

**erensan**<sup>o</sup>

a company of  GROUPE  
ATLANTIC



***Diathermic Oil Boilers (DB)  
Installation, maintenance  
and operation manual***

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ENSURE THAT THE BOILER PERSONNEL READ THESE  
OPERATING-MAINTENANCE INSTRUCTIONS

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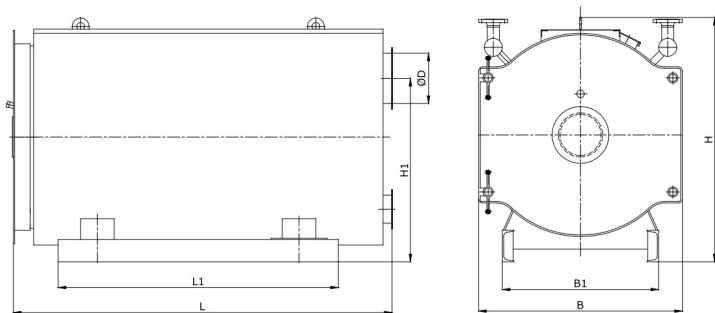
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## ERENSAN DIATHERMIC OIL BOILERS (DB)

### 1. SPECIFICATIONS

- DB type hot oil boilers have 3 passes. In the combustion chamber, pass one, with radiation, in the second and third passes the heat transferred and transmitted to thermal oil in spir pipes by convection and conduction.
- They are designed for 20-30-40 °C a return temperature difference and a maximum of 300 °C working conditions.
- Low back pressure ensures more comfortable combustion and less burner electricity consumption.
- These features of Erensan<sup>o</sup> branded liquid and gas fuel DB superheated oil boilers provide high efficiency work in a stable regime and reduce operating costs.



Specifications	Unit	300	400	600	800	1000	1250	1500	2000	2500	3000.000	4000	5000	6000
Capacity	kcal/h	300.000	400.000	600.000	800.000	1000.000	1250.000	1500.000	2.000.000	2.500.000	3.000.000	4.000.000	5.000.000	6.000.000
Capacity	kw	349	465	698	930	1163	1453	1744	2.326	2.907	3.488	4.651	5.814	6.977
L	mm	2170	2.390	2.600	2.890	3.040	3.248	3.640	4.120	4.300	4.630	5.300	6.400	6.500
L1	mm	1.570	1.610	1.900	2.100	2.350	2.330	2.780	3.140	3.445	3.530	4.000	4.550	5.000
B	mm	1.190	1.290	1.450	1.545	1.645	1.775	1.910	2.070	2.246	2.445	2.720	2.835	3.220
B1	mm	890	990	1.100	1.245	1.200	1.300	1.450	1.600	1.650	2.000	2.055	2.055	2.400
H	mm	1.485	1.585	1.745	1.815	1.910	2.040	2.175	2.335	2.513	2.815	3.106	3.208	3.530
H1	mm	1.015	1.040	1.210	1.245	1.290	1.408	1.530	1.640	1.800	2.043	2.267	2.308	2.596
ØD	mm	250	300	350	400	450	500	500	600	650	700	800	900	950
Back Pressure	mbar	3	3,5	5,5	6,5	7,5	8	8,8	9,2	10	10,5	11	12	12,5

## 2. TRANSPORTATION AND INTERIM STORAGE

2.1 The boiler must be carried using the lifting and carrying points located on the boiler, with appropriate equipment.

2.2 In horizontal handling, the boiler can be moved by controlled sliding on pipes on a flat surface, where hoists are not available.

2.3 When uploading, carrying and unloading, the boiler must be protected against mechanical shocks and crashes.

2.4 During transportation and pre-installation interim storage, the boiler must be protected against damages that may be caused by humidity and other mechanical external factors.

## 3. INSTALLATION

3.1 Mount the boiler on a pillar, high above the floor, at the mounting location.

3.2 Make the mechanical connections of the boiler as per the Principle Mounting Schematics.

3.3 We recommend our customers to buy the hot oil boilers as a whole package from our company. In the case of hot oil boilers not purchased with the whole package, the armatures shall be selected in accordance with the relevant standards and regulations and shall be mounted by specialized technical personnel. In addition, the comments of our company should also be referred to.

