



**OPERATING INSTRUCTIONS
FOR
STEAM BOILER**

Low pressure/ Superheated Steam

**Model no: S350
Serial no: 501
Year of build: 2002**

THE OPERATING INSTRUCTIONS FAIL TO SERVE THEIR PURPOSE IF THEY ARE NOT COMPLIED WITH AND DO NOT REACH THE PERSONNEL WHO OPERATE AND MAINTAIN THE BOILER.

PLEASE ENSURE THE MANUAL IS READ THOROUGHLY BEFORE THE BOILER IS PUT INTO USE.

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General Description

The construction approved portable steam boiler, is a horizontal two pass fire-tube boiler. The feed water is taken from a suitable clean supply and a minimum 2 bar is required. Depending on the local water quality, a suitable water treatment is required.

The boiler produces **superheated** steam (200°C) at **low pressure**. Normal operating pressure approx 0.5 bar – max operating pressure 1 bar. In the case of failure of water supply, excess pressure or temperature, the boiler shuts off and locks out automatically. This prevents spontaneous restarting. The automatic controls ensure the best possible operating safety.

The boiler is completely insulated and thereby provides optimal use of heat, giving high efficiency and low fuel consumption. The stainless steel canopy is 6mm thick, with 50mm thick insulation, including the boiler doors and rear floor.

The construction of this steam boiler is subject to the regulations for steam boilers which are controlled by the relevant authorities (**Construction code: 02-216-684/696**).

The following requirements are thereby fulfilled:

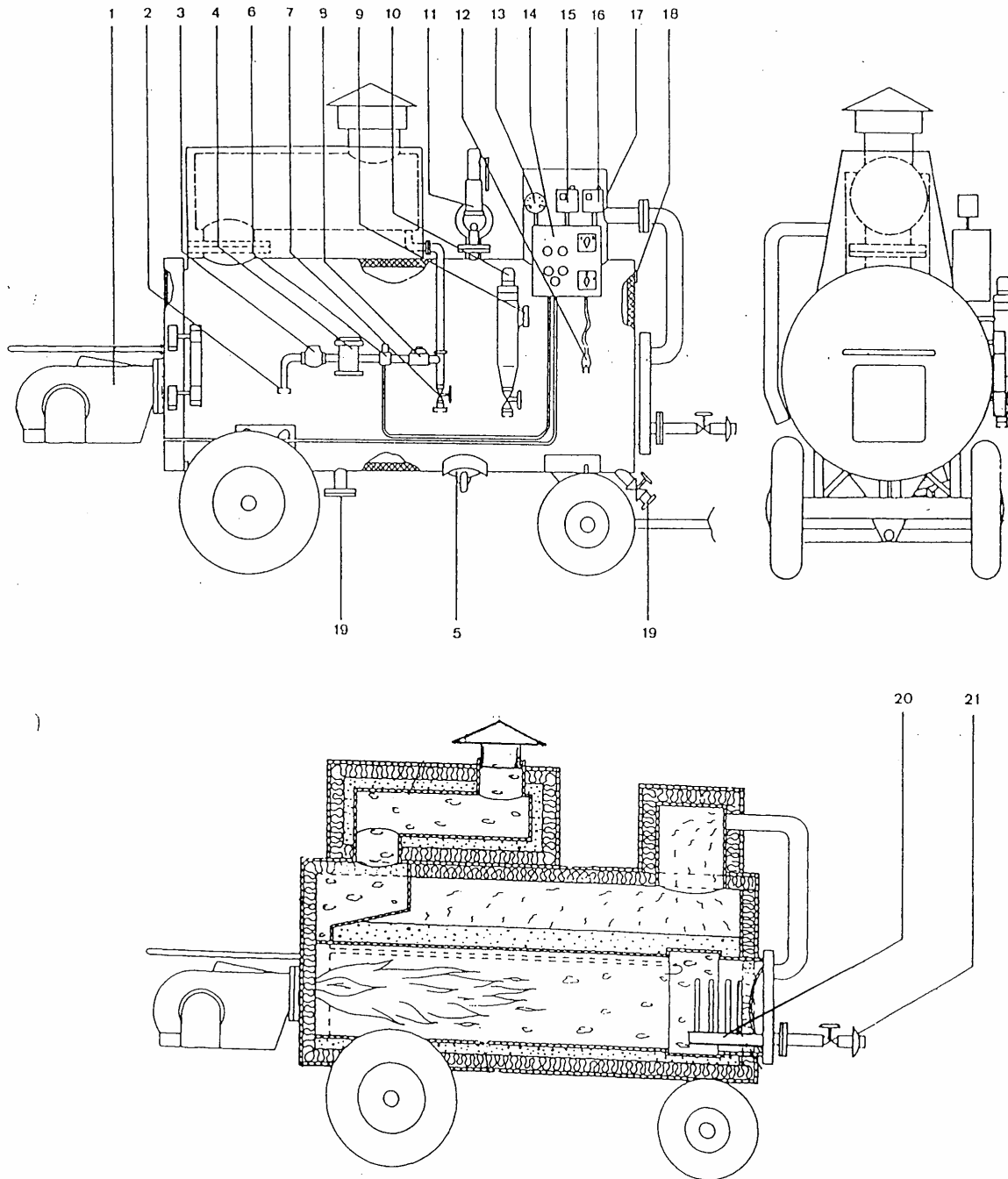
- a) The working materials of the parts under pressure are quality materials, the requisite attributes of which must be documented by the rolling and tube mill with certificates.
 - b) The welding tasks are performed only by approved welders.
 - c) The boiler has undergone a pressure test at 4 bar and was fully tested before leaving the factory
- Copies of all relevant certificates can be provided on request.

