

**Instruction manual
for the installation
and operation
of an F&H Crone
Excellent Flue Gas
Condenser**

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Instruction manual for the installation and use of an F&H Crone Excellent Flue Gas Condenser

GENERAL

The F&H Crone Excellent Flue Gas Condenser with which you have been supplied is a fin tubed type condenser that has been designed and manufactured to the highest standards in our factory, and which is guaranteed to meet your specific requirements.

To guarantee effective operation and a long operating life, it is important that the condenser is installed, commissioned and operated in accordance with these operating and installation instructions, which must be read carefully and applied.

To be sure that you have received this instruction book, we request that you fully complete the enclosed reply card and return it to us.

Warranty

The warranty that applies to the condenser supplied is stipulated in the "GENERAL CONDITIONS for the SUPPLY OF MECHANICAL, ELECTRICAL AND ELECTRONIC PRODUCTS" published by ORGALIME which has been send to you with our purchase conformation and we will be send you free-of-charge on request.

The warranty period will take effect from the moment the condenser starts operating, but no later than 3 months after delivery.

Any faults must be reported to us immediately. Problems which originate through negligence or as a result of not following the instructions in this instruction book are not covered by the warranty.

A. Operation

A.1 Application

Flue gas condensers are used to cool down flue gases produced from natural gas powered installations. Most installations generally have hot water boilers with the condenser being installed behind or on top of the boiler. The energy which is released from these installations is used to heat the water. The maximum supply temperature of the flue gases in the condenser is 210° C.

The water is heated in the flue gas condensers to a maximum temperature of 95° C. The condenser is part of a closed system with a maximum allowable pressure of 3 bar.

A.2 General operation

The flue gas condenser is installed behind a gas-powered boiler. All flue gases coming from the boiler are directed through the condenser where they are cooled. The heat that is released from this process heats the water in this closed system. The remaining highly-cooled flue gases disappear through the stack or can be tapped off for CO₂ dosing or other applications. All this is dependent on the installation. Before delivery, the condenser is pressurised with cold water in the factory to about 4 bar to ensure tightness. The normal condenser operating pressure is usually around 1 bar. The maximum allowable operating pressure is 3 bar.

A.3 Operation of the Flue Gas Condenser

The flue gas condenser is fitted with a bypass channel as standard. When the bypass is closed, the flue gasses are directed away through the condenser block. The burner ventilation fan then meets with a greater resistance and must be able to absorb this pressure difference. This is why the choice of burner fan capacity is important. If the flue gases are unable to be directed away through the condenser block, the diverter valve must be repositioned using the handle so that the condenser block is closed off. In cases where gas/oil burners are used, this position must be protected by means of a limit switch.

If oil is being used as fuel (for emergency purposes), the condenser block must be closed. If heavy oil is being burned or if it is reported that light oil is being burned for long periods, the condenser an extra discharge must be created to direct all of the flue gases away from the condenser through a separate exit (stack).

A circulation pump ensures that a 'flow' of water is pumped through the condenser. If the 'flow' of water is insufficient then this can cause overheating. It is therefore important to maintain a sufficient flow of water through the condenser. The water connections to the condenser are based there on.

The maximum temperature is monitored by a thermostat. This protection must be included in the start-up conditions for the boiler-burner combination. Water sided the condenser is protected against overpressure (> 3 bar) by a safety relief valve.

The flue gas condenser is a closed appliance and is provided with an inspection door in the flue gas housing for inspection and maintenance purposes.

B. INSTALLATION

B.1 Installing the condenser in the system

The F&H Crone condenser is manufactured from corten steel which guarantees that the condenser will have a long operating life.

It is imperative that rapid temperature fluctuations are avoided. In order to prevent excessive stresses, which can cause leakages, the increase and the decrease of the temperature of the condenser water may therefore be no more than 2°C per minute.

B.2 Delivery

The flue gas condenser is supplied as standard with a diverter valve, bypass channel, discharge channel to flue stack, condensate collector and hose. The flue housing is attached to the F&H Crone boiler, or may be supplied loose with 4 (adjustable) support legs and a separate smoke box.

B.3 Regulations

The discharge from the condensate collector and the discharge of flue gases must comply with the NEN 3028 regulations. For the electrical installation, the NEN 1010 regulations apply. Be aware that local regulations may be different!

B.4 Setting up

The flue gas condenser must be set up in a frost proof area so that it is possible to carry out inspection and maintenance on the equipment. The free area required on the inspection side is a minimum of 1 metre.

With a loose condenser, after the condenser is placed straight and on the right level on its supports, the inlet channel must be welded without stress to the boiler flue housing.

B.5 Installation of safety protection devices

Fit the pressure and limit switches, thermostat, relief valve and thermometers in place as shown in appendix 1.