3.4 The boiler mounting location must be in conformity with the relevant standards and regulations. The mounting location must absolutely have an outward-opening door, a clean air inlet at the surface level and a dirty air discharge chimney (apart from the boiler stack) at the ceiling level. The window and door frames of the boiler room must be of fire-proof material.

3.5 A hot oil boiler should have the following:

3.5.1 Temperature control device in equal numbers as to the number of burner phases, and 1 safety thermostat,

3.5.2 Flue gas temp thermostat,

3.5.3 Max. differential pressure switch,

3.5.4 Manometer at boiler inlet and outlet,

3.5.5 Differential pressure switch (fixed between the boiler return & supply direction to stop the burner when pressure difference is low i.e. there is no flow),

3.5.6 There must be a thermometer for measuring the temperature at the boiler outlet, return direction and stack,

3.5.7 Closed type safety valve (if the circulation pump is on the return line),

3.5.8 The electrical connections of the hot oil boiler electricity panel, Thermostat, Differential pressure switch, Flow-switch, Expansion Tank Level-Control Device, Filling and Circulation Pumps and Burners wiring connection must be done by a qualified electrician.

3.6 Never connect more than one boiler to the same chimney.

## 4. SAFETY RULES

4.1 The boiler stack should be constructed in accordance with the stack/chimney construction rules.

4.2 Twice every year, the stack must be cleaned, and must be checked to ensure that there are no cracks or holes in any section, and that the stack cleaning cap is closed and sealed.

4.3 Before the initial operation and after long-term stop periods, make sure that the boiler, collection tank and expansion tank is filled with enough oil and that the suction and pumping valves of the boiler feed pump and the circulation pump are turned on, that the pump is de-aired, and the pump circulation directions are correct.

4.4 The Operation and Safety Thermostat, the Max. Pressure Switch, and the differential pressure switch operation and setup values should be checked constantly.

4.5 The volume of the oil collection tank must be 50% higher than the total oil volume of the system. A level indicator must be placed on the collection tank.

4.6 The oil volume of the expansion tank should be at least 30% of the total oil volume of the installation. Level and pressure checks should be conducted automatically and should be monitored constantly. The temperature of the open expansion tank should not exceed 60°C. The expansion tank should be placed above the ground level so as to prevent oil circulation in the tank; it should not be isolated but be protected against frost.

4.7 The flue gas temperature must be monitored constantly and the stack thermostat must be tested frequently to ensure appropriate functioning. (In case the oil circulation ceases for any reason, the flue gas temperature would rise due to the oil leak in the boiler and the negative impact on the heat transfer due to the consequent soot and tar; in such a case, the stack thermostat acts as the control element that deactivates the burner.)

4.8 In case of unusual noises from the boiler or the installation during the operation of the boiler, close the burner immediately and stop the burning process in the boiler. The boiler and the system should be inspected, and the failure should be rectified after ensuring safe working conditions.

4.9 In the hot oil system, appropriate discharge elements should be mounted at the top for air vent, steam and gas discharges. In addition, a blow-down installation should be available to discharge all the oil and other materials where necessary.

4.10 In the hot oil system, the pipes and pipe joints (flanges) must be made of steel. The pipes must be carbonized (ASTM A-53, ASTM A-106 or ST.35.8) seamless steel. Never use cast iron, as it would result in the danger of breaks, cracks or leaks in the pipes.

4.11 In case the burner fails to operate, do not press the reset button more than twice, and call the authorized burner service.

4.12 In case of leaks in the burner fuel connection and transfer lines, stop the burner immediately and close the line valves. If you are using natural gas or LPG, use a leak sensor and smoke detection sensor so that system that automatically cuts the gas transfer from the main entry.

4.13 In LPG fired installations, never start the burner if you detect ice or dew formations on the outer surfaces of the pipes due to the liquidation of the gas remaining in the fuel pipes from the night before, especially on cold days. Discharge the liquid LPG safely from the drain valve liquidation can also occur at normal times due to evaporator level control or line regulator problems.)