Technical Data:

Model no	Steam capacity		Thermal capacity	Oil usage/hr		Dimensions	Weight
	Kg/hr	M ² area	Btu	Kg	Litre	L x W x H (mm)	Kg
MS100	100	15-20	254,000	7	8.75	2200 x 1000 x 1650	600
MS200	250	30-50	635,000	17	21.25	2600 x 1100 x 2000	900
S250	300	50-65	754,000	18	22.50	3000 x 1200 x 1800	1200
S350	400	60-90	992,000	26	32.50	3100 x 1200 x 2000	1460
S500	550	80-120	1,390,000	36	45.00	3700 x 1400 x 2200	1780
S750	800	130-180	1,985,000	55	68.75	4100 x 1500 x 2500	2300
S950	1000	180-220	2,541,000	68	85.00	4500 x 1700 x 2600	2750
S1350	1350	220-270	3,513,000	100	125.00	5000 x 1800 x 2700	3580
S2000	2000	300-400	5,121,000	150	187.50	5700 x 2100 x 3000	4200

Electric supply: 220/240v up to model S500, 16 amp; thereafter 380/415v three phase, 50 hz, 32 amp

BOILER DRAWING



LEGEND OF BOILER DRAWING

1. Burner
2. Water connection
3. Water flow meter
4. Dosing plant
5. Hand inspection flange
6. Magnetic valve
7. Bypass valve (manual filling)
8. Non return valve
9. Water level sight glass
10. Electrodes for water level control and limiter
11. Safety valve
12. Electrical connection
13. Pressure gauge
14. Control panel
15. Safety pressure limiter
16. Pressure regulator
17. Steam dome
18. Serial plate
19. Emptying and deslurrying
20. Superheater
21. Steam outlet

Steaming Techniques

Before chemicals were introduced, steam was the natural way to disinfect soil. However, the old methods of steaming were laborious and growers found it much quicker and easier to use chemicals.

In recent times, we have become much more environmentally aware and realise the dangers of putting more and more poisonous chemicals into the soil and then proceeding to grow crops which may have to be consumed.

As resistance to various chemicals increases, even stronger doses have to be used. The human factor also has to be taken into account and the potential danger to staff and animals should not be underestimated.

What are the benefits of steam?

Even the ancient Egyptians found that when the Nile flooded its banks onto barren soil, and then the hot sun shone on the sodden fields, the land became fertile and crops could be grown. Since then, countless scientific investigations have proved that using steam to disinfect the soil naturally, is the safest and most extensively used method.

Modern steaming techniques have been developed which are far simpler than the old methods which many growers still remember. No one would doubt the advantages of steaming and our boilers now offer many different methods of steaming.

Steam also helps to combat soil fatigue and releases the beneficial nutrients in the soil. Steam leaves no harmful or poisonous residues in the soil. It is absolutely harmless and can be used without any risk to the environment, in all fields of horticulture and vegetable cultivation.

After steaming, planting can begin as soon as the soil has cooled without any uneconomical waiting time. Partial areas can be steamed, without any danger to adjacent areas of cultivation. The remaining heat after steaming, further encourages the growth of the beneficial bacteria and the crop itself.

Your steam boiler

Your boiler is manufactured to the highest standards and is completely automatic, with numerous safety features. You only have to prepare the soil, lay the sheets, switch on the boiler and check the temperature under the sheets, at regular intervals.

The boiler is fitted with a superheater, to produce steam at up to 200°C but normally operating at only 0.5 bar pressure (approx). The 50mm thick insulation provides 96% efficiency. It is extremely cost effective, with a life span of at least 20 years, if properly maintained.

Being portable, it is sited as close as possible to the area to be steamed, thereby injecting the steam straight into the soil, without the need for complicated pipe runs. A siren sounds to notify a fault or if water, oil or power supplies fail and the boiler shuts down automatically. The control panel fault lights will show where the fault lies.

Another factor that must be considered is the layout of your nursery and the glasshouse itself. Suitable access to the doors and any internal obstructions must be taken into account when deciding what size beds (within the boiler's capacity) you wish to steam.

How deep can I steam?

With sheet steaming, depths of up to 25cm can be achieved (which is normally suitable for most growers), however, for depths up to 50cm, we can supply either a plough system or a vacuum system, depending on the application. For shallow steaming, we supply a range of steaming hoods. The hood is placed over the area to be steamed (for approx 30 minutes) then moved around as required.

How do I prepare the soil?

The only preparation required is to dig down to at least the required steaming depth. Ideally the soil should be well loosened, with a coarse texture and average moisture content. This is best done with a spading machine, to ensure that the soil is not too fine. Even fist-sized lumps are not a problem, as the superheated steam will easily penetrate it.

If, however, the soil is finely rotovated, the steam cannot travel through the soil and will condense on the surface. A loose, porous structure also guarantees that sufficient oxygen immediately penetrates into the soil after steaming, so that the micro-organisms can become fully active. Adding organic compost / straw etc before steaming improves the soil structure.

The growth-promoting bacteria develop very quickly, to such an extent that there is a considerable increase in the activity of the micro-organisms. Organic fertilisers are normally added before steaming to further improve the soil. Inorganic fertilisers should, as a general rule, not be added to the soil until approx 6 weeks after the steaming has taken place, as the soil is so fertile.

How does sheet steaming work?

Having connected the water, oil and power supplies, the boiler is allowed to fill and then produce steam. This would normally take up to 10 - 30 minutes, depending on the size of the boiler. The steam is led from the boiler by a stainless steel flexible hose, through quick-coupling pipes, to the steam injector which is laid at the end of the prepared bed.

