

**INSTRUCTION MANUAL
FOR
INSTALLATION AND
OPERATION OF A
HEATING-/ LOW
PRESSURE STEAMBOILER**

Type	:	
Boiler serial number	:	
Name of Owner	:	
Date of issue		
Handed to	:	
Copy handed to	:	

Confirmation of reception

We would like to point out that you can start claiming warranty from the moment that we have received a copy of this letter fully completed and signed.

Herewith I declare, male/female, job title
....., to have received the instruction manual belonging
to the Crone boiler number in good order.

Date:

Signature:

.....

.....

Name user :
Street/PO Box :
Zip code :
Place :
Telephone number :
Facsimile number :
E-mail address :
Website :
F&H Crone boiler number: :
Boiler type: :

Please complete this form fully and send it to:

F&H Crone B.V.
2841 MJ Moordrecht
The Netherlands

or fax:
0031 182-633 257
Or e-mail:
info@fhcrone.nl

GENERAL

The equipment you have just received has been designed and manufactured with the greatest possible care in our factory in order to meet the demands which will be made of it.

To ensure that it functions properly during a long life, it is important that it be installed, started and operated with equal care. That is why this booklet has been provided. You should read it carefully and follow the instructions. To ensure this manual has reached you, we kindly ask you to complete the reply on page 2 and return it to us.

GUARANTEE

The equipment carries a 12 months guarantee. This period commences after the boiler has been installed and made operational, but no later than 3 months after delivery has taken place.

Problems which arise due to careless or negligent installation or failure to follow instructions contained in this manual, are not covered by the terms of this guarantee.

Furthermore, the guarantee terms and conditions are as described in the attached 'General Conditions for the Supply of Mechanical Electrical and Associated Electronic Products, Orgalime, Brussels, October 1992'.

INSTRUCTIONS FOR INSTALLATION

GENERAL

Aside from that contained in this manual, there are also national codes and standards to be adhered to regarding installing boilers. Furthermore, you have to ensure that you are aware of the regulations which apply to Nuisance Conditions as well as the regulations issued by your utility companies.

POSITIONING

The boiler is not suitable for placing in the open air. You must ensure that a floor is used with proper foundation suitable of sustaining the total weight of the boiler when it has been filled with water.

The floor must be level and smooth so that the boiler's runners are flat against the floor for their entire length and that the boiler is perfectly horizontal.

The boiler must be easy to access for inspections and carrying out controls bearing in mind the boiler must be left free for access to the fire tubes for cleaning purposes.

SAFETY RELIEVE VALVES

Each boiler must be equipped with suitable safety relieve valves which comply to the applicable national codes or standards. The safety relieve valves have to be mounted directly to the boiler without an intermediate closing fixture and must be adjusted at a pressure in compliance with the national codes and standards and may not be adjusted at a higher pressure than the maximum allowable working pressure.

SHUNT INSTALLATION

It is of importance that the temperature of the water in the boiler is the same throughout the boiler body. To accomplish this, the boiler must be provided with a circulating pump with a capacity equal to a minimum per hour of 3 times the boiler content. For this purpose there is a suction connection provided at the bottom of the boiler. From here, the boiler water can be pumped back into the boiler via the shunt pump through the inlet connection placed in the upper of the boiler. No other systems are to be connected to this shunt system.

See illustration in annex 1.

FIXTURES AND FITTINGS

All pipes connected to the boiler need to be fitted in such a manner that there will be no undue strain transmitted to the boiler. Furthermore, the boiler must be provided with a regulator to ensure that the water temperature of the boiler never falls below 65 degrees Centigrade.

Without prior consent from the manufacturer, no alternations to the boiler connections may be carried out, neither may piping or nozzles be added to the boiler.

WATER LEVEL SAFETY MEASURES

The boiler installation must be provided with a means of ensuring that it is impossible to operate a heating boiler if it is not completely filled with water. In case of steaming below the lowest permissible water level, the boiler must be provided with a means of ensuring that it is impossible to operate the boiler.

COMMENCING OPERATIONS

Commencing operations and carrying out activities may only take place after you have ensured that no materials or tools have been left in the boiler by mistake. Check to make sure that the boiler is properly filled with water.