4.14 Never open the boiler door unless the burner is stopped and the power is cut.

## 5. INITIAL CLEANING

The plant must, as far as possible, be cleaned of impurities such as welding beads, scaling and rust deposits.

It is usual, though, to purge the pipelines with compressed air and to inspect all vessels.

Dirt particles collecting in the strainers and low-lying plant components and also impurities in the vessels must be carefully removed.

## 6. TIGHTNESS TEST

Heat transfer plants must be tested for tightness. The test medium may be liquid or gasses. When using water it must be taken into account that it can generally not be completely removed from the plant and longer "boiling out" times are required on commissioning. This is the reason that at present air is used almost exclusively as test medium. The test pressure is then adjusted to about 1,5 to 2 bar. The test pressure shall never exceed 2 bars.

All flanges and connection points and all weld seams must be brushed with soap solution and leakage points are indicated by the soap bubbles. To increase the test pressure above 2 bar makes little sense because the danger exists that gas flows through the soap solution under the pressure and consequent high velocity without forming bubbles. A strength test cannot be obtained at an increased pressure because the main stress occurring in operation (resulting from thermal stresses) cannot be represented.

To restrict to a minimum the storage of compressible media for safety reasons the components already subjected to a pressure test the UVV pressure vessel in the manufacturer's workshop, such as vessels, larger headers and distributors and also the heater and possibly the heat consumer should be excluded from the tightness test with air. This can be done with blind flanges on these components.

Circulating pumps with stuffing box should also be excluded because there is a risk that the test pressure cannot be maintained due large gas leakage at the stuffing box.

## **7. FILLING OF THE PLANT WITH HEAT CARRIER AND PRESSURE TEST**

Filling can be done from barrels or tankers. Before filling the installation, the whole system must be cleaned and dried.

Open all valves first including vent lines. Now you can start the filling process.

It is most suitable to fill slowly from the lowest point of the plant so that the air can escape through the opened vent lines. The filling process must be continued until the minimum level is reached in the expansion vessel. When the oil level reaches the minimum level indicated on the expansion tank, stop the filling pump. Wait for a short while, and then continue filling up the oil until the air and gas accumulated in the air discharge valves is discharged totally and the oil starts to come through. After completing the filling up, check the oil for dryness. The oil must be water free; however, water condensation may occur during storage, shipment or activation. Turbidity in the oil indicates the presence of water.

## **8. FUNCTIONING TEST**

The functioning test comprises the controls to be carried out prior to starting the heating, e.g. the following work:

8.1 Setting the measuring, control, monitoring and limiting apparatus.

8.2 Setting the motor protective switches to the rated currents.

8.4 Checking that all valves in the circuit system are opened except the discharge and discharge valves and filling pump valves that will transfer oil from the system to the storage tank when necessary.

8.5 Checking the lubrication of the circulating pumps bearings.

8.6 Checking the easy rotation of the pump shaft and coupling running. Turn the pump mill and coupling manually to ensure that they rotate smoothly. In case of any tacking, make the axis intersection adjustments must be conducted by the authorised service before activating.

8.7 Switching on the main switch in the electrical switch cubicle.

8.8 Starting the main circulating pumps and check of their direction of rotation.

8.9 Venting of the plant components and topping up the heat carrier if necessary.

8.10 Shutting down the circulating pump after about half an hour and cleaning the strainers.

This operating cycle:

- a) starting the pumps
- b) venting
- c) cleaning the strainers

must be repeated until the plant is completely vented and deposits are longer found in the strainers. It is recommended to install fine mesh filters for the start-up operation to be replaced after cleaning cycle by coarse mesh filters.

8.11 Check if fuel supply is ready for operation.

## **9. ACCEPTANCE TEST**

The system must be subjected to an acceptance test after completing the installation of the plant. The acceptance test is to ensure the agreement with the planning data (plant diagrams, installation plans, current flow diagrams) and thus to guarantee the working capability of the plant. The following points are important:

9.1 Check the pipelines by means of the plant diagrams (P&I).

9.2 Checking of the laying of the pipelines with regard to fixed points, loose points and expansion possibilities.

9.3 Checking the provision of vents at the highest points of the system and of drains at the lowest points.

9.4 Checking of the system that screwed connections with seals in the thread are not installed in the "hot" part of the plant (specifically at the heat consumers).