The maximum thermostat protects the installation against overheating. This can occur as a result of the pump not rotating or valve's not being completely open which will then mean that the 'flow' of water going through the condenser is insufficient. The maximum allowable temperature is 95° C.

It is possible that the resistance from the flue gases in the condenser block will increase through contamination. This will affect the operation of the burner. The resistance is protected by a pressure switch. This must be set to 100 Pa above the maximum operating pressure.

Furthermore, the overpressure protection must be set to 3 bar (= maximum operating pressure). The position of the diverter valve is protected by the limit switch. This switch must be mounted in such a way that starting up with oil heating is only possible when the flue gases are diverted via the bypass channel.

B.6 The installation of the condensate collector

A condensate collector is supplied with the condenser for collecting the condensate. This collector also acts as a water lock to prevent escaping flue gases into the boiler room. After the hose has been cut to the correct length, attach it to the connection under the flue housing using a hose clip. The hose must terminate about 5 cm above the bottom of the steam trap because this functions as a water lock. A PVC discharge line can be connected to the overflow connection. The condensate with its a low pH (<7), can be used for irrigation water. Local legislation sometimes requires that water that is discharged into the public drainage system must have a neutral pH.

B.7 Water-side connection

Ensure that the relief valve is properly connected to the discharge system via an 'open' connection. Connect the pipe work to the condenser using the correct nuts and bolts. The water circuit from the condenser must be connected in such a way that there is always overpressure in this system. This means that the suction side of the pump may not be directly connected to the condenser unless the minimum overpressure in the system is higher than 1.5 bar.

The lines to be connected to the condenser must be installed in such a way that no stresses are exerted on the condenser tubulars through expansion or otherwise.

No changes may be made to the condenser tubulars when tubulars are being installed without the permission of the manufacturer.

C. Start-up

Checkpoints

Before the installation is put into operation, the following points must be checked:

- Is the system filled with water?
- Has the system been bled?
- Do the pressure and temperature switches operate correctly?
- Is the diverter valve in the correct position?
- Is the condensate collector/water lock filled with water?
- Is there water flowing through the condenser and are all the valves completely opened?
- If one of the protection devices has been activated, repair it and reset the system.
- Read off the gas pressure on the pressure switch and set the pressure switch to this value + 100 Pa.

D. Faults

Faults will be indicated on the switch panel by the illumination of one or more red lamps, provided that this panel has been purchased. After the cause of the faults have been discovered and rectified and the reset button has been pressed, the installation can be restarted again.

E. Maintenance

E.1 General

The cleaning process itself is as a result of the condensate dripping onto the heat exchanger and ensures there is very little contamination of the equipment. However, the precipitated condensate can produce iron oxide in the Corten steel flue housing, some of which will be discharged to the steam trap.

The protection devices must also be checked a minimum of 1x per year, for example, in combination with burner maintenance.

E.2 Cleaning

The condensate collector/ water lock must be cleaned regularly (a minimum of 4x a year). The oxides and contamination on the bottom of the flue housing must be removed a minimum of 1x a year.

If the heat exchanger becomes contaminated, it must be cleaned. The extent of contamination can be estimated with respect to the increase of resistance in the flue gas circuit. Access to the condenser can be effected easily and quickly via the inspection door. If necessary, contact your installer or boiler maintenance company.

OPERATING AND MAINTENANCE INSTRUCTIONS

Condenser and boiler water quality

The boiler water must comply with the specifications given in appendix 2.
The water may possibly need processing before it is added to the installation.
If this is the case, expert advice must be sought.

Carrying out checks

During boiler operation, the quantity of water required to replenish the installation must be checked. Excessive replenishment may indicate to leakage, and any leakage must be traced and repaired immediately to prevent oxygen corrosion among other things. During operation, any leakages that occur on the flue gas side must also be repaired immediately.

The flue gas temperature may be no higher than 100° C above the boiler water temperature, and must be measured regularly. When this temperature rises, the fire tubes must be cleaned. Regularly check the operation of the steam trap (if fitted) and the presence of any residue in it.

Depending on the operation conditions, but at least twice per year, the boiler must be checked with respect to the following points:

Before entering, please ensure that the condenser has adequate ventilation!

Check list:

- Thickness of seals and inspection door;
- Condition of rubber flaps along bypass diverter;
- Tightness of vin tube/tube plate connections;
- Contamination and corrosion of the vin tubes and other surfaces on the flue gas side;
- Condition of the condensate discharge hose;
- Operation of the relief valve(s) or overflow valve(s).