Before starting the boiler, make sure the front door has been properly closed and that the hand wheel has been gradually and firmly secured with the special key, so that the sealing cord fits tightly into the notch preventing leakages at a later stage.

The explosion lock on the rear of the boiler must be checked as follows: a wooden mallet or block must be used to gently tap the lid into place to ensure the sealing cord fits snugly into the notch. The nuts must be firmly screwed into place to the point where resistance can be felt, but sufficient space must be available for the springs so that should an explosion inside the furnace take place, the lid may be pushed back.

Finally, the soot hatch in the smoke box needs to be gradually mounted, When this has been done, you may start the burner. Starting the burner requires a burner specialist being present. Starting the boiler must commence using a low flame to ensure that inadmissible strain of materials is avoided and to prevent cracks into the heat resistant concrete. Starting the boiler while the water temperature is below 60 degrees Centigrade a great deal of condensation appears which may give you the false impression that the boiler is leaking.

Check all sealings and review all bolts. Open valves slowly to prevent water hammer. The viewing glass in the explosion lock is solely to check the flame while making

adjustments to the burner. To prevent dirt and burn deposits forming it is necessary that the hatch be kept closed in normal operation.

The maximum capacity of the burner must be adjusted in such a manner that the maximum boiler capacity marked in the boiler identification plate is not exceeded.

USE AND MAINTENANCE INSTRUCTION

1. **The quality of the water in the boiler and the heating system**
The boiler water must adhere to the specifications described in annex 3. The water may need to be processed prior to being added to the installation. To this you may need to seek professional advice.

2. **Checks to be carried out**
During the boiler's use, the quality of water supplied to the installation must be checked. Excessive amounts of water being added to the system means leaking has taken place. You must track down the leak and repair it without delay in order to prevent corrosion caused by dissolved oxygen.

Leaking which takes place during use on the flue gas side of the boiler must be dealt with immediately.

The exhaust temperature needs to be regularly checked. When this temperature rises during a certain period, this can be an indication that the fire tubes become filthy and need to be cleaned. This is especially important for boilers with an oil burner. Filthy fire tubes can effect the efficiency of the boiler.

Depending on the circumstances, but no less than twice per year, the boiler ought to be checked for the following:

- the operation of the shunt system;
- the proper tightness of the sealing;
- filthy fire tubes;
- tightness of the fire tube / tube sheet fixation;
- operation of the safety valve(s);
- condition of the heat resistant concrete around the blast tube of the burner.

The boiler needs to be inspected annually for the following:

- water side dirt e.g. muck and scaling, especially between the fire tubes near the tube sheet of the fire box.

Should any divergences be found, you are requested to consult a specialist. After cleaning, the boiler may be closed making sure you use new gaskets.

3. **Instructions of suppliers**

Operating and maintaining the burner and other equipment requires you to refer to instructions issued by the suppliers concerned.

4. **Polluted air**

Should the burner ventilator absorb air polluted with gases, chemical traces of herbicides or other chemicals, serious blockages may take place and irreversible corrosion may be caused in the boiler. Make sure your boiler is not subjected to such chemicals.

THE INSTALLATION OF LOW PRESSURE STEAM BOILERS

Warning: The production of steam goes hand in hand with very high temperatures. You must ensure that the boiler is handled with the greatest caution to prevent dangerous situations arising. **Only do what you know is correct and never take risks. When doubt, find out first, or let an expert do it.**

The boiler must be provided with the following:

- Safety valves of proper size and adjustment (see safety valves);
- A steam valve at the steam discharge connection;
- Blow down valve;
- Water level gage;
- Manometer with check-valve and syphon;
- Water level regulator with 3 switches for:
 - ◆ Water supply pump “out”;
 - ◆ Water supply pump “in”;
 - ◆ Low water level alarm and burner cut-off;
- Low water level alarm electrode;
- Press stats for regulating the burner;
- Supply water valve with non-return valve.

SAFETY VALVES

The capacity of the safety valves has to be sufficient to discharge all steam at full boiler capacity with no more increase of the pressure than 10%. Refer to annex 4 for determination of steam production.

