

Service

40H

Opening pressure	175 bar
Pump pressure	155 / 6 bar
Nozzle pressure	135 bar
By-pass pressure	11 bar
Water quantity at min./max. pressure	13.9 / 12.8 l/min.
Water quantity at steam	5.8 l/min.
Pump pressure at steam	30 bar
High pressure nozzle	1505 = 1.35 mm
Max. temperature of inlet water	30°C
Inlet pressure, max.	10 bar
Chemical injector	890 mbar
Injector, back pressure, max.	25 bar
Power absorbed (pump pressure)	5.4 kW
Power consumption (by-pass pressure)	5 amp.
Power consumption (pump pressure)	9.8 amp*
Insulation class	F
Density	IP45
Motor r.p.m. (pump pressure)	2820 r.p.m.**
Sound pressure acc. to ISO 3746	77 DB(A)
Type of piston / diameter	16 mm
Wobble disc no., 50/60 Hz	58(8) / 61(11)
Type of oil / quantity	Castrol Alphasyn-T 150, 250 ml.
* 9.8 amp. at 380V (8.4 amp. at 415V) ** 2820 r.p.m. at 50 Hz (3420 r.p.m. at 60 Hz)	

Boiler effect	58 kW
Water outlet temp. at max. water quantity (12°C)	76°C (170°F)
Oil consumption at max. water quantity and temp.	5.5 kg/h - 6.5 l/h
CO ₂	10 - 12%
CO	50 - 100 ppm
Temp. flue gas at 20°C ambient temp.	160 - 200°C
Smoke scale number	Max. 1
Flue gas loss	Max. 10%
Oil nozzle type (1.25 US.gal/h)	4.71 kg/h - 80°H
Oil pressure	12 - 13.5 bar
Boiler tube / measurements	Seamless st35.8 / ø16x2.3 mm
Heating surface	1,8 m ²
Blast pressure	55 mm VS
Quantity of inlet air	Approx. 80 m ³ /h
Excess of air	1.3 (30%)
Outlet flue gas	140 m ³ /h at 200°C
Tank capacity max./min.	35 l / 6 l

Opening pressure	125 bar
Pump pressure	107 / 4.5 bar
Nozzle pressure	95 bar
By-pass pressure	9 bar
Water quantity at min./max. pressure	11.4 / 10.5 l/min.
Water quantity at steam	5.6 l/min.
Pump pressure at steam	30 bar
High pressure nozzle	1505 = 1.35 mm
Max. temperature of inlet water	30°C
Inlet pressure, max.	10 bar
Chemical injector	890 mbar
Injector, back pressure, max.	23 bar
Power absorbed (pump pressure)	3.4 kW
Power consumption (by-pass pressure)	2.5 amp.
Power consumption (pump pressure)	6 amp*
Insulation class	F
Density	IP45
Motor r.p.m. (pump pressure)	2820 r.p.m.**
Sound pressure acc. to ISO 3746	77 DB(A)
Type of piston / diameter	16 mm
Wobble disc no., 50/60 Hz	57(7) / 60(10)
Type of oil / quantity	Castrol Alphasyn-T 150, 250 ml.
* 6 amp. at 380V ** 2820 r.p.m. at 50 Hz (3420 r.p.m. at 60 Hz)	

Boiler effect	54 kW
Water outlet temp. at max. water quantity (12°C)	80°C (176°F)
Oil consumption at max. water quantity and temp.	4.6 kg/h - 5.6 l/h
CO ₂	10 - 12%
CO	50 - 100 ppm
Temp. flue gas at 20°C ambient temp.	160 - 200°C
Smoke scale number	Max. 1
Flue gas loss	Max. 10%
Oil nozzle type (1.25 US.gal/h)	4.71 kg/h - 80°H
Oil pressure	10 - 11.5 bar
Boiler tube / measurements	Seamless st35.8 / ø16x2.3 mm
Heating surface	1,8 m ²
Blast pressure	55 mm VS
Quantity of inlet air	Approx. 77 m ³ /h
Excess of air	1.3 (30%)
Outlet flue gas	135 m ³ /h at 200°C
Tank capacity max./min.	35 l / 6 l

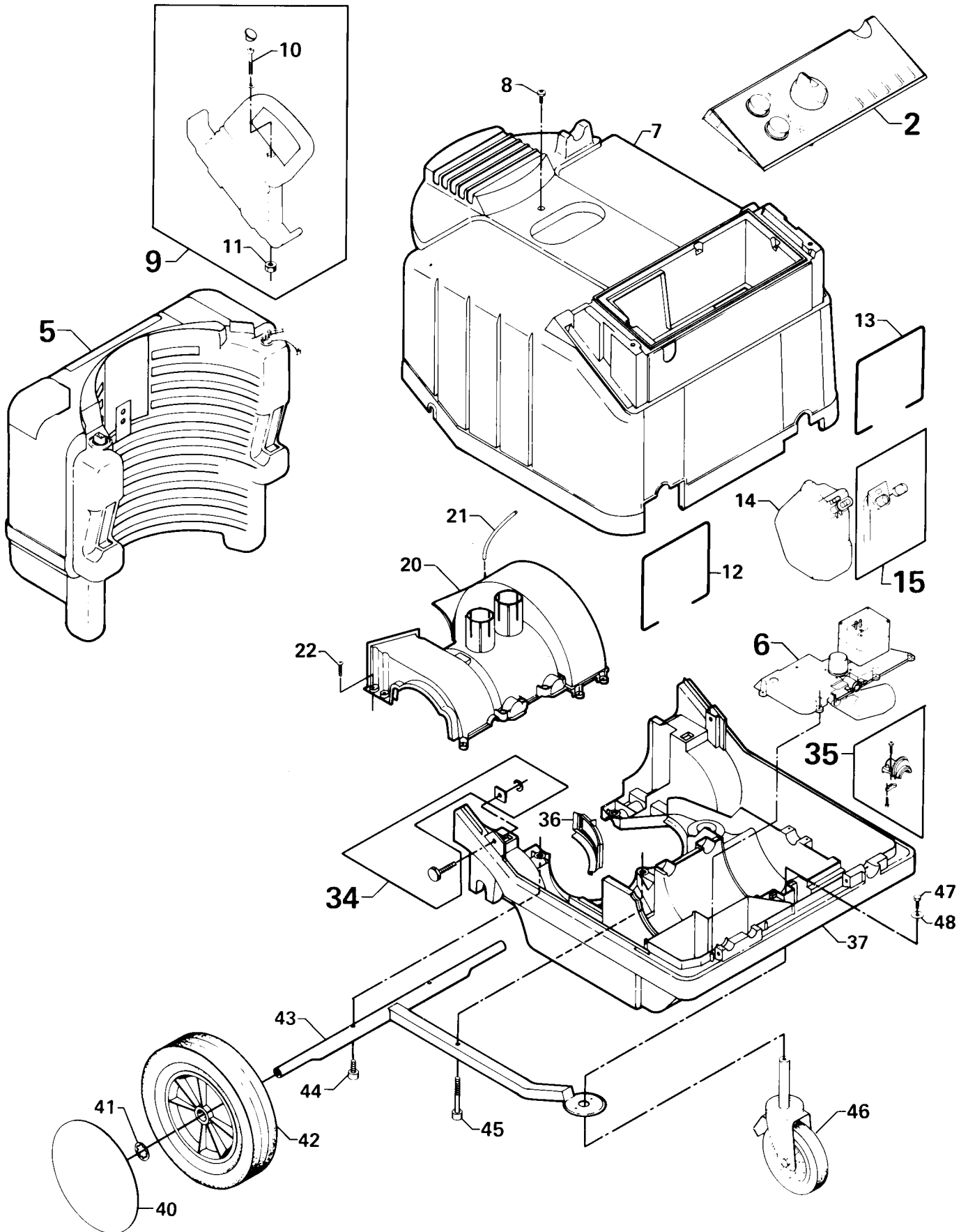
Opening pressure	115 bar
Pump pressure	100 / 4 bar
Nozzle pressure	86 bar
By-pass pressure	8 bar
Water quantity at min./max. pressure	11.0 / 10.2 l/min.
Water quantity at steam	5.6 l/min.
Pump pressure at steam	29 bar
High pressure nozzle	1505 = 1.35 mm
Max. temperature of inlet water	30°C
Inlet pressure, max.	10 bar
Chemical injector	890 mbar
Injector, back pressure, max.	23 bar
Power absorbed (pump pressure)	3.2 kW
Power consumption (by-pass pressure)	6.5 amp.
Power consumption (pump pressure)	15.5 amp*
Insulation class	F
Density	IP45
Motor r.p.m. (pump pressure)	2820 r.p.m.**
Sound pressure acc. to ISO 3746	77 DB(A)
Type of piston / diameter	16 mm
Wobble disc no., 50/60 Hz	56(6) / 59(9) - GB: 62(12)
Type of oil / quantity	Castrol Alphasyn-T 150, 250 ml.
<p>* 15.5 amp., 1x220V, 50Hz (12.8 amp., 1x240V) ** 2820 r.p.m. at 50 Hz (3420 r.p.m. at 60 Hz)</p>	