A special steaming sheet is laid over the area to be steamed, weighted down on all sides but left open at the front end, to allow the injector to take in air initially. As soon as the sheet has lifted, which only takes a few minutes, the injector must also be closed off and the sheet weighted down around it. Then only minimal supervision is required, to check the temperature at regular intervals.

The next bed to be steamed should now be prepared, with the sheet laid and weighted down. At the end of the first steam, the injector is simply moved to the next bed and steaming commences again. While the first sheet cools, it is best to leave it on the bed until required, as the sheet continues to hold the steam in the soil. After steaming, gently rake over the surface to allow oxygen to enter the soil. **All tools must be sterile. Ideally, disinfectant trays should also be used at glasshouse doors.**

How long do I have to steam for?

Steaming should be done with a thermometer - not a clock! It is impossible to know whether the soil has been sterilised, purely based on the time you have been steaming. Steaming is completed when the

soil has reached the required temperature (normally 90°C) at the required depth. The time it takes will

depend on the soil condition, the ambient temperature and the steaming depth. However, the following can be used as a guide: steaming time = 1 to 1.5 hours, per 10cm steaming depth.

It is generally agreed that most harmful bacteria are killed at 70°C, however, we recommend that you steam to 90°C to ensure that the high temperatures have been sustained for long enough to reach any cold pockets in the soil. You should not exceed 100°C, as steaming at too high a temperature could also kill off the beneficial bacteria.

Prior to steaming, it would be advisable to have your soil examined and take advice on any especially difficult pest which you have to cope with. The steaming depth is determined by your crop and the depth of roots on both the crop and any weeds/diseases which are present in the soil.

Can I steam other materials?

Steam has many applications outside horticulture, eg sterilising wine vats, hospital equipment etc. Any material that can withstand the high temperatures can be steam sterilised, either in a container, or a tailor-made system designed and built to suit your particular application.

Compost and soil can be sterilised in trailers, fitted with a grid of steaming pipes and covered with a steaming sheet or lid. The injector is then connected to the trailer for quick and easy steaming.

If you have large quantities of compost, special bays can be constructed with built-in pipework, for constant steaming. Normally one bay would be filled/emptied, while the other bay is steaming. The compost can be laid to 35cm deep, or 1m deep using a vacuum system.

Crops grown in open fields can also be steamed. There are various methods, again depending on the steaming depth required and we can supply a totally self-contained unit which also incorporates fuel tank, water tank, generator and spading machine.

Steaming is not an exact science and we would be pleased to advise on individual applications.

New accessories are constantly being developed to further improve efficiency and reduce the labour time involved. Please call us for further information.

THE BENEFITS OF STEAM

CONGRATULATIONS.....For health and environmental reasons, you have made the right decision by purchasing your steam boiler.

But also, steam sterilisation actually gives a better yield and a healthier crop, both of which mean increased profit.

Consumers are now demanding better quality products and residues in crops, particularly salads, is a serious concern. Your crops will be much more acceptable now that you are using steam, giving you the edge when competing in a tough market.

As there are no waiting times, your land is fully utilised at all times. No need to wait until the whole house is empty - steam as and when you want - without even having to worry about the weather. Staff can even continue to work in the house while steaming is taking place.

There is no need for licensed contractors for steaming. There is no need to pay someone to steam for you. With your own boiler, you can set it up and leave it to steam while you get on with other jobs. Other than checking the temperature, you need only come back 2-3 hours later and set up the next bed.

Our boilers have been in use in Europe since the early 50's and many of them are still in use today. With regular servicing and maintenance, it should give you in excess of 20 years service.

The manual contains important information on using and maintaining the boiler – please ensure that it is read thoroughly before putting it into use.

If you require any further advice, we would be pleased to hear from you.

(NB: Although we have used the accepted term of “steam sterilisation”, the word “pasteurisation” is more accurate. The soil is not left sterile as the beneficial bacteria remain and actually benefit from steaming.)

STEAMING ADVICE – SHEET STEAMING

These notes will help you to understand the basic principles of steaming. With experience, you will soon be able to determine your own method of operation. If you have problems with particular weeds or diseases, it may be worth obtaining advice as to the steaming depth/temperature/time required.

After steaming, great care should be taken to avoid contaminating the soil, as it will be extremely fertile.

Good soil preparation is essential for successful steaming.

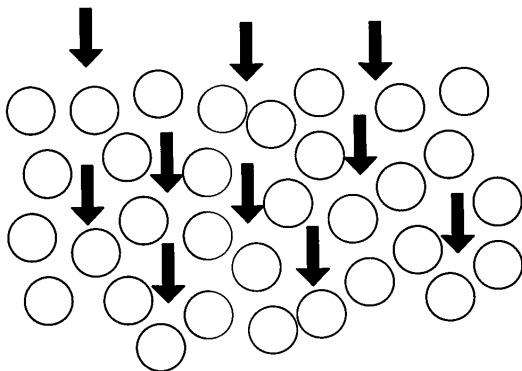
To prepare the bed to be steamed, check of course that the bed size is compatible with the boiler (see Tech Data). The area should not be too long and narrow, as the steam would have too far to travel and lose excessive heat.

Sheet steaming can be used to steam to a depth of 25cm (although 30cm may be achieved if conditions are excellent).