Each boiler must be equipped with suitable safety relieve valves which comply to the applicable national codes or standards. The safety relieve valves have to be mounted directly to the boiler without an intermediate closing fixture and must be adjusted at a pressure in compliance with the national codes and standards and may not be adjusted at a higher pressure than the maximum allowable working pressure.

REGULATING THE WATER LEVEL

Adjusting the water level entails using the Lowest Permissible Water Level (L.P.W.). This level is shown on the level column.

The water level regulator must be mounted in such manner to allow regular blow down. Low water level alarm and burner cut off must be established as indicated on the level column.

LOW WATER ELECTRODE

The task of the low water level electrode is to prevent damage to the boiler should the water level regulator fail. The electrode must be adjusted 30 mm. below burner cut off.

When the alarm is triggered by this electrode the low water level alarm and the "pump on" switches of the water level regulator are out of order. The burner must be locked automatically when this alarm is actuated.

DRAINAGE PIPES

The blow down valves of the level column, the gage glass, water level regulator and boiler must be connected in such manner to the sewer that hot water being ejected from the system together with any steam may never cause damage or endanger the premises of life and limb. A drainage channel and/or drain must therefore be able to cope with high temperatures.

PRESSOSTATS AND MANOMETERS

The boiler requires Press stats for automatic on and off switching of the burner and for any capacity adjustments.

These, together with a manometer are to be mounted on a distributor connected in turn via a syphon pipe, with the steam chamber of the boiler.

The manometer must be connected to this distributor using a manometer spigot, so that it is always possible to check the working of the manometer.

The maximum press stat of the burner must be adjusted in such a way that the burner stops working and is locked prior to the opening of the safety valves. The on/off press stat is set below the setting of the maximum press stat. Any high/low or regulating press stat in turn, may be made to operate under this pressure.

SUPPLYING WATER

Depending on capacity and other circumstances, the boiler may be supplied using a supply pump or from the main drinking water supply. It should be established in advance whether the water which is available meets the requirements of water quality (see annex 2 and 3).

Should the water require it, then prior treatment before being used in the boiler must be carried out. This treatment depends on the quality of the available water and should be determined by experts.

In the pipe line between the supply pump/magnetic valve and the supply piping, a non return valve is to be mounted to prevent flow back of the boiler water. Further, a valve should be mounted so that any defects in the working of the non return valve may be dealt with, without the need for draining the boiler.

OPERATING THE BOILER DURING STEAM PRODUCTION

When draining, open and close the valves slowly and make sure that hot water which escapes shall never cause damage or endanger the premises or life and limb.

Drain the boiler twice a day. Drain until the water level is reduced approximately 50 mm which is visible in the gage glass. This is to prevent scaling and a too high content of dissolved products in the boiler water. The level column, the water level regulator and the gage glass also should be drained twice a day. The following procedure should be adhered to:

- A. Close the valve on the steam side;
- B. Open the drainage valve;
- C. Close the valve on the water side;
- D. Open the valve on the steam side;
- E. Close the drainage valve;
- F. Open the valve on the water side;
- G. Check the operation of the instrument involved.

After this drain procedure with the water level regulator, you have to reset the burner.

REPLACING THE LEVEL GLASS

Should the glass break, for whatever reason, then it ought to be replaced as follows:

1. Close the gage glass using the spigots. Be careful of high water temperatures, steam, and all taps and spigots which are hot;
2. Remove the transparent protective cover;
3. Remove the bronze top of the upper fitting;
4. Loosen the packing closing ring of the upper fitting, this also is a swivel nut;
5. Loosen the packing closing ring of the lowest fitting;
6. Remove the old glass with its rubber packing;
7. Slide a new glass into the upper part of the opening making sure that the new rubber packing and the closing rings and nuts are in the correct order to mount the glass;
8. Put the glass in the lowest setting and check the length. Sufficient space ought to be available for mounting the bronze top on the upper fitting;
9. Put the lowest packing in position and turn it together with the packing closing ring;
10. Put the lowest packing in position and turn it together with the packing closing ring;
11. Mount the transparent protective cover;
12. Close the upper fitting with the bronze top;
13. Open the gage glass spigots gently and check to see if the glass does not leak.