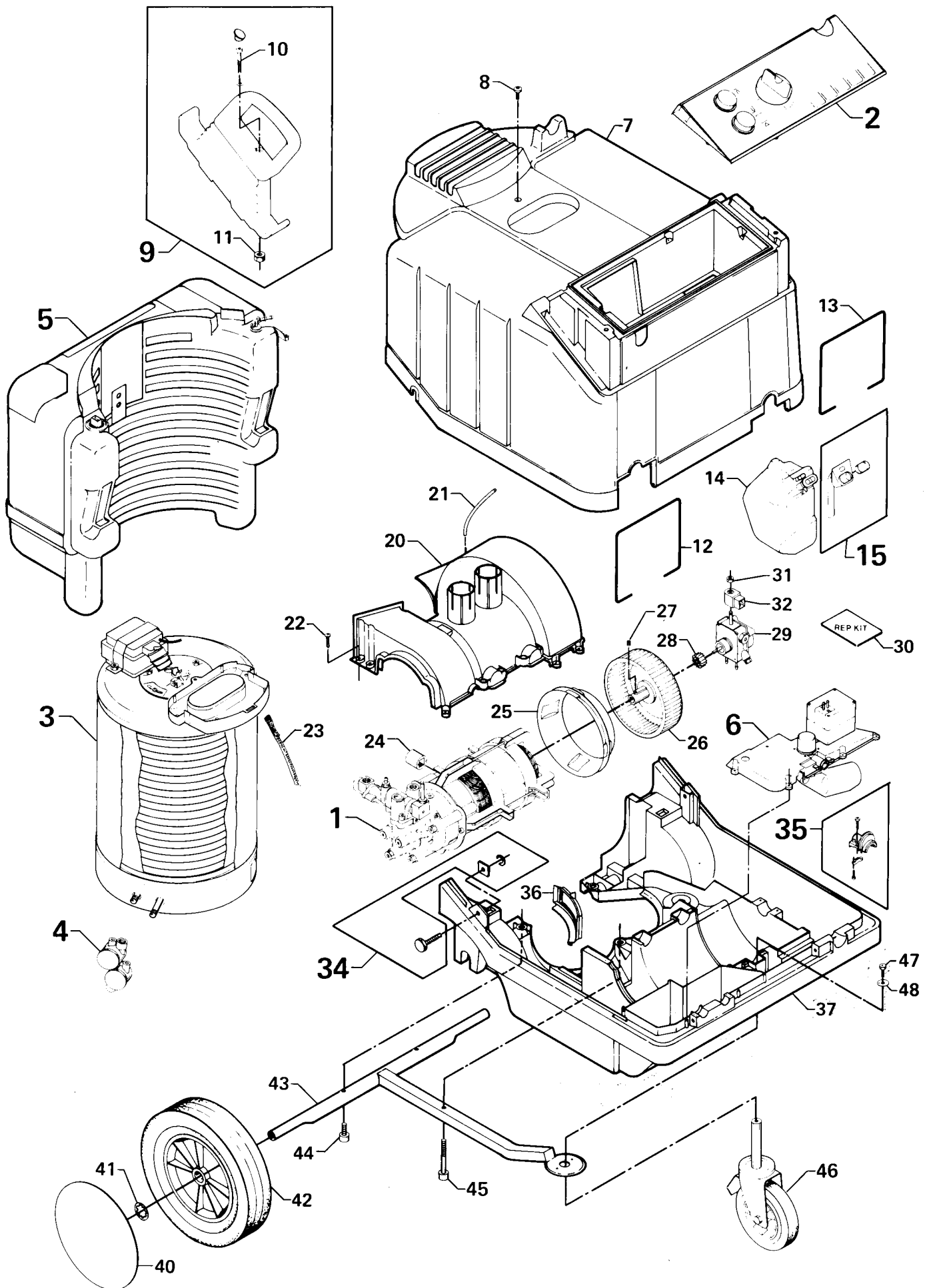
Boiler effect	52 kW
Water outlet temp. at max. water quantity (12°C)	80°C (176°F)
Oil consumption at max. water quantity and temp.	4.4 kg/h - 5.3 l/h
CO ₂	10 - 12%
CO	50 - 100 ppm
Temp. flue gas at 20°C ambient temp.	160 - 200°C
Smoke scale number	Max. 1
Flue gas loss	Max. 10%
Oil nozzle type (1.25 US.gal/h)	4.71 kg/h - 80°H
Oil pressure	10 - 11.5 bar
Boiler tube / measurements	Seamless st35.8 / ø16x2.3 mm
Heating surface	1,8 m ²
Blast pressure	55 mm VS
Quantity of inlet air	Approx. 75 m ³ /h
Excess of air	1.3 (30%)
Outlet flue gas	130 m ³ /h at 200°C
Tank capacity max./min.	35 l / 6 l

Cabinet

Structure

B





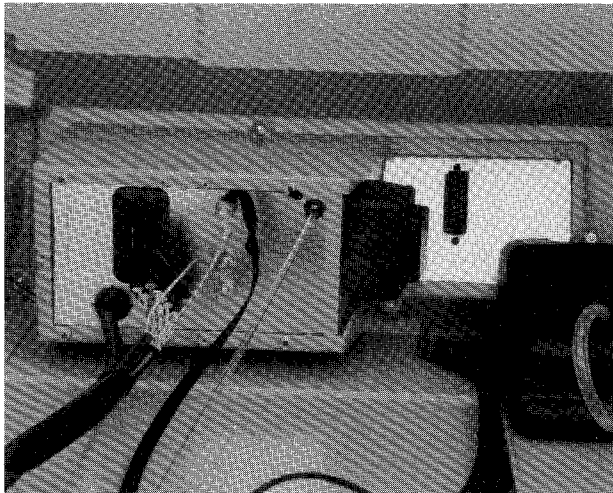
The 3 main components of the cabinet are at the same time the skeleton and covering of the machine:

Top cabinet: Containing el.-box with electronic control. The material is PP PLASTIC.

Bottom cabinet: Containing water tank, motor pump suspension and fan housing, as a part of the construction. The material is PP PLASTIC.

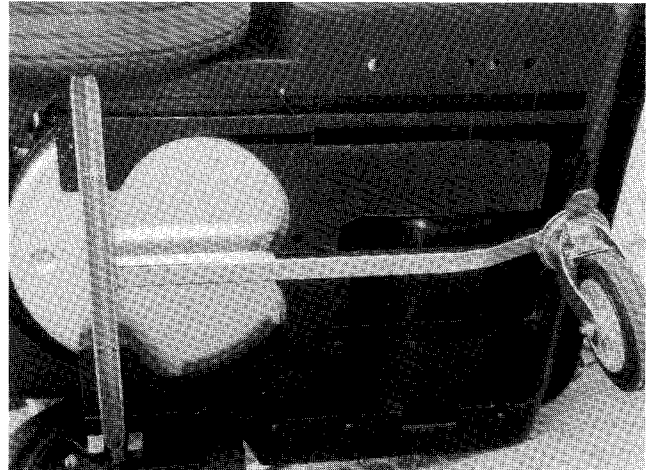
Front cabinet: Consists of an oil tank for fuel, container rack, and dosing for detergent. The material is PE PLASTIC.

Top and bottom are assembled with 2 screws, one in each side, and also a screw in the top at the opening of the chimney. The two parts are hinged together with 2 cabinet hinges placed internally at the connection side for water and electricity.

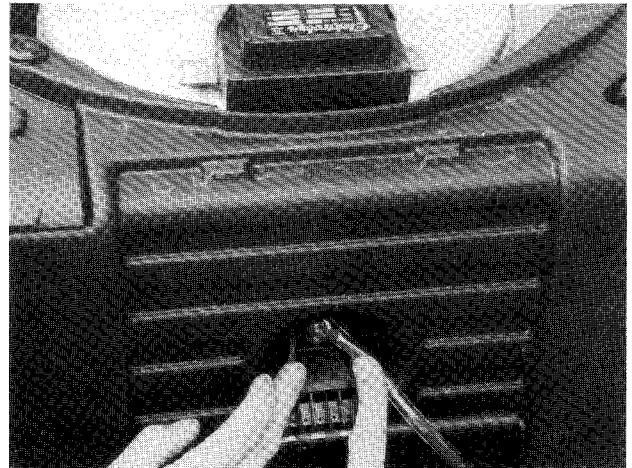


A belt between water shield and top cover limits the opening and keeps the cabinet in place. The cover of the el.-box is mounted from the underside with 4 nuts.

The cover of the water tank is mounted complete with float valve, water inlet filter, and quick coupling. On the cover a softening pump is mounted, which sucks from a tank mounted in the top cover.



The boiler is placed in the bottom and attached with 3 bolts to a wheel bracket of galvanized steel tube, which is placed under the bottom.

