be tightened any more, and must be replaced by a new one. Gaskets must be replaced when damaged.



! WARNING!
BE SURE THE GASKET FITTER READS AND UNDERSTANDS THE FOLLOWING INSTALLATION INSTRUCTIONS

- Be sure that the boiler is out of commission and the boiler is empty and without pressure. Remove the crab(s) and cover plate and remove the old gasket. Thoroughly clean the surface of the cover plate and boiler ring.
- Place the gasket on the cover plate, make sure that the replacement gasket is of the correct size, and be sure the gasket is pushed down tightly on the cover plate. Do not use any grease, lubricant or adhesive. If the gasket is not pushed down firm enough before the cover is tightened, the gasket may be pinched causing a failure when pressure builds up.
- After the cover plate is placed in the boiler ring and the gasket is in place, make sure the cover plate is in-center of the manhole ring. An off-center cover plate can concentrate forces on the gasket and cut it in two. The cover plate may also drag on the boiler-hole ring and fail to seal as the pressure rises.

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- Set crab(s) and tighten nut(s) only enough to provide a firm fit, hand-tighten the nuts and then add $\frac{1}{4}$ turn using spanner or wrench.
- The boiler should be warmed gently. If the gasket leaks while pressure is being build up tighten the nuts further, enough to stop leakage. It is important to keep the nuts firmly tightened thereafter. This prevents vacuum developed by cooling on shutdown from feeding and draining.
- A gasket can only be used ones.
- After installing the new gasket, the nuts must be tightened frequently. Because the pressure has built up inside the boiler the gasket is pressed together and there will be a margin on the bolts. During pressure building of the boiler the nuts must be tightened every 15 minutes. When the pressure of the boiler has been reached thighbone the nuts every hour during the first day. Inspect the gasket after 1week.
- The gaskets in the manhole or handhole at the bottom of the boiler are usually hard to install. Small particles of scale or sand tend to run down on the mating surface after cleaning and before assembling. If this occurs, the best course of action is to drain the boiler and repeat the fitting sequence, otherwise, the gasket life could be severely reduced.

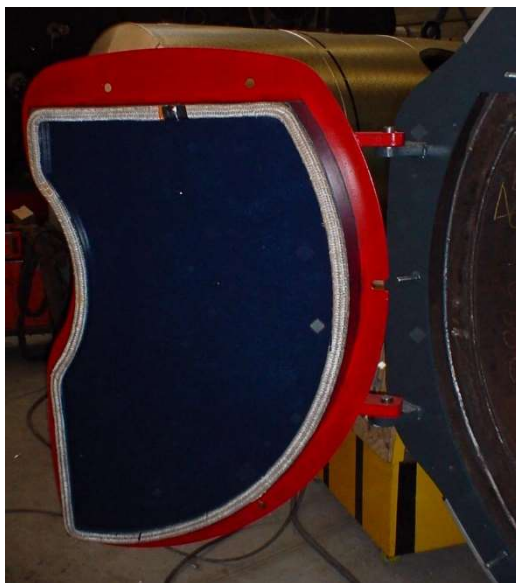
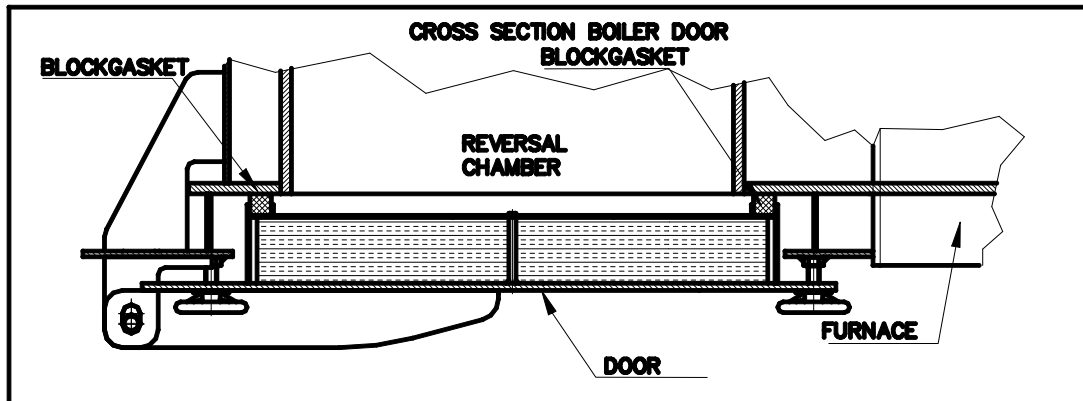
We advise you to have a spare gasket in stock