9.5 Checking of the fuel supply system.

9.6 Check of the electrical lines that they are protected against effects of leaking heat carrier.

9.7 Checking of vent lines from the open expansion vessel or collection vessel that these lead into the open air.

9.8 Checking the installation position of fittings, strainers and control valves (especially of the three-way control valves).

9.10 Checking of pump cooling water and inert gas supply systems, if they exist.

9.11 Checking the design and execution of the heater room that this meets the heater room specification. Attention has to be paid in particular to the room ventilation and system venting, the danger switch and the fire extinguishers.

## **10. COMMISSIONING:**

10.1 Check installation and boiler connections.

10.2 The system must be tested for leaks. Gas and air (usually) are used in this test. Test pressure approx.

It is between 1.5-2 bar. During the test; process machinery, tanks and circulation pumps (shaft seal may be excluded). All joints, welds and flanges must be checked with soap bubbles. The test pressure must never be increased above 2 bar.

10.3 Before filling the system, the system must be cleaned and dried. If a gas separator is present in the installation, such action is not necessary. When the system is empty, compressed air should be supplied and water and moisture elements should be eliminated. All ventilation and other valves should be opened, and any residues of oil and oil accumulated in the installation should be discarded and then the filters should be cleaned. After the cleaning process is completed, all the valves opened are closed and the filling process starts thereafter.

10.4 Filling with oil: The best and most accurate filling is to start filling from the lowest point of the system. Thus, the oil that starts to fill is pushed up the air on it. When the oil level reaches the minimum level in the expansion vessel, the filling pump is stopped. After a short wait, the filling process should be continued until the gas and air discharge accumulated in the air venting devices are finished and the oil comes. When filling is complete, the oil should be checked. The formation of water in the oil, which should be homogeneous, can occur during storage, transportation and commissioning works. The turbidity of the oil means that there is water in it.

10.5 Functional tests before commissioning:

10.5.1 Adjust measuring, control, monitoring and safety devices.

10.5.2 Open all valves in the open position, check the shaft seals and make sure they are working properly.

10.5.3 Check the lubrication of the circulation pumps shaft seal and roller bearings, making sure that the pump shaft and coupling are rotated by hand. If there is an itching, do not start and axial coupling.

10.5.4 Switch on the main switch of the control cabinet.

10.5.5 Start the main circulation pump and check the direction of rotation.

10.5.6 Allow the system to bleed, if necessary, check with some oil from the top.

10.5.7 The circulating pump must be stopped after half an hour of operation and the waste accumulated in the strainer cleaned.

a) Starting the pump,

b) Venting,

c) Cleaning of dirt,

(It is recommended that the strainer filter be a fine filter at the beginning, then replace it with a coarse filter when no dirt remains).

10.5.8 Check that the illuminated and audible alarm system is activated and does not give any alarm before starting.

10.6 To prevent local overheating of the oil, first open the bypass valve between the return and return collectors and slowly heat the primary circuit. When the thermal oil outlet temperature reaches 70 ° C, the corresponding valves must be slowly opened so that the entire system circulates. For the first start-up and long-term shutdown, the burner must be heated in the manual and minimum position as slowly as possible up to 100 ° C. Check that the set temperature controller stops the burner when it reaches 100 ° C. When the system is automatic and the burner stops, the burner switch should be turned off and the main circulation pump should be operated, and the air should be taken out of the air evacuation equipment respectively. This time must be a minimum of 30 minutes. Check that the piping and connections are tight. Bleeding must be continued until the pointer remains stable on the system manometers.

10.7 If the system does not have a direct opening to the atmosphere, then the expansion tank should be opened and vented. If the system is operating under nitrogen pressure, the nitrogen gas must be shut off and the expansion tank vented. This is necessary, since water will evaporate around 100 ° C, and if there is water in the system, it is necessary to remove the vapor that will occur. As the pump pressure also exceeds, the evaporation temperature shifts to higher values. A

gas separator should be installed at the point where the expansion tank is connected to the system to ensure that gases and vapors are removed quickly and easily from the system.