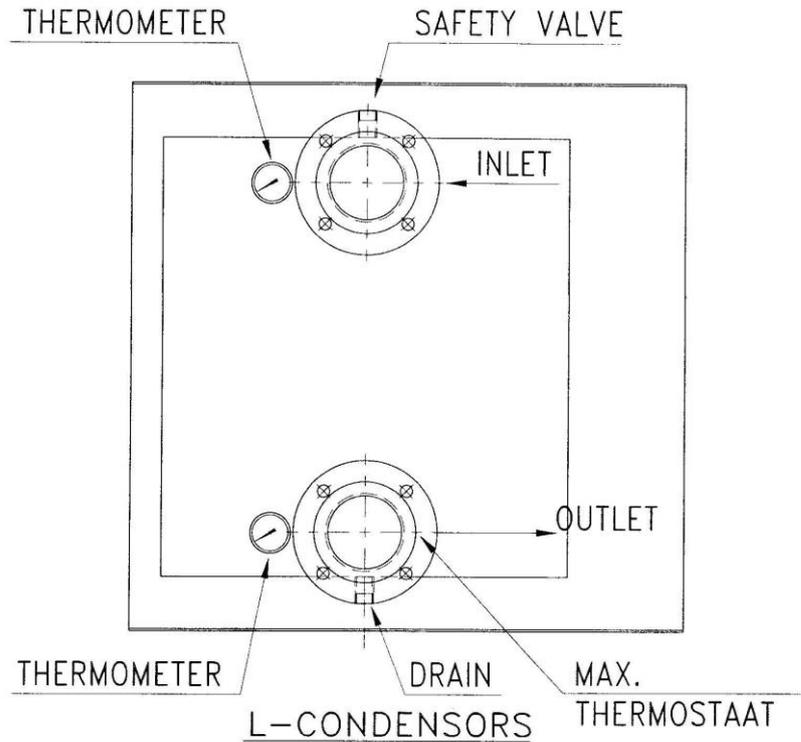
Burner ventilation fan

The suction of combustion air which is contaminated with vapours, elements of plant-based protection agents or other chemicals, can cause serious corrosion occurring in the boiler / condenser and therefore must be prevented.

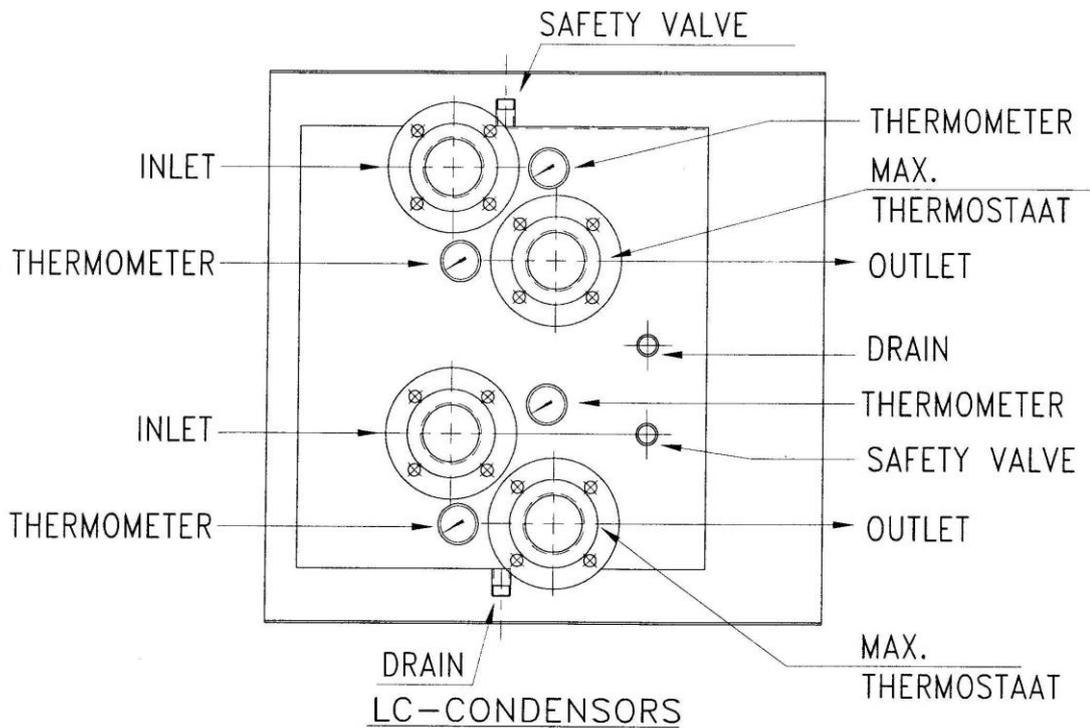
Operation and maintenance

For the operation and maintenance of the burner and other equipment, we explicitly refer to the instructions of the suppliers concerned.