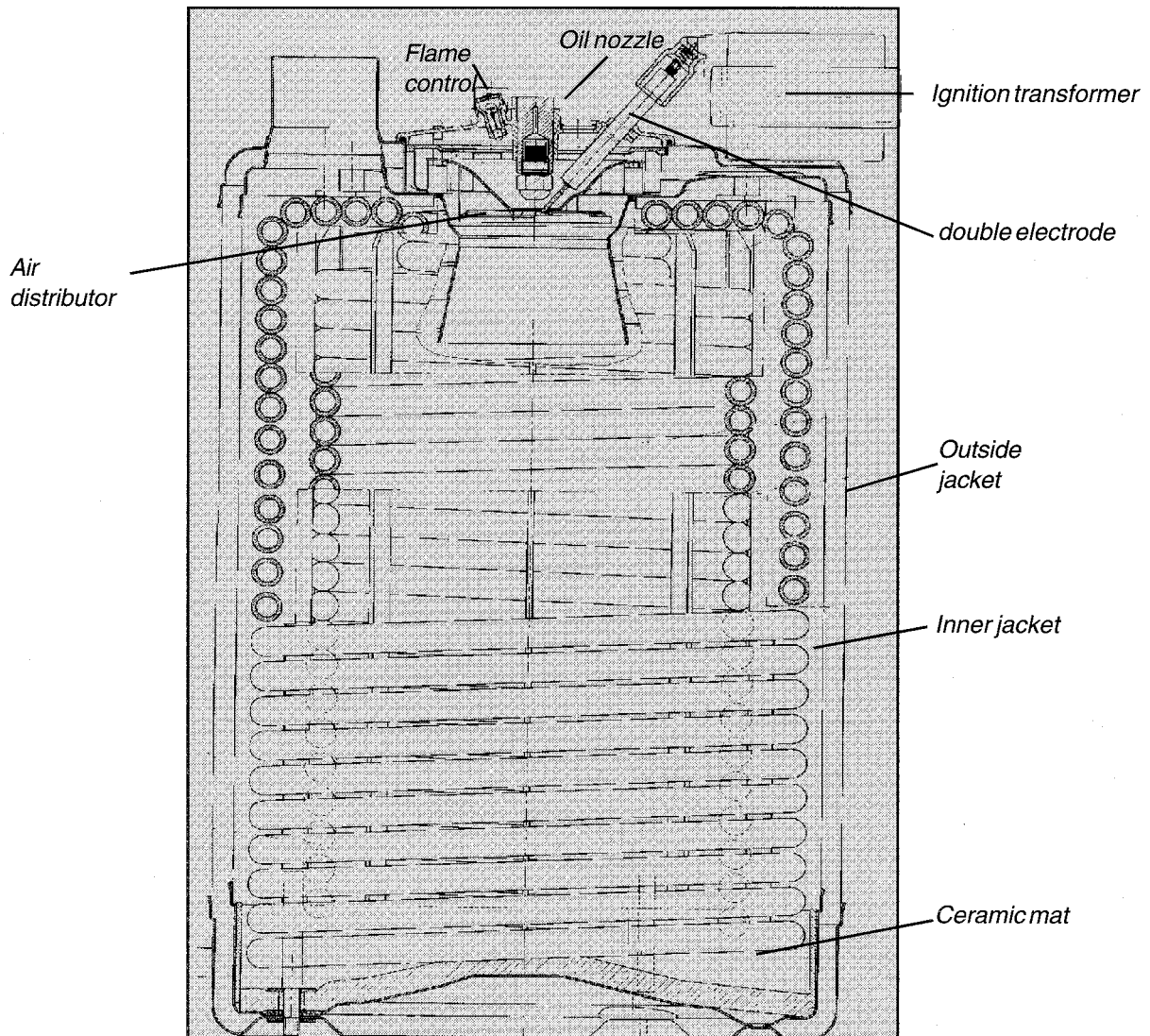


The oil tank is mounted onto the boiler with a screw placed behind container rack, and clipped onto the bottom with 2 hooks.

In the tank filler screen, level filter, filter holder with filter, suction hose, and also a hose connection with hose for return oil are placed.

The boiler is the heat generating part of a hot water machine. It consists of a labyrinth-constructed tube coil, which encloses the combustion chamber.

The tube coil is enclosed by a double container with boilerjacket, bottom, and top in a sandwich construction, between which the combustion air is pressed in to the combustion. An insulating mat placed in the bottom of the boiler makes sure that the inner bottom, among other things, is protected from superheating.



The two ends of the tube coil have been lead out through the side in the bottom. Tightness between tube and container is achieved with ceramic felt disks innermost against the hot side, and teflon sleeves placed against the outer boiler jacket.

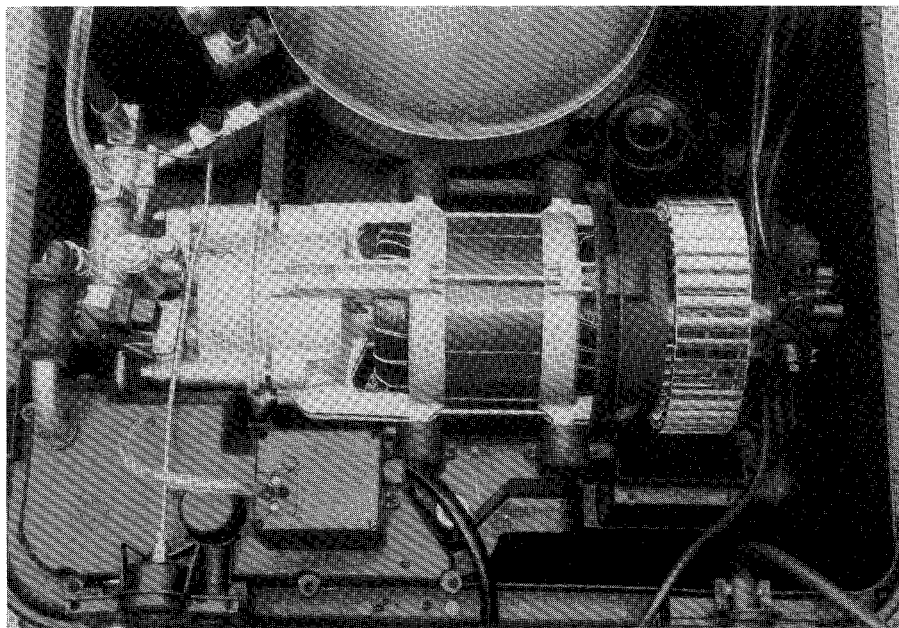
The oil burner is mounted as an integrated part in the top cover on the top of the boiler. It consists of an oil nozzle, an air diffuser, an air control throttle, and a double ignition electrode which is in direct connection with the ignition transformer mounted on the top of the boiler.

The top cover also contains a flame control, an inspection glass, and an air adjusting screw.

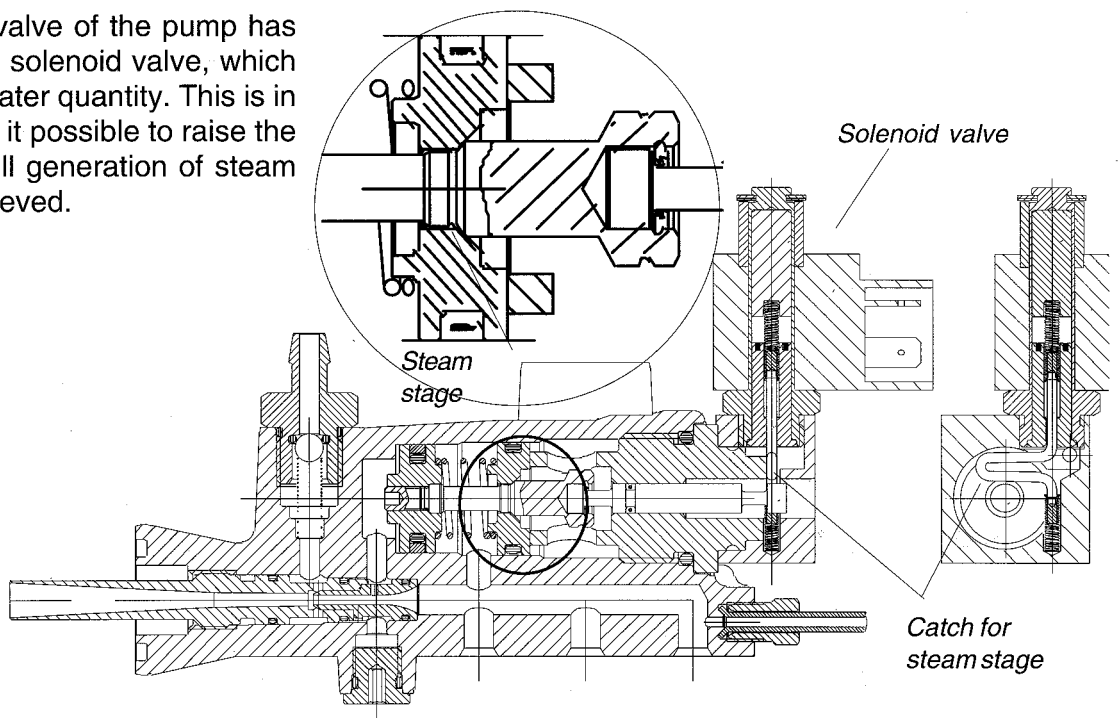
With a few exceptions the 40H motor pump is identical to the motor pump unit on the 40C machines. Therefore, please see this chapter in the 40C manual.

On the hot water machine the motor pump is placed horizontally, and in addition to the pump the motor also powers an oil pump and a powerful fan. The fan sucks a cooling air flow past the motor and presses pre-heated air into the combustion chamber of the boiler.

Unlike the 40C motor the 40H motor is equipped with a temperature sensor, which is placed in the windings. This extra safety has the purpose of preventing that the motor is superheated, e.g. if the air passage of the boiler is blocked.