**NOTE:
NEVER OVER-COMPRESS THE GASKET
ALL GASKETS MUST BE RENEWED ANNUALLY**

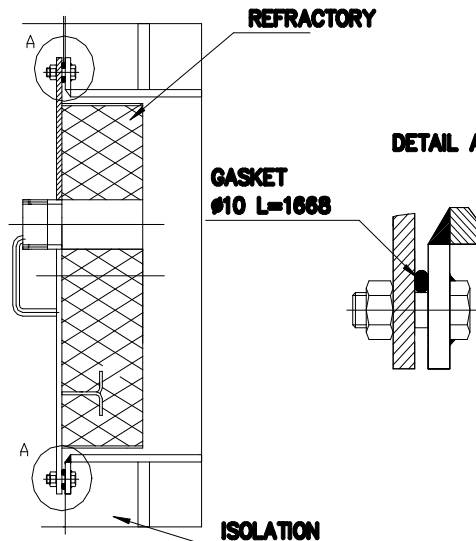
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5.4 Gasket boiler door and inspection hole

In the factory the gasket is already installed inside the front return chamber and inspection hole. (See image)



CROSS SECTION INSPECTION HATCH



After putting the boiler in use, you need to tighten the hand wheel and nut(s) in front of the boiler door frequently for a good closure. Because the gasket will shrink during heating it is essential to tighten the door regularly, if not the gasket will harden, and it will be necessary to change the gasket yourself if leakage occur. When the door or inspection hole doesn't close anymore, even after tightening the nuts(s), the gasket must be changed.

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5.5 *Draining the boiler*

Drain the boiler every week by opening the drain valve complete with one motion. Repeat this action several times until clear water emerges from the boiler.

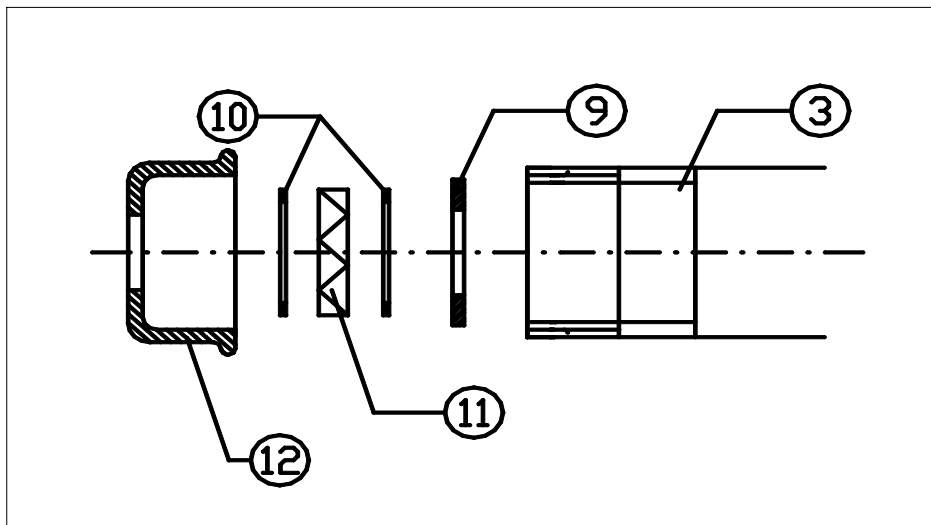
Contamination of the boiler system can easily be detected in this manner.

Warning!! Take care of personnel protection

Water from the boiler is very hot, never drain a boiler straight into the sewer, and always use a blow down vessel or a drain pit. Drain with the max. working pressure of the boiler.

Attention, the boiler must be drained daily during the initial start-up period, or else the pollution from the hot water system will get caught on the heated surface and the bottom of the boiler.

5.6 *Mounting the reflex glass*



NOTE! BE SURE THAT THE BURNER IS TURNED OFF DURING THE EXCHANGING OF THE BURNER SIGHT GLASS

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- Place the first gasket (pos.10) inside the head (pos. 10), then The reflex glass (pos. 11) and then again, another gasket (pos. 10)
- To make sure that the reflex glass doesn't rattle or even break during the operating, close the head with a bolting-ring M30 (pos. 9) from sink steel acc. DIN 125 A
- After this turn the head (pos. 12) on the pipe nipple (pos. 3).

Installation for burner sight-glass

6 Guarantee definition and Service

HKB guarantees for a period of 6 months after delivery for a good working of the installation, according to the Metaalunie agreements.