Appendix 1



NUMBER OF NOZZLES MAY VARY
BUT FUNCTION OF NOZZLES AT THE
SAME ELEVATION IS THE SAME



APPENDIX 2: CONDENSER WATER QUALITY INSTRUCTIONS

Oxygen content and hardness

In the heating system, the quantity of make-up water added determines, among other things, the oxygen content and the hardness of the water. The heating system must therefore be regularly checked for water tightness and any leakages discovered must be traced and repaired immediately.

Oxygen

There must be as little oxygen as possible in the system. A source of oxygen absorption is diffusion through seals, O-rings, synthetics and similar items. This form of oxygen absorption is not preventable, which is why corrosion prevention measures are sometimes necessary.

Hardness

Lime is produced as a result of heating water in the boiler.

To get an idea if the quantity of lime produced from a certain type of water with a certain water make-up will cause any problems for the boiler, the following formula can be used.

Stone number = $tH \times (5 \times S_j + I) / Q_k$.

In which: tH = Temporary hardness in °DH (easy to measure with test set for temporary hardness).

S_j = Annual quantity of make-up water (a water meter installed in the make-up line is therefore an absolute necessity).

I = Capacity of the total system in m.

Q_k = Boiler capacity in kW

If the figure is < 0.25, then the chances of harmful amounts of lime being precipitated in the boiler are small.

If the figure is > 0.25, then (partial) water softening is advisable.

The system water may not be noticeably condensed (e.g. through steam escaping) because the chloride content in this water may be no more than 10% higher than in the make-up water.

INSTALLATION WATER

It is recommended that the quality of the installation water is checked a minimum of 1 x per year. If this task is carried out by an expert, that expert will also be able to give an assessment of the water quality and, as necessary, give advice as to whether any treatment of the water is or will be required. In **no** event may the following values be exceeded.

| | | |
|---------------------------|---|---|
| Solid matter (sludge) | : | none except for a very small amount |
| pH | : | 9 - 10 (with presence of Aluminium 8 - 9) |
| Hardness | : | # 1 °D |
| p number | : | 0.5 - 2 mval/l |
| m number | : | < 2 p number |
| Oxygen O ₂ | : | < 0.1 mg/l |
| Conductivity | : | with no additions < 1000 µS/cm |
| Cl ⁻ | : | < 100 mg/l |
| Hydrazine | : | none with respect to carcinogenicity |
| Phosphate PO ₄ | : | 20 - 50 mg/l |
| Sulphate SO ₄ | : | < 100 mg/l |

If chemical dosing is required, then this must only be carried out by experts. Other treatment products should only be used on the advice of the supplier.

Appendix 3: Required condenser pump capacity

| Boiler capacity | Condensortype | Pump capacity M ³ /hr | | Condensortype | Pump capacity Upper 2 nd section M ³ /hr | Pump capacity Lower 1 th section M ³ /hr |
|-----------------|---------------|-------------------------------------|--|---------------|---|---|
| 600 kW | L 6C | 7 | | LC 6 | 8 | 7 |
| 1200 kW | L 12C | 16 | | LC 12 | 15 | 15 |
| 1800 kW | L 18C | 23 | | LC 18 | 19 | 22 |
| 2400 kW | L 24C | 31 | | LC 24 | 30 | 29 |
| 3000 kW | L 30C | 38 | | LC 30 | 37 | 37 |
| 3600 kW | L 36C | 46 | | LC 36 | 45 | 45 |
| 4200 kW | L 42C | 54 | | LC 42 | 54 | 52 |
| 4800 kW | L 48C | 61 | | LC 48 | 60 | 60 |
| 6000 kW | L 60C | 76 | | LC 60 | 75 | 74 |
| 7200 kW | L 72C | 92 | | LC 72 | 90 | 89 |
| 8400 kW | L 84C | 109 | | LC 84 | 105 | 104 |
| 9600 kW | L 96C | 123 | | LC 96 | 120 | 119 |
| 10800 kW | L 108C | 135 | | LC 108 | 135 | 135 |
| 12000 kW | L 120C | 150 | | LC 120 | 150 | 150 |
| 14000 kW | L 140C | 163 | | LC 140 | 163 | 163 |

ACKNOWLEDGEMENT OF RECEIPT

We draw your attention to the fact that the guarantee on the condenser takes effect from the day that we have received by return this acknowledgement of receipt of the instruction book, completed and signed.

Herewith I declare M/F

Job title _____

For condenser number _____

_____ have received the associated instruction book in good condition.

Date: _____ Signature: _____

Name of user : _____

Address : _____

Postcode : _____

City/Town : _____

Telephone : _____

Fax : _____

E-mail : _____

Website : _____

Condenser number : _____

Condenser type : _____

Capacity : _____

Year of manufacture : _____

Please complete this form and return it to:

F&H Crone B.V.
Grote Esch 400
2841 MJ Moordrecht
or
Fax to: 0182-633 257
or
E-mail: info@fhcrone.nl