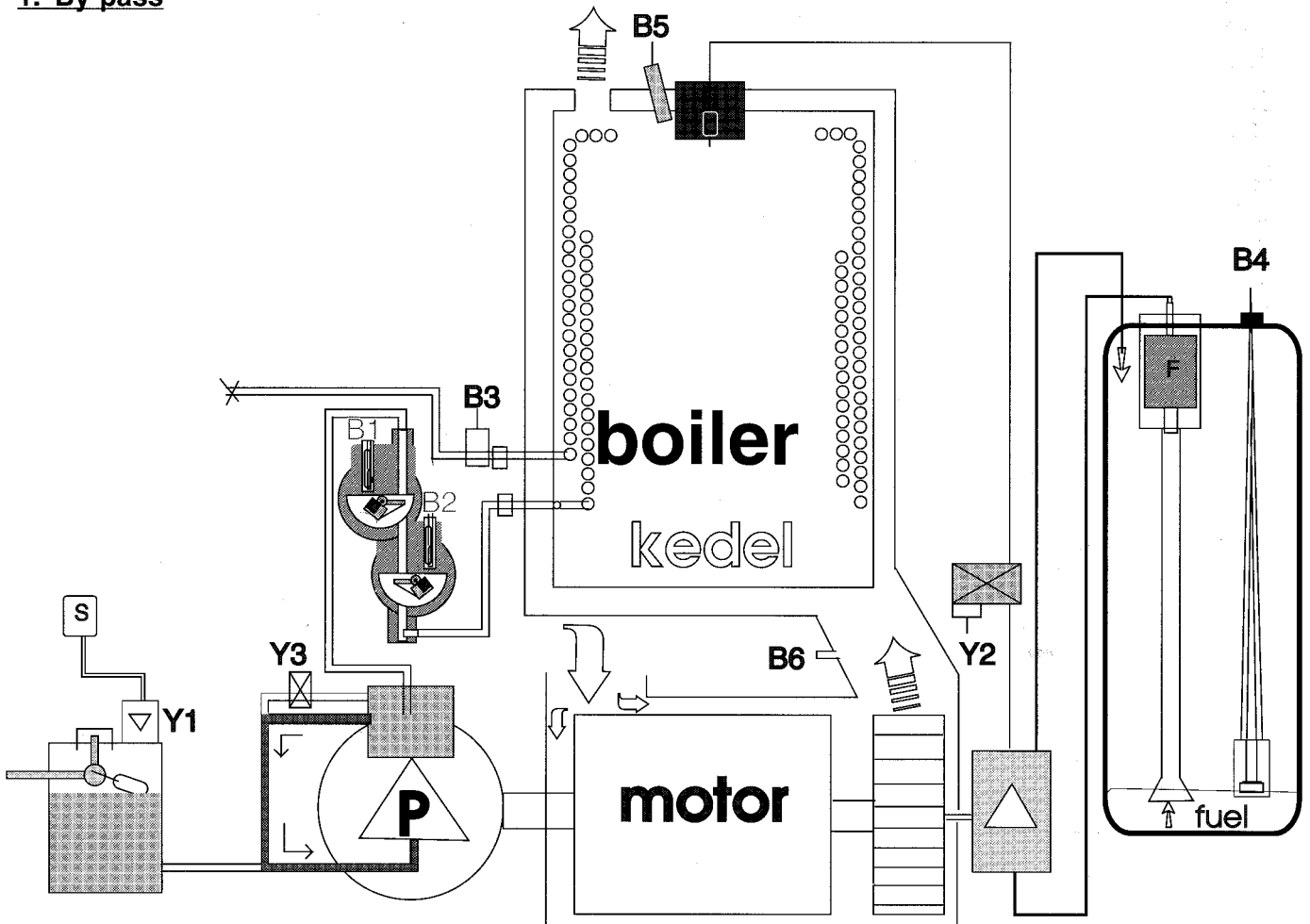
The by-pass valve of the pump has been added a solenoid valve, which controls the water quantity. This is in order to make it possible to raise the temperature till generation of steam has been achieved.



The 40H hot water machine has 3 normal operating states:

1. By-pass
2. Operation at max. water quantity
3. Operation at reduced water quantity

1. By-pass

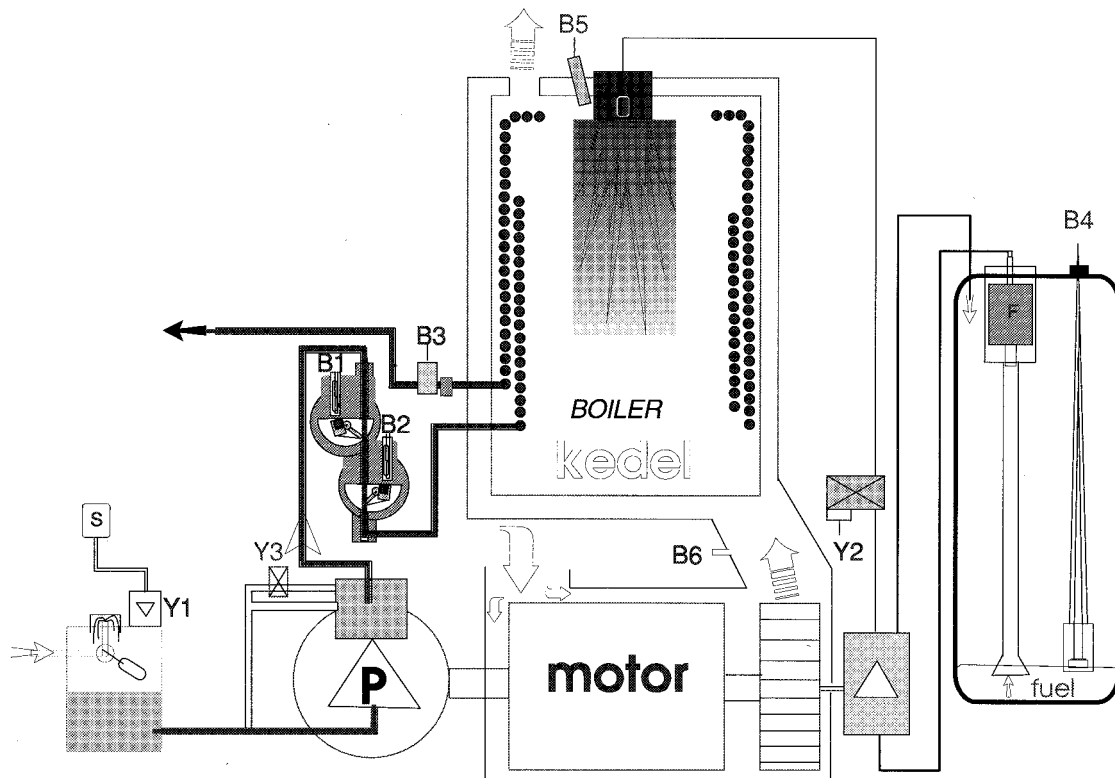


When the pump is started with closed spray handle, the machine runs in by-pass. That means that the by-pass valve is completely open between the outlet and inlet of the pump, and in this way circulates the water at a low pressure, approx. 10 bar.

As there is no flow from the pump through the boiler, the flow switches B1 and B2 are open, and consequently, Y2 will remain closed. The same goes for the fuel oil pump, which recirculates to tank. (If this state continues for approx. 5 minutes, the machine will stop automatically).

2. Operation at max. water quantity

(Starting point: the machine runs in by-pass)



If the temperature selector is set at a temperature below 100°C, the solenoid valve Y3 will be inactive. That means that when the spray handle is opened, the max. water quantity of the pump will pass through the 2 flow switches B1, and B2, and on through the boiler and out.

If the set temperature is higher than the temperature the sensor B3 registers, the solenoid valve Y2 will open for the fuel oil to the nozzle. As the electrodes run with constant spark regardless of operating state, the combustion will start.

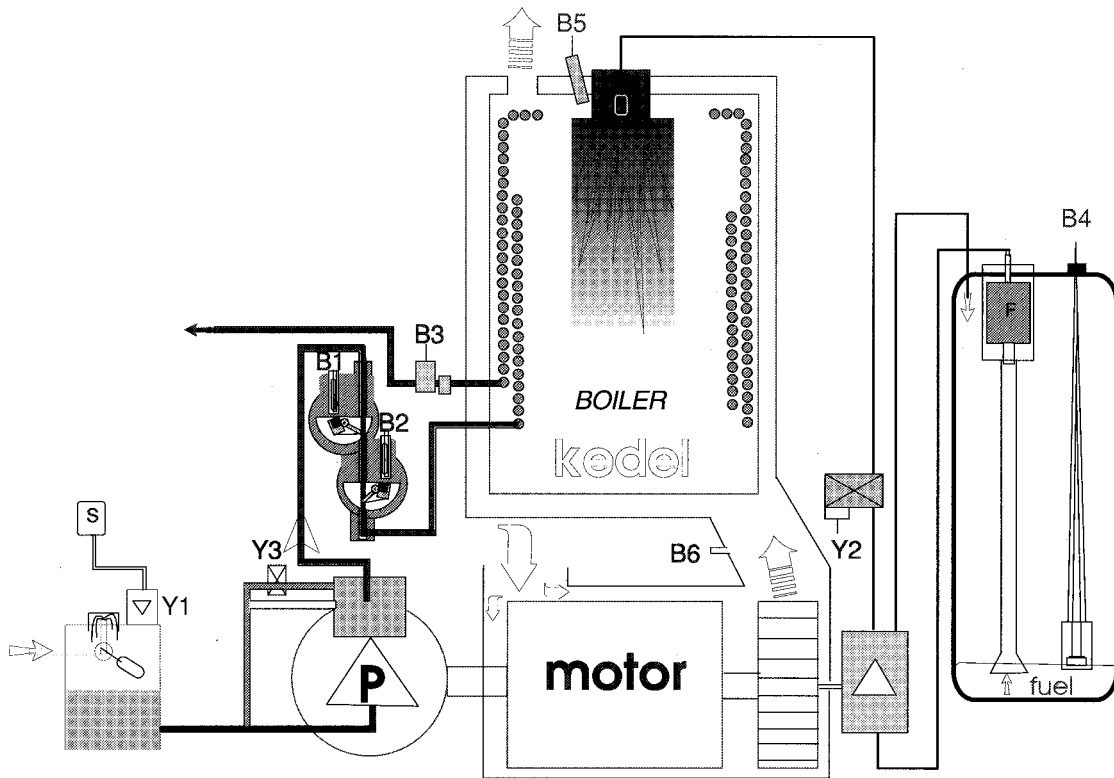
When Y2 is activated also the softening pump Y1 will be active and add No Scale to the water in the tank. The quantity which is added is adjustable from 25 ml/hour to approx. 50 ml/hour, corresponding to 30 dH to approx. 40 dH. Pre-adjustment from KEW is minimum.