CHANGING THE FUNCTION OF THE BOILER FROM STEAM PRODUCTION OF HEATING SERVICES

To change the function of the boiler from steam production to heating services, the following need to be carried out:

1. Stop steam production by switching off the burner;
2. Close the steam valves and, if applied, the valves of the lower supply and return system during steam production. Switch this system off according the instructions of the heating installer;
3. Blow down the water level gage glass and water level regulator;
4. Make sure that any drainage water, which might escape, can safely take place, and allow the boiler to empty itself completely through the blow down valve. Ensure the boiler is properly ventilated to prevent damage caused by under pressure;
5. Allow the boiler to cool off. Check the waterside of the boiler if it is dirty and/or scaling has been formed;
6. Should the boiler be dirty then clean it thoroughly;
7. Remove the safety valves and replace them with safety relieve valves suitable for the function of a heating boiler (see safety relieve valves).
8. Close the boiler and fill it completely, remember to ensure that excess air is expelled;
9. Open the valves of the heating system and the shunt system. Switch on the shunt system;
10. Switch the burner to the heating setting, operate the boiler at a low flame and check the operation of the regulating and safety equipment;
11. Switch on the heating system;
12. Check the whole system operating properly and safety.

CHANGING THE FUNCTION OF THE BOILER FROM HEATING SERVICES TO STEAM PRODUCTION

To change the function of the boiler from heating services to steam production the following needs to be carries out:

1. Switch of the burner, the heating circuit and shunt system;
2. Close the heating system valves;
3. Ensure the boiler is ventilated properly. Blow down the boiler until the water level, which ever is higher. This level is indicated on the water column or on smaller boilers on the front head;
4. Remove the safety relieve valves and replace them with safety valves suitable for the function of a steam boiler (see safety valves);
5. Check to see the following are in good working order:
 - The safety valves;
 - Manometer and manometer check valves, open and close easily and are not leaking;
 - The siphon tubes of manometer and Press stats, are clean and not corroded, also on the inside;
 - The gage glass spigots open and close easily and are not leaking;
 - The water level regulator valves open and close easily;
 - The non return valve in the water mains;
 - The supply pump/magnetic valve controlled by the water level regulator;
 - Low water level alarm with burner safety lock from the low water electrode;
 - Regulation and safety protection using the press stats.
6. If the heating installation also has a system for heating during steam production, open the valves in the lower supply and return connection. Then start up the system according the instructions given by the heating installer;
7. Switch on the burner installation for steam production services.

Annex 2.

Requirements for water in heating boilers

1. *Dissolved oxygen and hardness*

Bad water quality can cause damage to the boiler and heating system by corrosion.

The quality of water supplied to heating systems is partly determined by the contents of dissolved oxygen and hardness of the water in the heating system. This is the reason why the whole system is to be checked for leaks regularly and leaking is to be dealt with immediately.

1.1 *Oxygen*

The excess of oxygen in the water is to be prevented. If an open expansion system is applied, then measures have to be taken that solution of oxygen in the water is prevented. Another cause of oxygen solution into the water is via gaskets and other permeable materials like some kinds of rubber, plastics, etc. Starting a circulating pump with insufficient system pressure also entrains air through the pump seal of automatic de-aerators.

1.2 *Hardness*

Scaling can occur when water is heated in a boiler. The possibility of scaling can be calculated with following formula:

$$ST = tH \times (5 \times Sj + I) / QK$$

with:

ST = figure indicating risk of scaling

TH = temporary hardness in degrees dH.

this figure is given by the water supplier or easy to measure ourselves.

Sj = Quantity of water added to the system per year.

I = Volume of the whole heating system.

QK = Boiler capacity in kW.

If $ST < 0.25$ then there is no risk for scaling.

If $ST > 0.25$ then you should take measures to prevent scaling like using a softener.

Consult experts for this purpose.