10.8 During the discharge of gases in the expansion line and in the expansion tank, there is a danger of cooling and condensation. It is therefore an advantage that the expansion tank with a small by-pass line taken by the pump press, run hot during this boiling period.

10.9 In the operation after the first burner stop, the burner capacity in the manual position and the minimum position should be increased by increasing the servomotor angle by 10 'degrees and not exceeding the thermal oil outlet temperature increase in 50 ° C for 1 hour.

For each temperature rise of 50 ° C, consecutive stop and deaeration operations, as described in Section 4.6, shall be repeated in the same manner.

When the boiler outlet temperature is reached, it must be ensured that the pressure fluctuations in the system are over and that no gases and vapors remain in the entire installation.

10.10 In closed expansion systems, nitrogen must be supplied to the expansion tank at the pressure corresponding to the installation static water height after the first stop at 100 ° C and the deaeration process.

When the boiler thermal oil outlet temperature is reached, presostad adjustment is made to be 0.2 bar above the gas pressure formed in the closed expansion tank.

The closed expansion tank and all safety valves in the system should be of closed type and the discharges should be taken to the Main Oil Storage Tank. The air pipe must be pulled from the gas receiver to the intermediate expansion part and then to the expansion tank with the rising slope. The lower level of the expansion tank must be above the intermediate expansion piece.

10.11 In open expansion systems, the oil temperature in the expansion tank shall not exceed 70 ° C. To ensure this, the primary circulation pump must meet the installation pressure loss and the height must be calculated so that it does not circulate from the expansion tank. Expansion tank lower level minimum 2.5 m. should be above.

10.12 In the volume between the cold oil storage tank and the expansion tank, the oxygen of the air must not be contacted with hot thermo oil even once. It is advantageous to purge this air with intermediate nitrogen gas.

10.13 System durability, tightness, pipe elongation, pump coolant temperature (if wet cooling) are to be checked.

10.14 Once the required operating temperature has been reached, the checks listed in 4.13 shall be performed again. Safety equipment is checked to see if it is working.

10.15 Checking oil samples: The heat transfer oil must be changed during a certain operating period, if necessary. Abnormal operating conditions require oil to deteriorate earlier and thus change. At the latest, after one year of operation, it should be checked in the laboratories of the Petroleum Company to which it belongs, to determine whether the oil will be used further.

10.16 The operation of the boiler indicator and control devices shall be checked on a daily basis. If necessary, the defective device must be replaced.

## **11. RECORD OF MEASUREMENTS**

The most important data at rated load operation must be contained in the record of measurements.

11.1 These are generally the flow and return temperatures and the pressures at the pump and heater.

11.2 The number of operating hours and the flow rate of the heat carrier must also be recorded.

11.3 For gas fired heaters the gas temperature data must be recorded.

11.4 Flame heated heaters require a considerably more extensive measuring technique. It is essential to record the following:

11.4.1 type of fuel

11.4.2 calorific value

11.4.3 fuel flow rate

11.4.4 flame geometry

11.4.5 flue gas data; such as:

a) flue gas temperature

b) CO<sub>2</sub> content

c) CO content for gas burners

d) soot number for oil burners

e) NO<sub>x</sub> content if required

f) flue gas pressures

11.4.6 determination of the combustion efficiency for determining the rated output. During the measurements the load conditions must be constant.

## **12. ADJUSTMENTS:**

12.1 The hot oil boiler and installation accessories must be in compliance with the boiler label values and the relevant standards. When choosing these equipments, please refer to the comments of our company.

12.2 The burner capacity adjustments must be made by the relevant burner technician, ensuring that it does not exceed the boiler capacity label values.

12.3 Operation thermostats or temperature control elements must be adjusted according to the default oil output temperature values. The safety thermostat must be adjusted to 1-2 C higher than the operation thermostat.

12.4 When the boiler is operating with maximum capacity, the flue gas thermostat must be adjusted 5-10 C higher than the read flue gas temperature value.

12.5 Expansion tank level controller adjustments: min. level must be 1/3 of tank bottom level; max. level must be 1/3 of tank upper level. When max. level is reached, check that the oil feed pump is stopped. The controller should be adjusted to the level designated for starting the oil feed pump. In case the system goes under the minimum level, a level controller is required to stop the burner and activate the alarm sound.