Under normal circumstances the combustion will stop automatically, when the following 3 conditions are present:

1. The spray handle is released: hereby the flow through B1 and B2 ceases, and Y2 closes.
2. The water outlet temperature reaches the set value: when B3 registers the temperature, Y2 will close.
3. The level of the fuel oil tank reaches the lower limit: level sensor B4 cuts off before the suction pipe is emptied of oil. Y2 closes, and a lamp shines in a tank symbol on display panel.

3. Operation at reduced water quantity (steam operation)

(Starting point: the machine runs in by-pass)

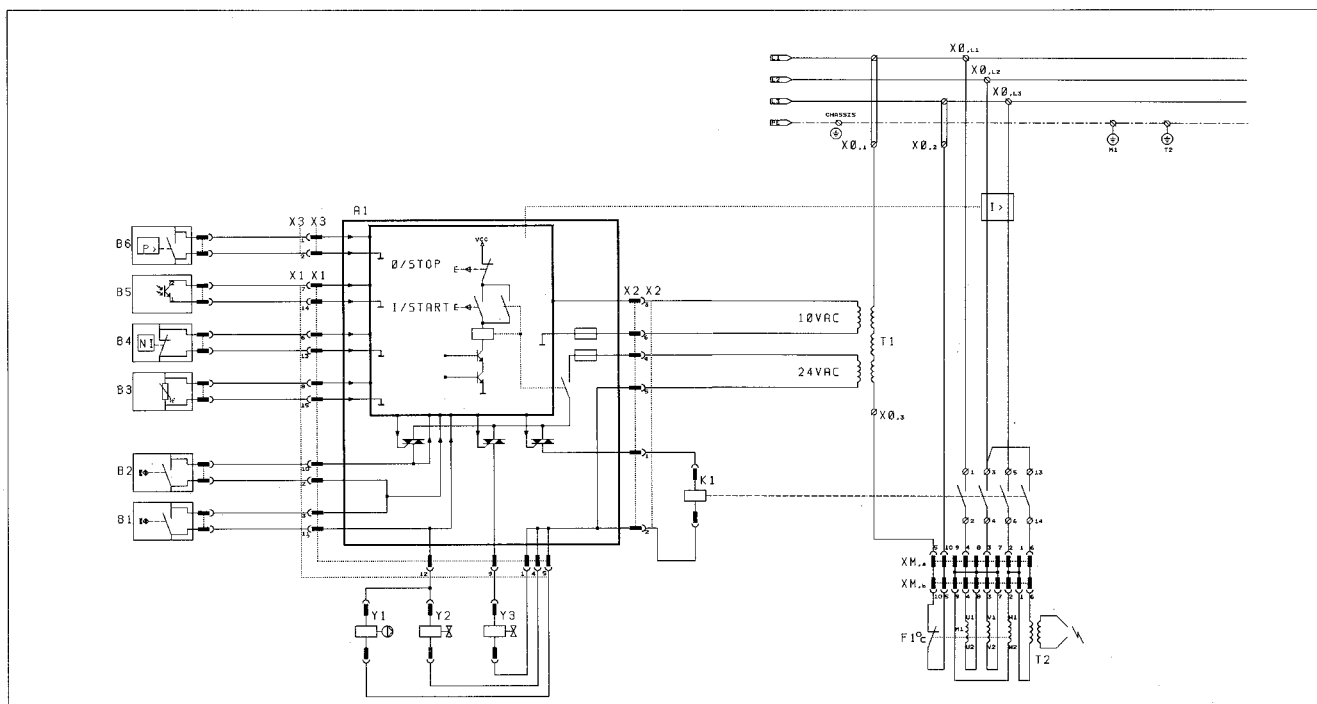


If the temperature selector is set above 100°C, the solenoid valve Y3 activates a catch, which will prevent the by-pass valve from closing completely when the spray handle is activated. That means that approx. half of the water quantity of the pump continuously runs in by-pass in the pump, while the rest = the reduced water quantity passes through the boiler. Hereby the possibility of reaching a higher temperature of the outlet water from the boiler has been achieved. As a precaution Y3 is locked in an active position, until the water temperature is below 100°C.

The purpose of the electrical control is to co-ordinate the information which the various sensors give, and from this decide whether the furnace is to burn, whether the machine is to be stopped, or whether the machine is to run with steam stage in or normal operation or cold operation.

All information about type of operation and working hours, and also the cause of stoppage are stored in the microprocessor of the PC board A1 and can be recalled when required.

The PC board is equipped with voltage from a control transformer, which supplies 10V AC to the information system and 24V AC for operation of contactor K1, and solenoid valves Y1, Y2, Y3. and the B1 and B2.



- B1 and B2** Are reed contactors which are placed in the flow contactor, which is a small switch which makes contact, if it is influenced by a magnetic field. E.g.: a magnet KEW No. 1813724 in a 4 mm distance is to activate the switch.
- B3** Is a temperature sensor of the PT500 type, which at a temperature of 20°C has a resistance of approx. 539Ω and at a temperature of 100°C approx. 692Ω .
- B4** Is a level switch, which is placed in the fuel oil tank. It consists of a fluid with a metal disk which makes contact with 2 distribution contact points when the level is at a minimum.
- B5** Flame sensor.
Is a photo transistor, which reduces its resistance when influenced by light, e.g. light from a regular 60W light bulb. In a distance of 10 mm the resistance will be between 900Ω -> 1200Ω . In the dark the resistance is approx. 100 KΩ -> 120 KΩ.
- B6** Phase sequence pressure switch.
Makes contact at pressure higher than 25 mm VS. It is placed in the el.-box and is in connection with the pressure side of the fan via a plastic hose.
When the pump is running correctly, the blast pressure is higher than 50 mm VS. The reverse direction of rotation gives less than 10 mm VS.