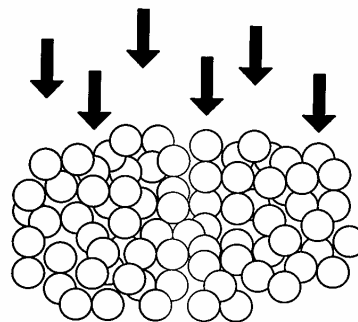
The soil should be loosened to the steaming depth required. This is best done first with an underground hoe and then with a spading machine (steam will be able to penetrate fist sized lumps). The soil should first be loosened along the length of the beds and then across them.

A rotovator should not be used, as the soil must not be too fine. Steam is unable to travel through fine soil and will condense on the surface, thereby compounding the problem.

Sandy soil, however, should be damp (not wet) before loosening, to give a better texture. A good test is with a handful of soil – if the soil runs through the fingers, it is too dry – if it can be kneaded, it is too wet. Ideally, it should be slightly sticky.



Loose soil – easy to penetrate



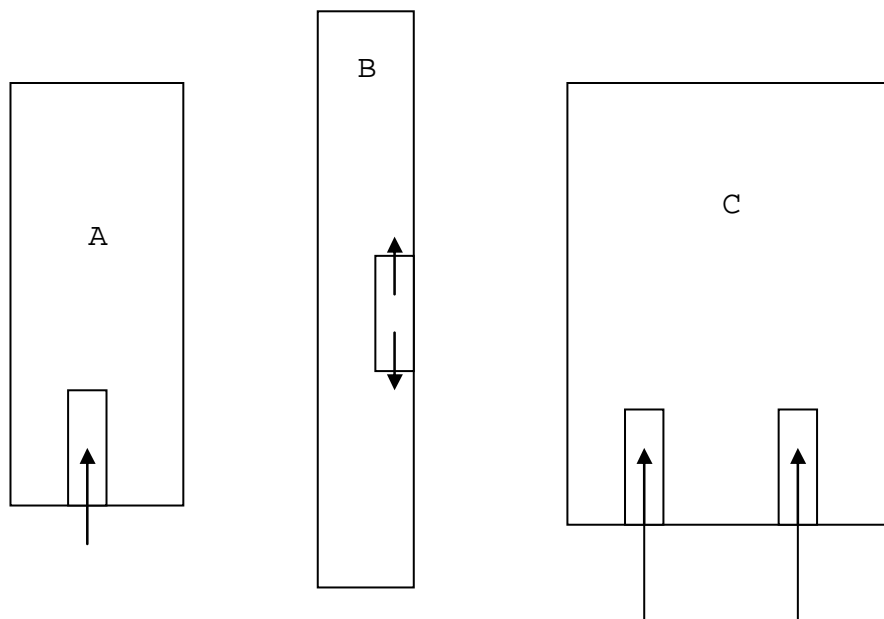
Fine or wet soil – difficult to penetrate

Laying the sheets

The steam injector should be laid on the edge of the bed and be protected with a frame, which can be either a tunnel of wire mesh or a wooden frame, approx 2m long x 50cm wide. This should then be covered with sufficient sacking (or similar), to protect the steaming sheet from the very hot injector, otherwise the sheet could tear.

The injector is initially left open to draw in a mixture of air and steam. This not only helps to raise the sheet quickly but the air also provides a protective layer, to prevent the sheet being damaged by the initial injection of hot steam. It is therefore important that the back of the injector is unobstructed at this stage, to allow the air to be drawn in. The air should then be restricted by gradually closing off the injector, until pure steam is led under the sheet for effective steaming.

The steam is normally injected at the end of the sheet (A). However, if the bed is long and narrow, it is better to inject the steam from the middle of the sheet to either side (B). On sheets over 6m wide, a distributor with 2 injectors must be used (C).



In general, it is best to steam a short, wide bed than a long, narrow bed. The maximum bed length should be 50m (up to S350 = 30m long). The sheet must be longer than the bed size, to allow it to rise.

Lay the sheet on the prepared bed, with weighting bags all round, to ensure that it is completely sealed and the steam does not escape. To ensure that the bags do not roll off when the sheet rises, tread heavily on the bags or dig a small trench for added security. It is not advisable to use soil to weight the sheets, as there is a risk of contaminated soil being carried over to the clean soil. Chains are not recommended, as they will become very hot and must be insulated to protect the sheet.

The boiler should be sited as close to the bed as possible, to reduce heat loss. The stainless steel flexible hose is attached to the steam outlet and then connected to the rigid pipes. If long pipe runs are required, cladding should be added, especially in cold weather.

While the boiler is heating up, the steam outlet valve should be left open, with the pipework disconnected. **ONLY** when steam is produced, can the steam outlet be closed and the pipework connected. The second nozzle can then be switched on. Should the sheet begin to flap badly, the boiler can be set back to one nozzle until the sheet has fully inflated, then turned back to two nozzles.

IMPORTANT: the sheet will now start to lift. When it is fully inflated and quite tight, the back of the injector should be sealed off with soil (or similar) to prevent more air being drawn in with the steam.

Temperature

The temperature, at which different diseases are killed, determines the steaming time. Steaming at a high temperature for a short time gives better results than steaming at a lower temperature for a longer time - **without** the problems of overcooking the soil.

Since each grower is faced with different problems, it is not possible to be specific about the temperature required but a general rule of thumb is that sustaining a temperature of 90 – 95°C (max) for 30 minutes kills all harmful bacteria without destroying the nutrients. Lower temperatures may be sufficient in many cases, depending on soil conditions.

During the steaming operation, the temperature of the soil must be checked at regular intervals, to ascertain when the required temperature (normally 90°C) has been achieved at the required depth. **It is absolutely essential that the temperature and not the steaming time monitor the steaming.** Conditions vary and only the temperature determines whether the steaming has been completed or not.