12.6 Adjust the nitrogen transfer regulator to the system min. pressure value. Adjust the pressure check valve to the top pressure value of the system.

12.7 We recommend that the replacement pumps used in the system be changed and operated at regular intervals in order to match the aging. During start-up of the backup pump, the switch must be heated at least 2 times after short-term start-up.

12.8 If you are using water-cooled pumps, adjust the temperature of the cooling water.

12.9 Check the safety valve adjustment pressure.

## **13. PREVENTING SMOKE-SIDE CORROSION:**

Liquid fuels, particularly fuel-oil that is included in the heavy oils group, contain 3% of sulphur. During the burning process, this sulphur accumulates in the boiler's fire and smoke-side surfaces and especially in secluded sections. This accumulated sulphur results in the formation of sulfuric acid when the boiler is stopped and restarted, by combining with the condensation water resulting due to the vapor in the flue gas.

To prevent this:

13.1 Use liquid fuels with low sulphur content.

13.2 Do not allow accumulation of soot and smoke on the boiler heating surfaces (burning chamber, smoke chamber); perform the cleaning procedures as frequent as possible.

13.3 Apply Panorin on boiler heating surfaces. In that way, the smoke adhering to the surfaces will vanish, which will eventually facilitate the boiler smoke-side cleaning.

13.4 The burner should not be allowed to stop frequently.

13.5 Burner adjustments and setup values must be sound and accurate. These adjustments should be done by authorized burner services. If possible, a Flue Gas Analysis should be conducted before the adjustments.

## **14. SHUTTING-DOWN**

14.1 The burner must first be switched off during the programmed shutdown. The primary and secondary circuit circulation pumps should continue to run until the boiler outlet and return temperatures are equalized and the temperature falls below 80 °C.

14.2 The initial commissioning procedure starting with article 4.6 should be followed in the same way for the start operations after the programmed stop of the system.

14.3 The sudden stop in hot oil systems is undesirable situation and it is recommended to install a generator system in a short time in case of electrical power failure.

14.4 In case of oil leakage in the system, the burner must be stopped immediately, and the oil must be collected in the appropriate container

so that it does not spread to the environment. The oil in the system should be transferred to the main storage tank by attraction or by forced suction by opening the suction side valves of the oil filling pumps. To help cool the hot oil boiler during this process, the circulation pumps should be run until the oil level has reached the gas receiver level, then shut down. In addition, in order to help cool the boiler, the doors of the boiler should be opened to contribute to the natural cooling.

## **15. MAINTENANCE:**

Relevant regular maintenance services of the system components are necessary and to be carried out by experienced personnel to ensure trouble-free operation of the plant over a longer period.

15.1 Monitor the operations of the boiler, oil collection tank and expansion tank armatures (level indicator, level controller, pressure check valve, thermometer, manometer, safety valve etc) constantly, and perform the necessary checks in case of any failures or faulty operations; replace the armatures if necessary. Apply thin metallic oil in the thermometer cartridges to prevent oxidation and to ensure a healthy heat transfer.

15.2 Check that all connections on the installation are leak proof. In case of any leakages, eliminate the problem immediately.

15.3 Perform regular checks on the boiler front cover and rear smoke chamber sealants; in case of any leakages, tighten all bolts and clamping elements; if the leaking persists, replace the gasket/tuft or contact our authorized services. Grease the clamping elements, nuts and bolts.

15.4 The boiler cleaning intervals should be adjusted according to the operation and pollution conditions of the boiler. Smoke-side cleaning should be performed at least twice a week for liquid fuels and twice a month for gas fuels, or more frequently if the boiler's pollution status so requires.

15.5 When conducting boiler smoke-side cleaning, check that the pump filters are clean. Apply the necessary cleaning procedures in case of any accumulations.

15.6 The heat carrier used in the system must be checked for further use at least once a year or more frequently if necessary, by the relevant oil company to ensure that the oil preserves its quality. After the first

commissioning and after plant modifications this period should be shortened once to about 3 months to recognize early changes in the heat carrier.