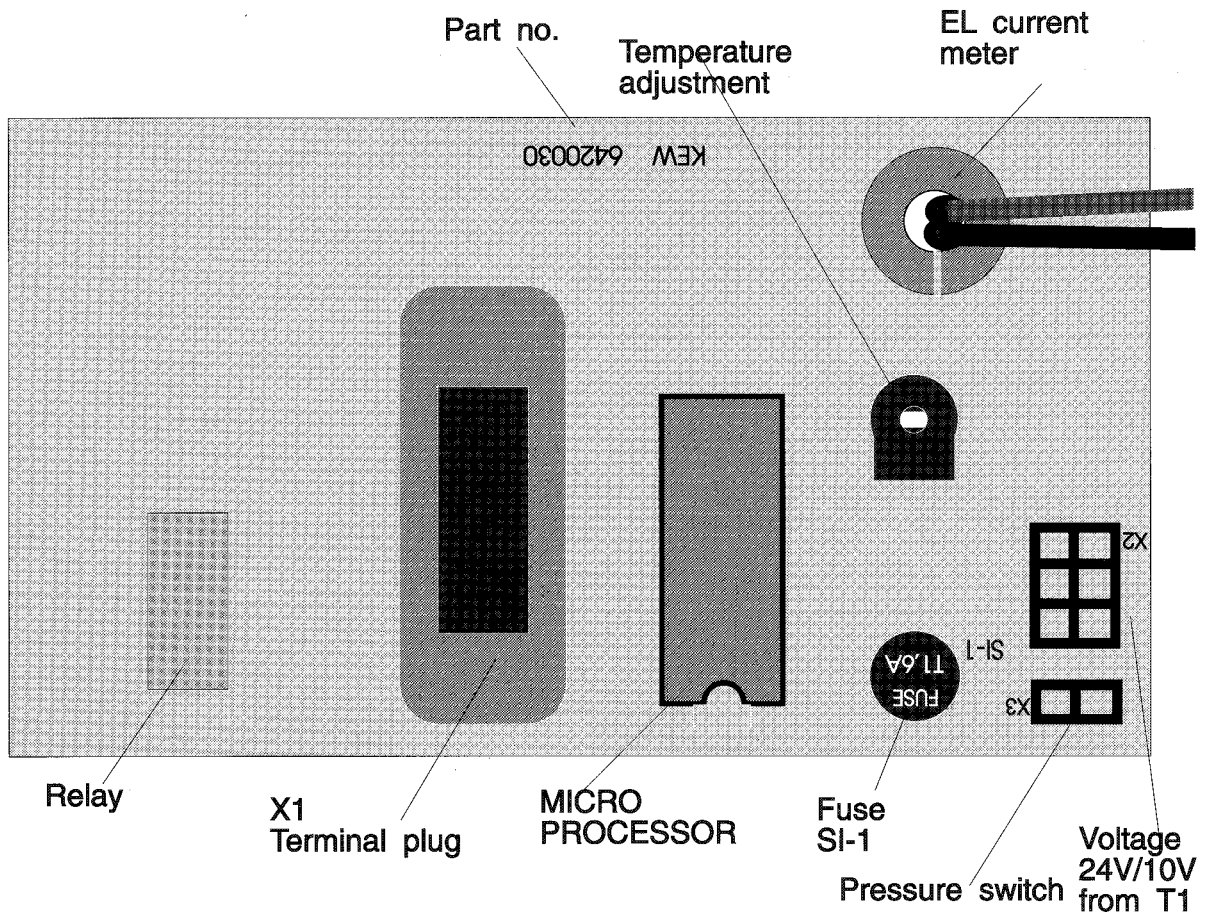
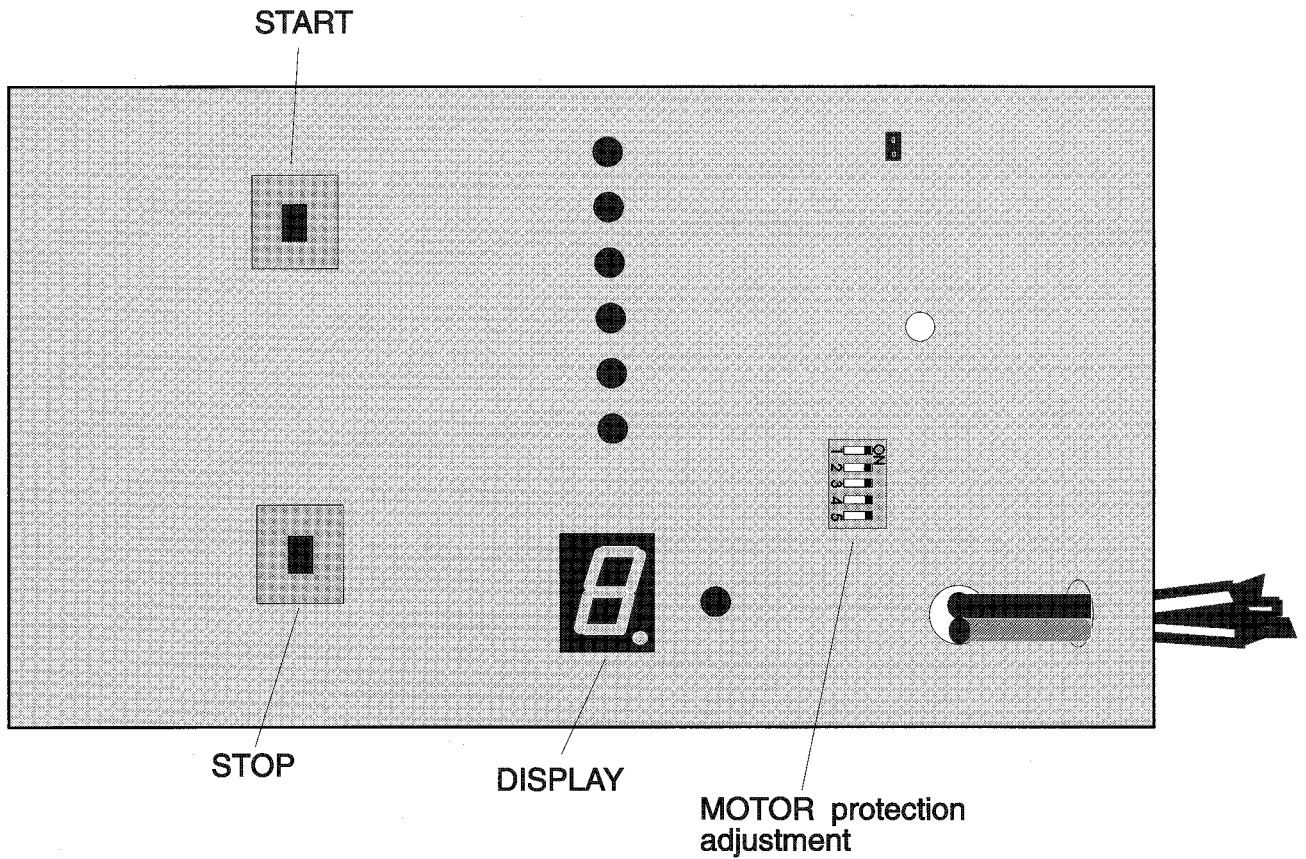
- MP** Motor protection for protection of the motor against overload. Physically it is placed on the PC board.
- T2** Ignition transformer is ON, when the motor is running.
- F1** Temperature sensor in the windings, which is ON, when the temperature is below 160 °C.
- Y1** The softening pump (24V) pumps "No scale" from container to water tank. The pump is electrically arranged in parallel to Y2, and consequently only active, when the furnace is burning. The pump capacity is controlled with an incorporated timer.
- Y2** Solenoid valve (fuel oil) (24V).
Opens/closes for the fuel oil from the oil pump to the oil nozzle and is controlled by various sensors via the PC board.
- Y3** Solenoid valve (steam stage) (24V).
Controls the closing of the by-pass valve. When the temperature selector is set at more than 100°C, approx. half of the water quantity is recirculated through the pump.
- K1** Contactor (motor relay 24V).

Breaks and makes voltage to motor and ignition transformer.
- T1** Mains transformer (control transformer) 24V/10V.

PC board layout

Function

C



The purpose of the boiler is to transfer as much as possible of the energy of the oil to the water in the shape of a temperature increase, in such a way that the environment is affected as little as possible by the process. For control of this requirement the following maximum values have been set from international regulations.

Flue-gas loss in percentages of fired quantity of energy: (12%) 10%

Smoke scale number in accordance with BACHARACH smoke scale: (3) 1

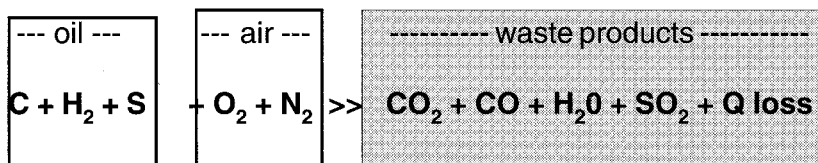
CO in flue gas: (220 ppm) 100 ppm

(previous demands)

The combustion process

A complete combustion of oil can in its most simple form be written: $C + O_2 > CO_2 + Q (= \text{heat})$. C is pure carbon, O_2 oxygen, and CO_2 is the pure waste product carbon dioxide. The composition of the oil is considerably more complex, e.g. contains the oil besides carbon also sulphur S and hydrogen H. In addition to 21% oxygen O the air also contains nitrogen N_2 , which by and large makes up for the rest of the content.

The combustion will consequently look like this:



Of harmful waste products CO is the most dangerous one, as very small concentrations may be deadly. CO is the result of an incomplete combustion, e.g. if there has not been sufficient air for the process. A more visible proof of this is sooting smoke.

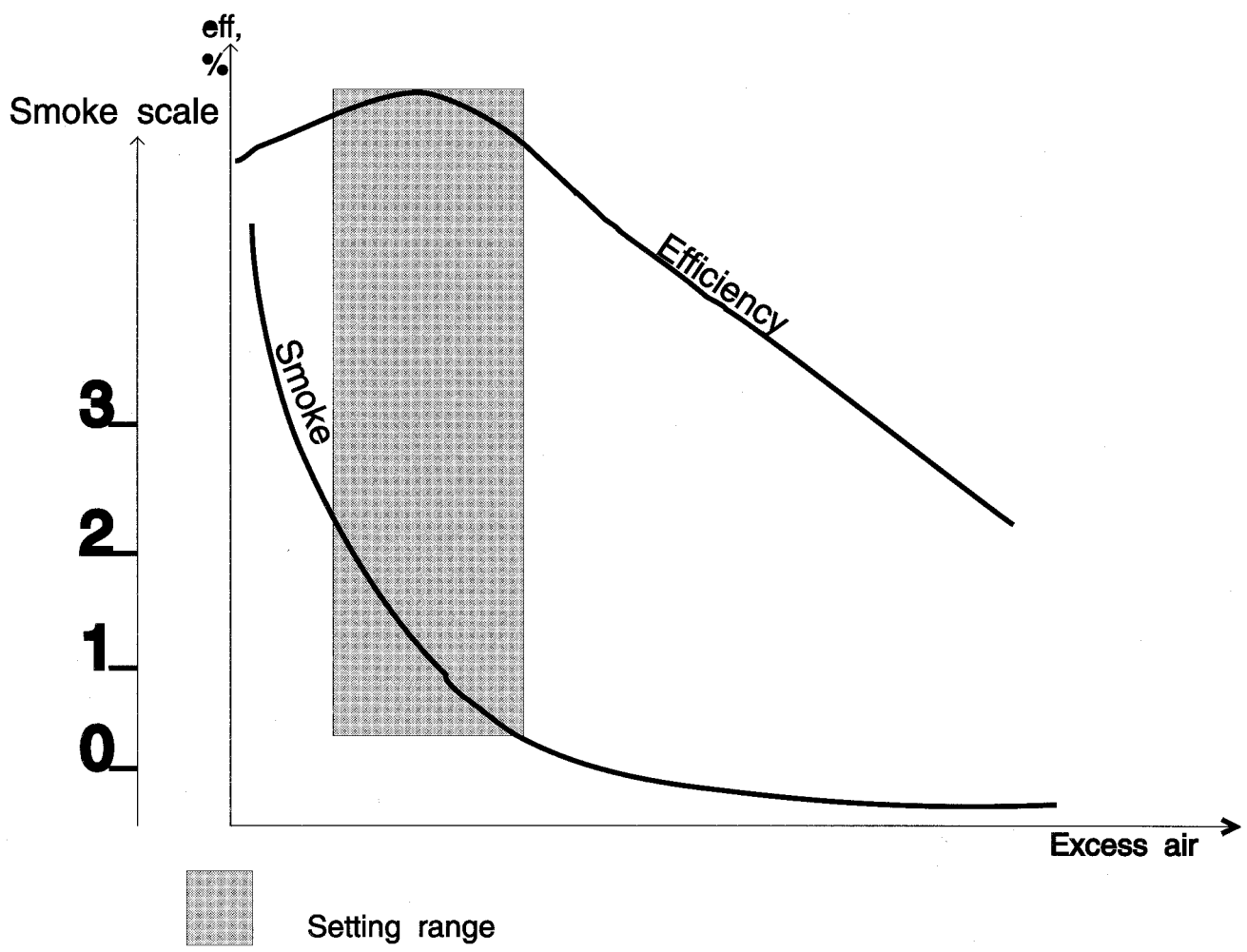
H_2O is water in the shape of steam and is, of course, harmless, unless it condenses in the boiler.