IMPORTANT: Great care should be taken when placing the thermometer (supplied with the boiler) under the sheet. Place weighting bags, in a “v” shape near the side edge of the sheet to prevent steam escaping. Allow the steam to settle and carefully lift the sheet to insert the thermometer.

Only the probe on the end of the thermometer picks up the temperature and this will show to what depth steaming has been completed. Insert the thermometer into the soil until the temperature reading settles at 90°C (or the required temperature). Then slowly push the thermometer into the soil until the temperature drops, thereby indicating the depth at which the temperature has been achieved.

Each 10cm deep normally takes 1 – 1½ hours, depending on conditions and soil preparation. This is a rough guide only and applies to sheet steaming. There are other methods of either speeding up the steaming time, or steaming to deeper than 25 cm.

Moving to the next area

While the first area is being steamed, it is advisable to prepare the second sheet, using alternate beds, to speed up the changeover process at the end of the first steam. The steam injector can then be moved to the next bed while the first area cools. By preparing alternate beds, the sheet can be flipped over onto the next adjacent bed after the sheet has cooled, while steaming continues.

After steaming, the sheet should not be moved for at least 1 hour (but max 2 hours) to contain the steam and allow the sheet to cool (to prevent damage). The sheet must then be removed to allow the soil to cool and prevent condensation. The surface should be lightly raked over to allow the air into the soil. Planting can then begin.

IMPORTANT: if the soil needs to be finely rotovated afterwards before planting, it is essential that all tools (also shoes etc) are disinfected to prevent contamination being introduced into the soil. Do not rotovate as deep as the steaming depth, to prevent any untreated soil being brought up from below.

Wet Steam

The boiler produces **superheated steam** at low pressure and will shutdown if it reaches the maximum setting of 1 Bar. Wet steam would only make the soil muddy and would not be successful. If wet steam is being produced, there are various possibilities:

1. The steam boiler is not in a horizontal position
2. The feed pipes are too narrow or too long and the steam is cooling down
3. The ventilation windows in the glasshouse are not closed during steaming (excess heat loss through the steaming sheets). Insulating blankets can be laid on the sheets to prevent heat loss.

POSITIONING THE BOILER

To ensure that the boiler operates perfectly, it is necessary to check that it is sited both horizontally (see spirit level on boiler) and vertically level (spirit level on boiler). The ground should be solid to ensure that the boiler wheels do not sink. The boiler should be sited as close to the steaming area as possible, with as little pipework as possible, to reduce heat loss. If excessive pipework is necessary outside the glasshouse, cladding should be added to the pipes, especially in the colder months.

ELECTRICAL CONNECTION

Single phase boilers require voltage/frequency of 220 volt/50hz, 16 amp.

Three phase boilers require voltage/frequency of 380 or 440 volt/50hz, 32 amp

The plug should be inserted at the control panel.

CONNECTING THE OIL SUPPLY

In preference to a long fuel line (recommended max 3m long), it is more convenient to use a clean oil container, which must obviously be sited on steady ground (preferably on a trolley for manoeuvrability).

The oil feed pipe from the burner should be connected, if possible, at least 10 cm from the bottom of the oil barrel, to prevent contamination. The oil return pipe from the burner (where fitted) can be inserted into the top of the barrel.

These pipes should not be longer than 3 metre. The pipes can be extended (max 5m) if the oil tank is sited on the same level or higher than the boiler.

IMPORTANT - Ensure that the oil pipes have no sharp bends.

WATER CONNECTION

The boiler should have been supplied with suitable treatment plants according to the quality of the local water supply. Having prepared the relevant water softener, the water should be connected using a water hose with a Geka coupling, directly to the boiler before the filter. Ensure the water supply is coming from a clean source.

The emergency connection should only be used, if the magnetic valve fails during steaming. Connect the hose from the Dosing Plant, by-passing the valve. The raw water supply hose remains on its normal position. The water must then be controlled manually and at the end of the steaming operation, the solenoid must immediately be replaced.

IMPORTANT: the water pressure before the solenoid valve must be at least 2 bar.

WATER TREATMENT

Water contains calcium, magnesium, iron, chloride, oxygen, carbonic acid etc in varying degrees, dependant on the water supply from one area to another, causing boiler scale and corrosion.

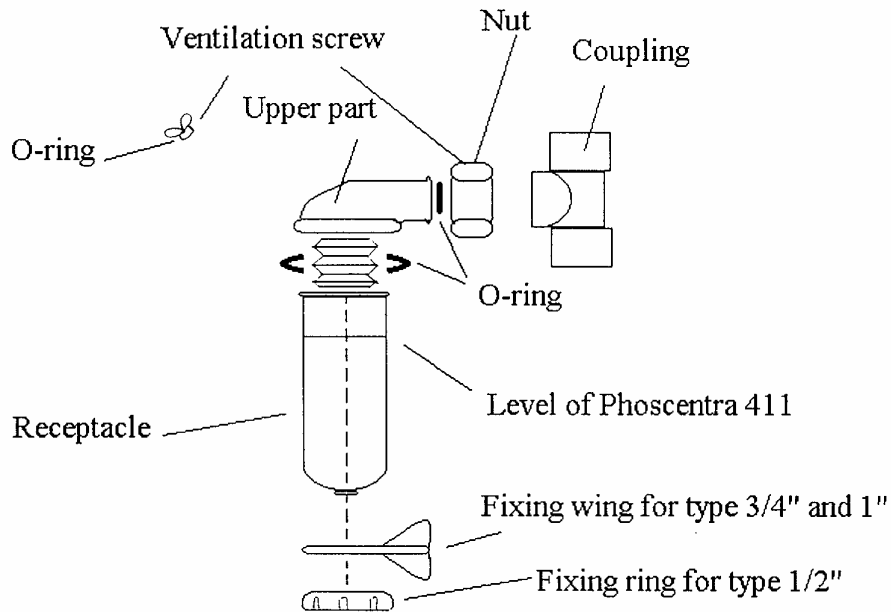
Boiler scale primarily consists of chalk, accumulating primarily on the boiler walls and to some extent can cause complete obstruction of the pipes. This causes a considerable reduction in heat transfer, thereby drastically reducing the efficiency of the boiler.