15.7 An important condition for the assessment is sampling uniformly to obtain a representative sample at about the same point and under the same conditions. The sampling point recommended is the flow side near the heater. The design of the sample container should enable safe sampling and prevent influencing the analysis data (e.g. flash point and boiling behaviour). This change occurs easily, if sampling without cooling is done at a "hot" plant in an open vessel, and the low boiling components can escape. The samples should mainly be taken by means of "cooling traps" or from a cold plant.

15.8 To avoid aging of the heat carrier the exclusion of air in directly open plants the temperature in the expansion vessel should be checked. Heat carrier leaked from the plant should not be filled in again. If the leakage volume is larger, this can be done, if an unobjectionable condition has been proved by an analysis of the heat carrier.

15.9 The operation of the boiler indicators and control devices must be checked daily, and in case of any violation of the normal operation conditions, the boiler must be stopped in a controlled manner and the necessary assessments and examinations must be conducted. If necessary, the faulty device must be replaced.

15.10 In case the boiler is to be out of operation for a certain time period, the system must be cleaned fully as in the weekly cleaning procedures, and the surfaces must be cleaned with soda solution to eliminate acidity. In case of accumulated layers, the solution should be applied repeatedly until the layers are all cleaned off. A PH paper tester may be used to assess whether the sulphur is cleaned off adequately (the pH value should read between 7 and 9). The acidity elimination process must be performed when the boiler is heated to 50-60 C. After this process, leave the surfaces to dry and apply linseed oil, turpentine oil and graphite on the surfaces to prevent rusting. Close the boiler covers to eliminate any contact with air. In addition, place semi-burnt lime in the boiler to ensure that the air in the boiler remains dry.

15.11 The electricity panel, burner panel, fuel filling and circulation pump propellers must be cleaned with compressed air. These elements must be protected from dust and water.

15.12 In case of any strange noises during the operation of the burner, fuel filling and circulation pumps, please contact the relevant authorized services.

15.13 Fuel filling and circulation pumps must be used in a rotating manner to ensure equal operational lifetimes. The grease fitting beds of centrifuge-type pumps must be checked, and the grease levels must be maintained. In case of any unusual mechanical sounds from the pump rollers or from within the pump, or in case of frequent thermal strokes, contact the authorized pump service.

## **16. REPAIRS**

16.1 As a principle, welding work must be carried out only by tested welders (to DIN 8560), and the AD specifications of series H being valid for the execution and welding supervision.

16.2 For welding work the heat carrier must first be completely removed from the component to be repaired. Leaked heat carrier may be covered and removed only with non-flammable blotting material.

16.3 Organic media can form with air an explosive mixture so that this gas mixture must be removed by flushing with inert gas. The inert gas flushing process must be maintained during the whole welding time.

16.4 Welding on components filled with heat carrier (to prevent formation of an explosive mixture) should be carried out only in extreme emergencies because cracking products are formed on the heat carrier side and unobjectionable welding cannot be carried out. There is the additional risk of carburizing the steel and at a corresponding cooling rate a hardness structure (martensite) may form.

16.5 The inert gas flushing does not ensure in large plant components that are explosive heat carrier vapour-air mixture is completely displaced. In these cases the heat carrier must be removed from the component and the inner surfaces rinsed with water. The plant component is then filled with water, only at the place to be welded a small air space is left and the water removed again after welding.

## **17. GENERAL:**

17.1 Do not be harsh when opening or closing the boiler door.

17.2 Protect the boiler front door refractory concrete platform from metal objects that may hit the concrete.

17.4 The fuel storage tank must be installed at a higher elevation than the fuel filling pump axis.

17.5 When starting the fuel filling pump, make sure that the fuel collection tank is filled with fuel.

17.6 Manometers should be installed at inlet and outlet of the filters, in order to see pressure difference (resistance of the filter) due to filter block out.

17.7 All safety apparatus mentioned in section 9.8 must be checked at least once yearly for their effectiveness.

17.8 An important condition for the safe operation of a heat transfer plant is the tightness of the plant. It is thus absolutely necessary that all sealing points on fittings, pumps, flanges etc. are checked at least once monthly and adjusted if necessary.