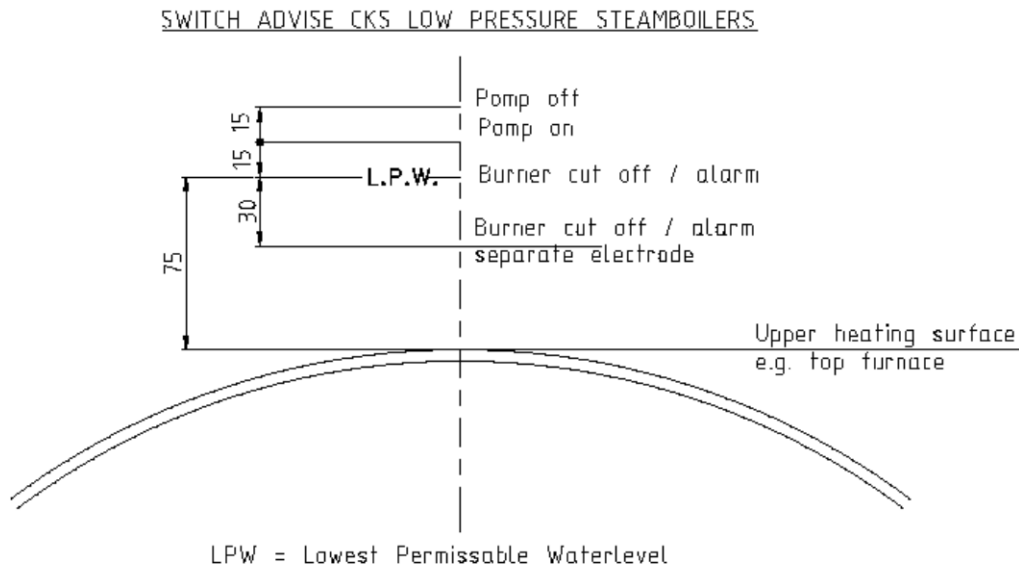
Prevent evaporation of the water

(e.g. steam escape) The concentration of salt solved in the water will rise in this case. The chloride content in the system water may not be more than 10% higher compared with the feed water.

If chemicals have to be added, this only can be done by experts and following guidelines have to be respected:

- Solids : none
- pH : 8-10 (with presence of aluminum 8-9)
- Conductivity : without additives < 1000 micro Si/cm
- Cl- : < 250 mg/l
- Hydrazine : none because of carcinogenetic
- Sulfite : of additives only 5-20 mg/l
- P205 : of additives only 5-40 mg/l

Other products to the responsibility of supplier of this products.



Annex 3.

Supplemental requirements of water quality for steam boilers

Boiler feed water

pH	:	min.	7.0
Hardness	:	max. degrees dH	0.1
Oxygen	:	max. micrograms/l	(100)
Uron	:	max. micro grams/l	500
Copper	:	max. micrograms/l	100
Oil	:	max. mg/l	3.0
Kmn04 figure	:	max. mg/l	(25)

Boiler water

p-figure	:	max. mval /l	2-10
Silicic acid	:	max. mg/l	15xp
Total dissolved	:		
Mat.	:	max. mg/l	3000
Hardness	:	max. degrees dH	0.1
Kmn04-figure	:	max. mg/l	(150)

If added

Phosphate	:	P205 mg/l	25-50
Sulphite	:	Na2SO3 mg/l	50-100
Hydrazine	:	none because of Carcinoginity	

() = aiming value

Annex 4.

Steaming capacities

Boiler capacity

kCal / hr	kW	Steam production kg/hr using Feedwater of 20 degrees Celsius
150,000	175	225
175,000	200	260
200,000	240	300
250,000	290	400
375,000	440	600
500,000	600	800
750,000	900	1,200
1,000,000	1,200	1,600
1,250,000	1,500	2,000
1,500,000	1,800	2,400
2,000,000	2,400	3,200
2,500,000	3,000	4,000
3,000,000	3,600	4,800
3,500,000	4,200	5,600
4,000,000	4,800	6,400
4,500,000	5,400	7,200
5,000,000	6,000	8,000
5,500,000	6,600	8,800
6,000,000	7,200	9,600
7,000,000	8,400	11,200
8,000,000	9,600	12,800
9,000,000	10,800	14,000

The safety valves have to be of a capacity sufficient to discharge the quantity of steam given in this table without rise of boiler pressure more than 10% as indicated as maximum working pressure for steam production on the boilers identification plate.