There will be no guarantee when the lack is caused by

- Normal wear and tear
- On-judicious use
- Lack or non-qualified maintenance
- Installation, assembling, changing or repairs by employer or third not authorized by or done by HKB or its representative.

This installation meets the needs of the concerning safety-demands, to avoid accidents repairs can only be done by qualified persons and after contact with HKB.

The boiler has to be inspected once a year. If the boiler is located outside, it must be inspected twice a year. The inspection must be done by HKB, otherwise warranty expires.

For service or maintenance, you can contact us at number +31 77 750 4000.

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APPENDIX A *Water requirements according EN 12953-10*

The next information about water quality is by us, HKB, as boiler manufacturer and supplier with years of experience, experienced as a reliable standard an correspond with the European Norm EN 12953-10 : 2003.
We therefor recommend to use this standard.

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Table 2.1 Feedwater for steam boilers (except attemperator spray water) and hot water boilers

Parameter	Unit	Feedwater for steam boilers		Make-up water for hot water boilers
Operating pressure	Bar (= 0,1 MPa)	> 0,5 to 20	> 20	Total range
Appearance	--	Clear, free from suspended solids		
Direct conductivity at 25 °C	--	Not specified, only guide values relevant for boiler water see table 2.2		
pH value at 25 °C	--	> 9,2 ^b	> 9,2 ^b	> 7,0
Total hardness (Ca + Mg)	mmol/l	< 0,01 ^c	< 0,01	< 0,05
Total hardness	°dH	< 0,05	< 0,05	< 0,03
Iron (Fe)	mg/l	< 0,3	< 0,1	< 0,2
Copper (Cu)	mg/l	< 0,05	< 0,03	< 0,1
Silica (SiO ₂)	mg/l	Not specified, only guide values for boiler water relevant, see table 2.2		--
Oxygen (O ₂)	mg/l	< 0,05 ^d	< 0,02	--
Oil/grease	mg/l	< 1	< 1	< 1
Organic substances (as TOC)	--	See footnote ^e		
^f Carbon dioxide (CO ₂)	mg/l	< 25	< 10	--

^a With copper alloys in the system the pH value shall be maintained in the range 8,7 to 9,2.

^b With softened water pH value > 7,0 the pH value of boiler water according to table 2.2 should be considered.

^c At operating pressure < 1 bar total hardness max. 0,05 mmol/l shall be acceptable.

^d Instead of observing this value at intermittent operation or operation without deaerator if film forming agents and/or excess of oxygen scavenger shall be used.

^e Organic substances are generally a mixture of several different compounds. The composition of such mixtures and the behavior of their individual component under the conditions of boiler operation are difficult to predict. Organic substances may be decomposed to form carbonic acid or other acidic decomposition products which increase the acid conductivity and cause corrosion or deposits. They also may lead to foaming and/or priming which shall be kept as low as possible.

^f HKB advises to include this parameter in your measurements.

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Table 2.2 Boiler water for steam boilers and hot water boilers

Parameter	Unit	Boiler water for steam boilers using			Boiler water for hot water boilers
		Feedwater direct conductivity > 30 μ S/cm		Feedwater direct conductivity \leq 30 μ S/cm	
Operating pressure	Bar (= 0,1 MPa)	> 0,5 to 20	> 20	> 0,5	Total range
Appearance	--	Clear, no stable foam			
Direct conductivity at 25 °C	μ S/cm	< 6 000 ^a	See figure 2.1 ^a	< 1 500	< 1 500
pH value at 25 °C	--	10,5 to 12,0	10,5 to 11,8	10,0 to 11,0 ^{b,c}	9,0 to 11,5 ^d
Composite alkalinity	mmol/l	1 to 15 ^a	1 to 10 ^a	0,1 to 1,0 ^c	< 5
Silica (SiO ₂)	mg/l	Pressure dependent, according to figure 2.2			--
Phosphate (PO ₄)	mg/l	10 to 30	10 to 30	6 to 15	--
Organic substances	--	See footnote ^f			--
^g Oxygen Scavenger Na ₂ SO ₃	mg/l	10 - 30	10 - 20	--	--

^a With superheater consider 50 % of the indicated upper value as maximum value.

^b Basic pH adjustment by injecting Na₃PO₄ additional NaOH injection only if the pH value is < 10.

^c If the acid conductivity of the boiler feedwater is < 0,2 μ S/cm, and its Na + K concentration is < 0,010 mg/l, phosphate injection is not necessary. Under the conditions AVT (all volatile treatment, feedwater pH \geq 9,2 and the boiler water pH \geq 8,0) can be applied. In this case the acid conductivity of the boiler water is < 5 μ S/cm.