Corrosion, unlike scale which builds up in the boiler system, actually eats into the boiler steel. It is therefore important that the appropriate water treatment plant is used in conjunction with the boiler:

1. Water hardness up to 15° dh (263 ppm) requires only the dosing plant, fitted as standard.
2. Water hardness above 15° dh (263 ppm) also requires either a single or twin column ion-exchanger, dependent on the degree of hardness.

If your water source changes, you must ensure that suitable treatment is applied.

Dosing Plant



Phoscentra 411: dosing powder

Un NO: 1823 – corrosive; contains sodium hydroxide, solid.

Special risks: R35 – causes severe burns

Safety advice:

- S24/25 avoid contact with skin and eyes
- S26 in case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
- S36/37/39 wear suitable protective clothing, gloves and eye/face protection.
- S45 in case of accident, or if you fell unwell, seek medical advice immediately (show label where possible).

Please ensure that all staff are aware of the potential dangers.

Dosing Plant

The following water treatment system has proved the most successful in avoiding boiler scale and corrosion and preventing premature boiler abrasion and loss of efficiency. The Phoscentra 411 adds a small amount of phosphate to the raw water supply. If the water contains sand, soil, mud etc, it is advisable to install an additional filter.

Filling

The unit is filled with 1 kg of powder and the usage is approx: 20gm /1000 lt water.
eg: S350 Boiler using 400 lt/hr water = 125 hrs steaming/1kg powder.

Important: the first time the dosing plant is used, fill the powder to the level, then add water to 5cm above the powder level. When mixed (stir if necessary), the unit can then be fitted to the boiler. If this procedure is not followed, the powder could be washed out when the boiler fills and flows through the dosing plant.

Check before every steaming operation, and replenish after approx 1/3 of the substance has been used. Close the by-pass valve, open the ventilating bolt, loosen the securing ring and fill with Phoscentra up to the "max" mark.

If too much powder is being used, it can cause the water to foam (this can be seen in the sightglass) which will **totally interfere with the water level controls**. Check that the dosing nozzle (tiny screw) is properly screwed into the coupling to give correct dosage.

Technical Data:

Max water temperature:	40°C
Max operating pressure:	10 bar
Connections:	1/2" - 3/4" - 1"

ATTENTION: In bright sunlight, a green film can form in the cylinder. (To avoid this, cover the transparent cylinder with black sheet.) The dosing plant can be cleaned by repeated rinsing with water (no alcohol or chemicals). In the case of heavy soiling, it must be dismantled and washed out.

End of operation

After operation, the water content in the dosing plant **MUST** be emptied through the drain valve. The water supply hose (raw) and the connection hose to the water feed pipework are to be uncoupled, so that the equipment can take in air. Open the drain valve, so that the substance can dry quicker. If there is a danger of frost, the complete dosing plant should be removed and stored.

SETTING INTO OPERATION

Selection Switch -Steaming/Heating

When using the boiler for:

- Steaming - Switch to `1 - Steam' to introduce the pressure controls.
- Heating - Switch to `2 - Heat' to introduce the thermostatic controls.

THE SETTING OF THE PRESSURESTATS AND THERMOSTATS (WHERE FITTED) MUST NOT BE ALTERED! THESE ARE SAFETY CONTROLS TO SHUT DOWN THE BOILER AT THE APPROPRIATE PRESSURES/TEMPERATURES.

Safety Siren Switch

This switch only controls the siren. When filling the boiler to the normal water level, the switch must be in position `O' (filling). If not, the siren will sound constantly.

It is important that when the boiler is full, the switch is put back to `1' (operation) to ensure that the siren sounds if any faults occur.

Switching on Boiler

1. Switch on main ON/OFF switch and the boiler fills automatically. The filling time is approx 10-20 minutes (depending on the size of the boiler), until the water is visible in the sight glass.
2. When both low water level lights come on, press the re-set button which releases the locking relays and the boiler is ready for operation.

Important: while the boiler is heating up, the steam outlet valve must be left open with the pipework disconnected, otherwise the pressure will build up and shut down the boiler. No personnel are allowed within the area of the steam outlet while it is open!!

As soon as steam is produced, the pipework can be connected (close steam outlet while connecting pipework).

3. Switch the siren on - position `1'. After a few seconds, the burner motor is set in motion for pre-aeration.

IMPORTANT:

Should the burner fault light come on, the burner must be reset at the start position, by pressing the reset button. This procedure may be repeated 1 or 2 times, until the oil pump has completely drawn in the oil. If the burner is not set in motion after these attempts, the oil flow line must have air in it and this should be cleared.

IMPORTANT:

With single strand oil filters, the filter must be bled during the pre-aeration phase. Turn the thumb screw with the plastic tube and keep open until the oil is free of air. Then tighten the thumb screw again.

4. The burner solenoid then releases oil to the burner for `nozzle 1', the burner flame ignites and the `Operating` lamp comes on. If the burner fault light comes on, repeat as above.
5. To safeguard the superheater, only switch on 'nozzle 2' after steam has been produced. The nozzle 2 lamp will now come on.