SO_2 sulphur dioxide will not be unpleasant, until it has been further converted into SO_3 , and together with the steam in the flue gas form H_2SO_4 (sulphuric acid), which results in corrosion in the boiler elements when it condenses.

N_2 nitrogen passes unaffected through the boiler. Unfortunately, it gets heated up, and is in that way the most essential cause of flue-gas loss.

CONCLUSION

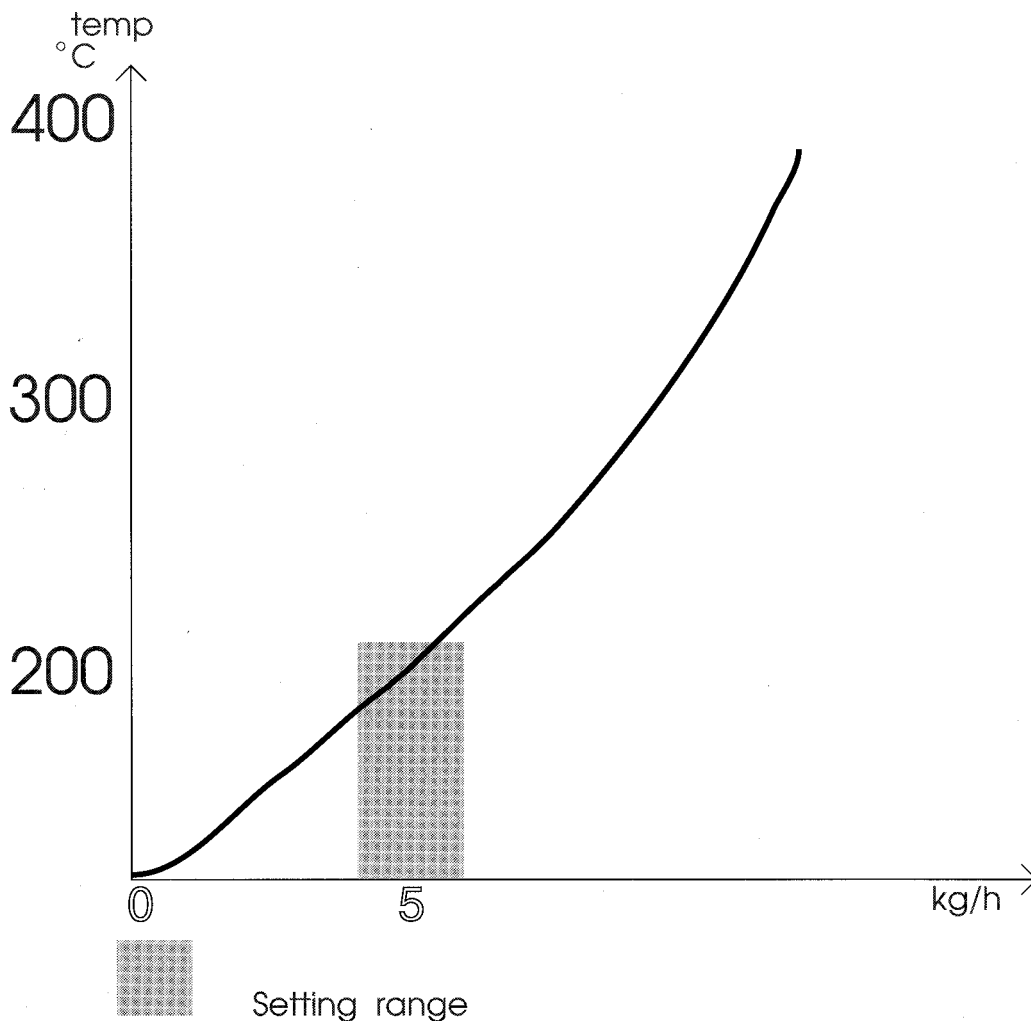
In order to obtain the best combustion with the lightest loss, the quantity of air supplied is to be as exact as possible.



In the 40H boiler the heating surface is approx. 1.4 m², i.e. the surface of the boiler tube, which receives heat from the burning oil.

As only a certain quantity of heat can be transferred per m², when it is to be done in an efficient way, it means that the amount of oil which is pumped into the boiler, just as the quantity of air, must be accurately adjusted.

On the diagram below it clearly appears that the flue-gas temperature rises steeply, when the fired quantity of oil is increased.



If the temperature gets too low there is a risk of condensation formation, and soot coating. If the temperature gets too high the efficiency will fall, and the surface of the pipe is loaded disproportionately with damage as a result.

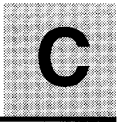
Conclusion:

The combustion process of the boiler is adjusted with 2 parameters, i.e. quantity of air and quantity of oil.

In order to get a general view of where you are in the adjustment, it is necessary to measure the flue-gas temperature and the CO₂ percentage in the flue gas.

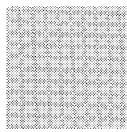
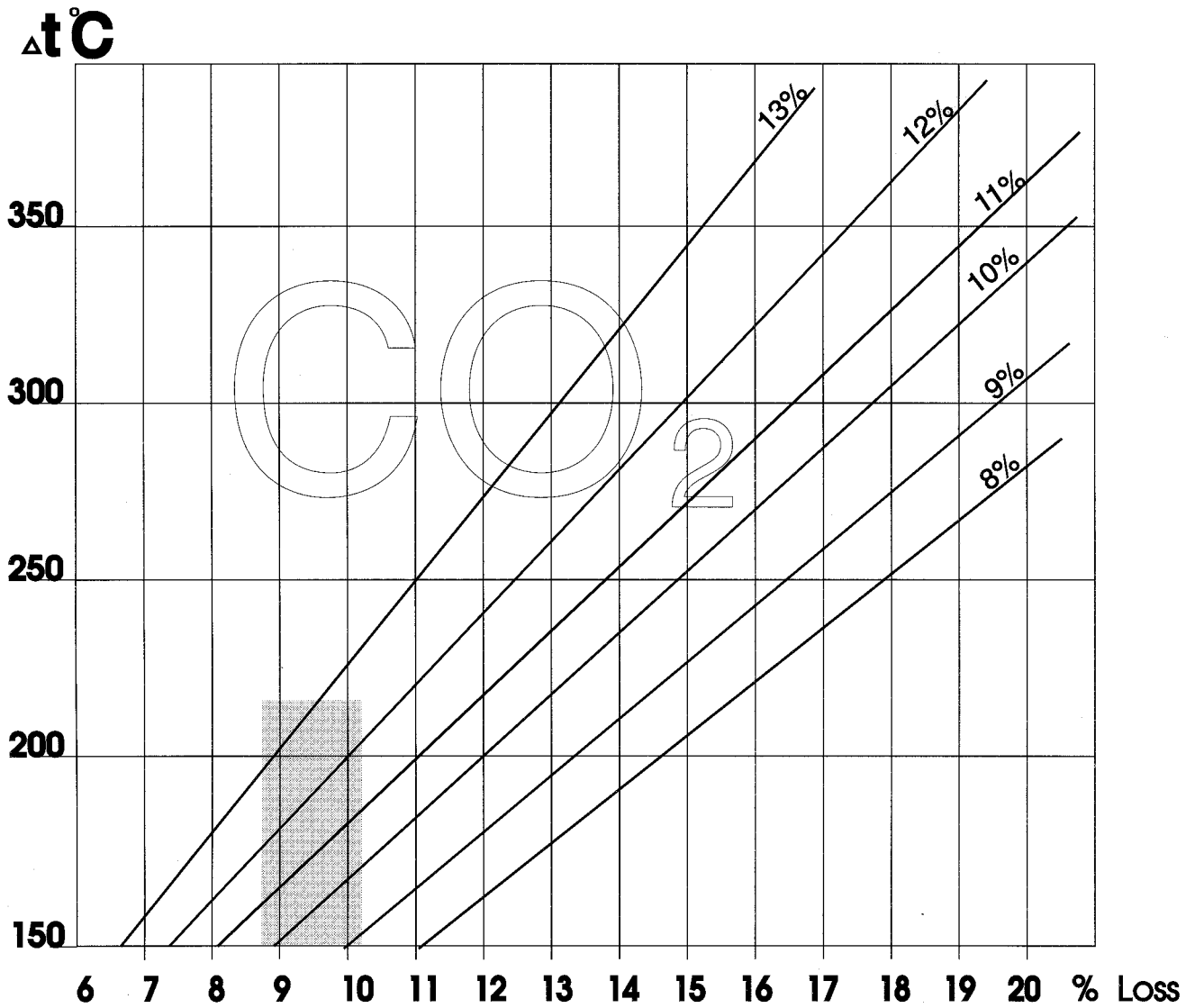
Combustion process

Function



The CO₂ percentage tells us how well the combustion has succeed. As there is only 21% O₂ in the air, and the oil contains other things than pure carbon, it will be possible in practice to achieve a maximum of approx. 13% CO₂.