^d If non-ferrous materials are present in the system, e.g. aluminum, they may require lower pH value and direct conductivity, however, the protection of the boiler has priority.

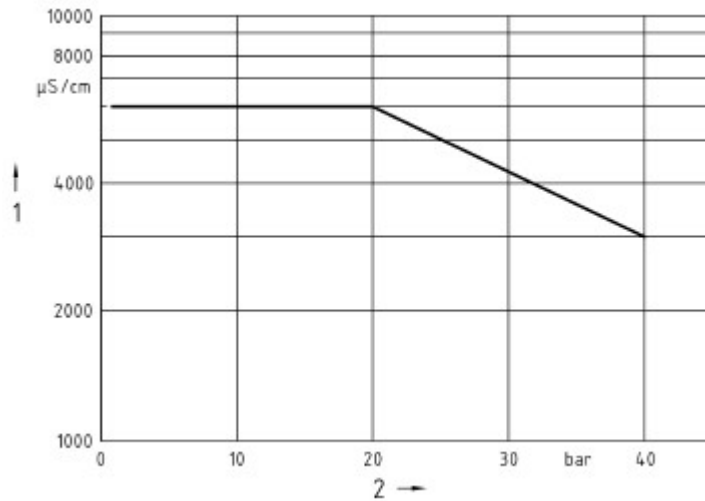
^e If coordinated phosphate treatment is used; considering all other values higher PO₄ –concentrations are acceptable.

^f See ^e in table 2.1.

^g Not applicable when using film-forming amines.

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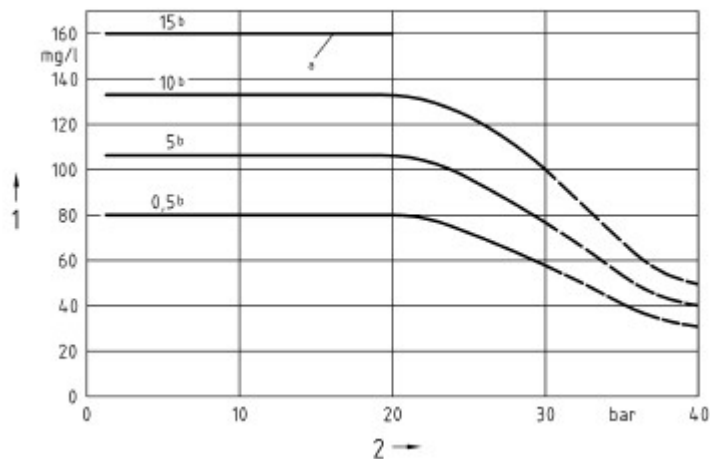
Figure 2.1 – Maximum acceptable direct conductivity of the boiler water dependent on the pressure; Feedwater direct conductivity > 30 $\mu\text{S}/\text{cm}$



Key

- 1 Direct conductivity
- 2 Operating pressure

Figure 2.2 – Maximum acceptable silica content (SiO_2) of the boiler water dependent on the pressure



Key

- 1 Maximum silica content
- 2 Operating pressure
- a) This level of alkalinity is not permissible > 20 bar
- b) Alkalinity in mmol/l

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APPENDIX B *Start-up schedule for burner with a new refractory*

Furnace diameters	:	Not for water-cooled refractory
600 until 1050 mm temperature	:	Heat up at low load up to operating
1100 until 1350 mm	:	Column A
1400 until 1650 mm	:	Column B
1700 until 1950 mm	:	Column C

Underneath mentioned values are minutes (On & off)

Column A			Column B			Column C		
Low load			Low load			Low load		
on	off	number	on	off	number	on	off	number
5	5	3x	5	5	3x	5	5	3x
10	10	3x	10	10	3x	10	10	3x
15	15	3x	15	15	3x	15	15	3x
30	30	2x	30	30	3x	30	30	3x
			45	45	2x	45	45	3x
			60	60	1x	60	60	3x
						90	90	3x

After this procedure switch over to high load and gently bring the boiler up to operating temperature
 Interruption of this procedure until the following day is no problem

Warning:

Never fill a boiler with a new refractory with hot water.

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APPENDIX C *Burner mounting*

ATTENTION!

After the burner is placed, the gap between the burnercup and the burner-accessplate must be filled up with the enclosed insulation blanket and the Plibrico-refractory!
For details see the drawing below.