IMPORTANT:

As soon as steam is produced, the safety valve should be briefly opened to check that it is operating. In the unlikely event of all pressure controls failing, the safety valve would allow the steam to escape from the boiler to release the pressure. Please check safety valve regularly.

DO NOT ADJUST PRESSURE STATS OR THERMOSTATS – at any time!!

WATER LEVEL CONTROLS

The water level regulator and limiter control the water feed to the boiler maintaining the correct levels, indicated by the water level lights (orange).

Should the water supply fail, the boiler will shut down and lock off automatically.

The water level limiter is a safety control which switches the boiler off as soon as the water falls below the lowest permissible water level.

The water regulator is fitted with 3 electrodes:

- If the water level falls to the lower level, the pump or magnetic valve is switched on to feed water to the boiler.
- When the water level reaches the upper limit, the magnetic valve closes or the pump is switched off.
- If the water falls to the minimum level, the boiler switches off automatically.

The sight glass will always show the level rising and dropping – however – if the water moves violently (boiling effect) or foams, then the water quality must immediately be investigated. The boiler will eventually shut down and probably will have to be emptied and refilled with fresh water.

This unit should be regularly inspected and cleaned of any deposits which may have built up on the probes and could prevent the unit functioning.

CLOSE OF STEAMING OPERATION

At the end of the steaming operation, the main switch is put to `OFF' and the power cable and the water feed pipe are disconnected.

The dosing plant must be completely emptied **every day**.

To protect the boiler during steaming, the water should be completely emptied and re-filled, at least every 2-3 days, depending on the water quality.

If the boiler is not being used for longer than 2 days (depending on the water quality), all water should be emptied by opening all drain cocks on the boiler and water level indicator, also the taps on the water feed and softeners, while the boiler water is still hot.

If there is a danger of frost, the boiler must be put in a room protected from frost. It is particularly important that the solenoid valve and the water softening plant are removed (or at least drained) and stored at room temperature, as frost would cause severe damage. All water must be drained before storing.

CONVERTING FROM STEAMING TO HEATING

(The optional heating accessories can be supplied at a later date if required)

The boiler can also be used for heating, by fitting the heating accessories.

1. Remove the superheater "S" and fit the blind flange to seal the chamber. The heating flow is connected at "V" and the return at "B"
2. The safety valve "SV" is removed, as the boiler operates at more than 1 bar when heating.
3. The pressure regulator battery "P" must also be removed (for the same reason) and the opening sealed with a ¾" stopper.
4. The electrical connections for the thermostats and safety thermostats are put in place when the operating switch is changed from Steaming to Heating.
5. Further information can be obtained from the circuit diagram.

MAINTENANCE/CLEANING

REGULAR MAINTENANCE WILL ENSURE GOOD PERFORMANCE AND PROLONG THE LIFE OF THE BOILER.

All water supplies contain minerals, in various concentrations depending on the water supply. These coagulate at 60°C and form boiler slurry. If this is not cleaned out of the boiler, it will thicken and form hard boiler scale. To prevent this, the drain cocks on the boiler and water level indicator must be opened briefly, **approx every 4 hours**, to enable all deposits to be rinsed out of the boiler, until the water runs clear. This is best done during operation.

IMPORTANT: EVERY MORNING BEFORE STARTING WORK, IT IS VERY IMPORTANT TO CLEAN OUT THE BOILER, AS THE DEPOSITS WILL HAVE SETTLED OVERNIGHT.

Although the boiler produces very little soot, any deposit means a loss of efficiency. The flame tubes must therefore be brushed out, with the brush supplied, as required.

AFTER 4 WEEKS OPERATING TIME, the boiler should be completely cleaned:

To open the boiler door on the model S750 – S2000 boilers, unscrew the bolt in the centre of the door and turn the slot to the vertical position.

- a) Brush out and clean the flame tubes, the heating tube and the flue gas chamber. Soot reduces the performance of the equipment, therefore, a clean boiler saves fuel and reduces costs.
- b) Clean the outer casing and rub with acid/resin free oil (eg linseed oil).
- c) Clean the oil burner, prefilter, pumps and nozzle filters, in addition to the ignition electrodes and diaphragms. Service the oil burner according to the burner manual.
- d) The solenoid valves on the water feed pipe and the level controls must be removed and cleaned of any deposits, to ensure correct operation.
- e) Open the upper and lower inspection flanges, as well as the washout valve, and check for lime deposits. Wash out the boiler thoroughly with a hose.

IF SCALE HAS BUILT UP, DECALCIFY THE BOILER!!

- f) The boiler door seals must be checked to ensure that they form a complete seal when the door is shut. These seals, and the refractory bricks in the door, must be checked for damage and replaced as necessary.

POSSIBLE BREAKDOWNS AND SOLUTIONS

Most breakdowns can be linked to operator error and the following should be checked.

FIRST OF ALL CHECK :

- a) ***Is there an electrical supply***
- b) ***Is there sufficient oil***
- c) ***Is there sufficient water – at the correct pressure (min 2 Bar)***

ELECTRICS

1. Check supply to control panel (plug, fuses etc)
2. Check fuses in control panel
3. Check ON/OFF switch
4. Press re-set button on control panel

If all the above fail to correct the fault, a qualified electrician must check out the system. The electronic relays are the main controls for the boiler and can be exchanged if necessary.

WATER

1. Check water in sight glass
2. Check supply to boiler
3. Check pressure of supply - min 2 bar
4. Check filter near to water feed connection
5. When filling the boiler, check the steam valve is open.
6. Check magnetic valve is operating and clean if necessary.
7. Check if there is a layer of scale or dirt on the electrodes.

If the boiler produces wet steam - check first of all that the by-pass is closed. If so, the boiler water has probably become chalky and must be emptied out. Clean out any scale or contaminants through the hand hole. Flush the boiler out with a hosepipe and refill. If the problem still exists, there is probably still some scale in the boiler and the procedure must be repeated.

OIL

1. Check oil supply from tank
2. Check for air in system
3. Check filters are clean (also check filter inside pump)
4. Check burner if nozzle switches have been switched off (on side of burner, model SE 350 to SE 750 only).
5. Nozzle filters should be checked and cleaned or replaced as necessary.
6. Check if burner fault light (red) is on, and press re-set button on side of burner.

After a burner fault, allow a few minutes before attempting to press the re-set button. If, after several attempts, it still locks out, a qualified engineer must be consulted.

LOCKOUT SYSTEMS

There are two lockout control circuits for the a) burner and b) boiler.

If the `**Burner Fault**' light comes on: first press the burner reset button. If the burner locks out again, check if the oil filter, the ignition electrodes or the diaphragm is dirty. Also refer to burner manual.

If the `**Boiler Fault**' light comes on, press the reset button . If this does not solve the problem, the following are possible:

WATER FEED SYSTEM:

1. **No water flows into boiler** - both water level lights go out.
 - a) Water level controls - check that terminals **19** and **N** in the control panel (**X1**) have 220 volt supply. If the supply is in order, then check the solenoid. If there is no supply, replace the ELV-3 control unit.
 - b) Solenoid - Check if there is a magnetic field on the coil, by switching on the main switch and listening for a slight click. The solenoid can also be checked with a screwdriver on the iron core of the coil.

If this is in order, clean the rubber membrane. Take the solenoid apart and wash with water, being careful to rebuild in exactly the same order, paying special attention to the small springs. There is a small air hole on the rubber membrane which may have become blocked.

If not, replace the solenoid. The boiler can be controlled manually with the bypass valve. Open this valve sufficiently to allow water to be **constantly** in the sight glass. The solenoid must be replaced as soon as possible to allow automatic operation.

- c) Electrodes in the water level unit - remove and clean off any chalk deposits. Check if boiler needs to be decalcified.
2. **Too much water** – water flows from the boiler even when switched off. Check and clean magnetic valve as shown above.

3 Water coming from steam outlet on boiler

- a) Check magnetic valve. If you pull the plug off the valve and the water stops, then the valve is functioning properly.
- b) If the water still flows, then the valve may be faulty and should be checked. It is more likely that there is dust blocking the tiny air hole in the diaphragm. Clean, replace and try again.
- c) If the valve is functioning properly, then the ELV unit is faulty.

4 Water quality

- a) Is the water frothing, bouncing etc in the sightglass?
This would suggest unsuitable water supply.
- b) Has the water been in use for more than a day or two?
If the water is left in the boiler for too long, it will froth in the sightglass. The water must be emptied and refilled after 1-2 days use, or possible more often with poor water quality. Flush out the boiler after any problems are encountered.
- c) Is the dosing plant being used/filled with powder?
The dosing plant is designed to protect your boiler by treating the raw water.
- d) Has something changed with the water quality/source?
The water treatment supplied with the boiler is suited to the sample of water provided.
- e) Are you using a very soft water supply?
If water is too soft, the conductivity can make the controls malfunction. A chemical can be added if no other supply is available.

5 Water pressure

The magnetic valve requires a **constant, minimum 2 bar** (maximum 6 bar) pressure to open.

Any temporary drop in pressure will affect the water controls.

WATER LEVEL LIMITER - ELV-3

Despite normal water level, either one or both of the water level lights go out. The ELV-3 unit may be need to be replaced. Always ensure the electrodes are free of scale.

PRESSURE AND TEMPERATURE REGULATORS

When steaming, the boiler has a maximum operating pressure of 1 bar.
When heating, the boiler has a maximum temperature of 95° C.
If this is exceeded, the steam valve will open to release the steam.

Check if there is an obvious reason and replace the regulator if faulty.
Eg: pressure may have built up if the steam outlet has been closed

TRANSLATION OF TEST CERTIFICATE

Boiler:

Model no:

Serial no:

Burner:

Manufacturer:

Type:

Number:

BN:

Control:

Number:

Type:

Reg no:

Heating oil:

Mixer:

Nozzles:

Nozzle 1

Nozzle 2

Make:

Type:

Gph:

Degree

Burner pump:

Make:

Type:

Boiler			Mixer			Oil			Flue gas			Air	
Hourly Water Usage Litre	Operating Pressure Steam outlet open (bar)	Steam Temp (°C)	A (mm)	B (mm)	C (mm)	Pump Over Pressure (bar)	Pre-heat Temp (°C)	Through-put (kg/hr)	CO2 (%)	Soot	Temp (°C)	Suction Temp (°C)	Air flap Positio

The boiler underwent a final test run to check for problem free functioning.

Signed and dated

TRANSLATION OF PRESSURE TEST CERTIFICATE

Confirmation of Water Pressure Test – Group II Steam Boiler

We hereby confirm that the steam boiler:

Model:

Serial no:

Production date:

Max operating pressure: 1 Bar

In the production factory of Moschle

On:

The construction and water pressure tests were undertaken **at 4 bar.**

The following were confirmed:

1. The important safety dimensions of the steam boiler
2. The safety test of the important parts of the steam boiler were successful
3. The pressure components and materials were checked against the materials list
4. The water pressure test was successfully undertaken
5. The boiler plate was stamped with this mark

(Dated and signed)