In order to find the best adjustment the below diagram can be used.



Setting range

On a hot water machine the possible faults can be divided up into the following types:

Pump faults

See chapter about trouble-shooting in 40C.

Faults which are read out on display

The fault code includes following readouts, which are symptoms of the direct or indirect cause of faults.

A and  show **abnormal power consumption**

C shows **symptom from temperature sensor**

F shows **symptom from flow control**

L shows **symptom from flame sensor**

P shows **symptom from phase sequence pressure switch**

U shows **PC board fault**

Faults which are not read out on display

Operation disturbances which are due to wear and tear, lack of maintenance or abnormal influences with symptoms such as reduced performance, operation stoppage, starting failure and operation with smoke development.

Fault code		Cause	Remedy	
First	Second	Power consumption xInom./time	Outer check	Inner check
A	1	1,10 30 min.	Voltage, max. variation +/- 10%. The cable of the machine, plug and extension cables. High pressure nozzle for dirt or scale formation.	Pressure faces and bearings of the wobble disc. The bearings of the motor. The opening pressure of the pump. The boiler tube for scale deposits. The mobility of the by-pass valve.
A	2	1,15 12 min.		
A	3	1,20 7 min.		
A	4	1,30 4 min.		
A	5	1,50 2,5 min.		
A	6	1,80 1,2 min.		
A	7	2,00 5 sec.	Breaking of phase. Fuses on network. Frozen pump.	Motor wires for breaking of phase. Ignition transformer. Start/operation capacitor.
A	A	0,00 5 sec.		Fuse SI 1 on PC board. Phase L3 on the secondary side of the contactor. Y1, Y2, Y3, K1. 24V connection on the transformer.
=	≡		Motor protection adjustment under 5 amp.	

Fault code		Symptom	Cause		
First	Second		Outer	Inner	Check
C	1	B3 Temp. sensor disconnected.	Plug disconnected. Wire defective.	Sensor defective.	Resistance at 20°C = approx. 539 Ω.
C	2	B3 Temp. sensor short-circuited.	Wire defective.	Sensor defective.	Resistance at 20°C = approx. 539 Ω.
C	3	B3 Temp. sensor more than 175°C.	Corroded plug connection. High pressure nozzle blocked.	Water quantity too small. Oil pressure too high.	Resistance at 20°C = approx. 539 Ω. By-pass valve. Oil pressure.
F	1	B1 / B2 Flow switch, contact made.	Wires defective. Coil on oil pump disconnected.	Reed switch defective. Flow switches are sticking. Fuse SI 1 on PC board defective. Transformer defective.	The flow switches. The magnet coils Y1, Y2, Y3, K1 + 24V supply. The magnets have different poles.
F	2	B1 / B2 Flow switches disagree for more than 4 seconds.	Air in system.	Sluggishly turning magnet. Defective Reed switch. Bad connection.	Injector. Hoses for leaks. Flow switches.
L	1	B5 Flame sensor disconnected.	Defective connection to flame sensor.	Flame sensor defective.	Check B5, see section C - El. control.
L	2	B5 Flame sensor short-circuited.	Defective connection to flame sensor.	Flame sensor defective.	Check B5, see section C - El. control.
L	3	B5 Flame failure.	Oil filter in tank blocked. Water in tank. Suction hose defective. The quantity of air too high.	Ignition failure. Oil pump defective. Flame sensor dirty. Oil nozzle defective.	Ignition electrode adjustment. Oil pressure. Replace oil nozzle. Air nozzle in bottom cabinet.
L	4	B5 The flame is not put out.	Oil residue in boiler bottom.	Solenoid valve Y2 leaky. Oil pressure too high.	Do + solenoid valve.

Fault code		Symptom	Cause		
First	Second		Outer	Inner	Check
P	1	Phase sequence incorrect.	Air hose connection to B6 open.	Pressure switch B6 defective.	B6 in following data, see under Function, E1. control.
P	2	Phase sequence pressure switch short-circuited.	Air hose connection to B6 closed.	Do	Do
U	1	Microprocessor defective (RAM).	Replace PC board		
U	2	Do (RAM)	Replace PC board		
U	3	Do (A/D)	Replace PC board		
U	4	Do (timer)	Replace PC board		

C	H	A	Unstable timer function. The other functions are O.K.
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Performance faults are not read out on the display. The symptom is reduced performance of the pump effect or the boiler effect. Re. the pump we also refer to 40C, chapter D.

The symptom of reduced boiler effect is a lower water outlet temperature than the set value. The possible causes for this are as follows:

Scale deposits in boiler tube:

Scale formation acts as insulation and reduces heat transfer to the water. The result is raised flue gas temperature = increased flue gas loss.

Cause 1: The hardness of the water > 30 dH

Remedy: Adjust the softening pump. Descale boiler tube.

Cause 2: Softening pump defective.

Remedy: Replace pump. Clean hoses for crystals, replace if necessary.

Sooted boiler tube:

Soot has the same effect as scale deposits, i.e. that they are both insulating against the heat transfer to the water and results in increased flue gas temperature = increased flue gas loss. Other symptoms are that the machine smokes during operation.

Cause 1: Air deficiency.

Remedy: Check:air adjustment, hole plugs in air nozzle in cabinet bottom and fan tightening to boiler.

Cause 2: Bad oil/air mixture.

Remedy: Check oil pressure and oil quality. Replace the oil nozzle. Adjust air diffuser.

Cause 3: Unfinished combustion.

Remedy: Check bottom insulation, boiler top gasket between tube and inner boiler jacket in top cover.
Check burner tube.

Cause 4: Unstable ignition.

Remedy: Check electrodes. Adjust the air quantity (less air).

Cause 5: Leaky solenoid valve on pump. Y2.

Remedy: Check/replace solenoid valve Y2.

Low oil pressure:

Cause 1: Incorrect adjustment.

Remedy: Adjust pump pressure, max. 13.5 bar.

Cause 2: Filter blocked, defective pump.

Remedy: Replace filter/pump. Empty and clean tank.

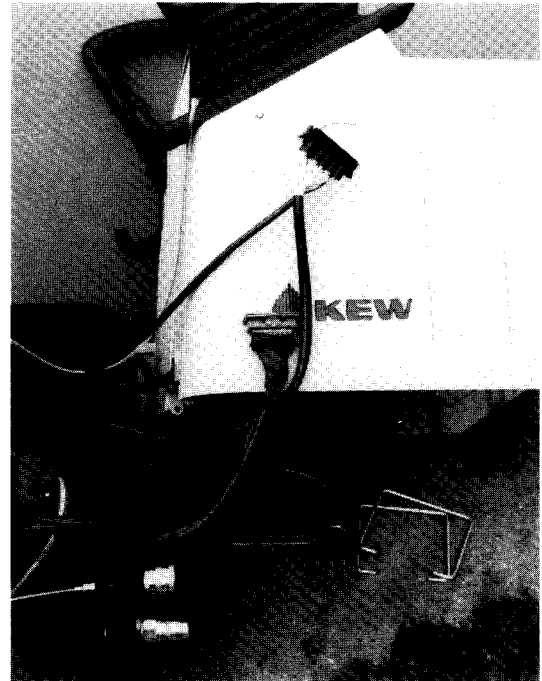
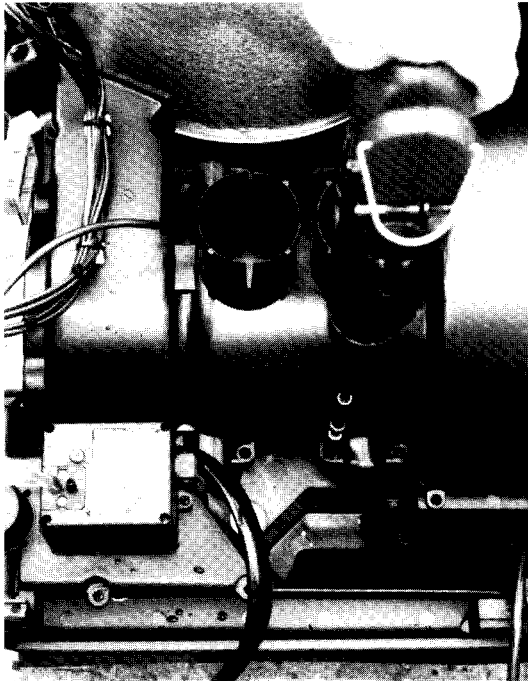
Full water quantity at steam stage:

Cause 1: Mechanical defect of by-pass valve or solenoid valve (is stock).

Remedy: Check by-pass valve.

Cause 2: Electrical defect solenoid valve Y3.

Remedy: Check plug and wires. Replace coil.

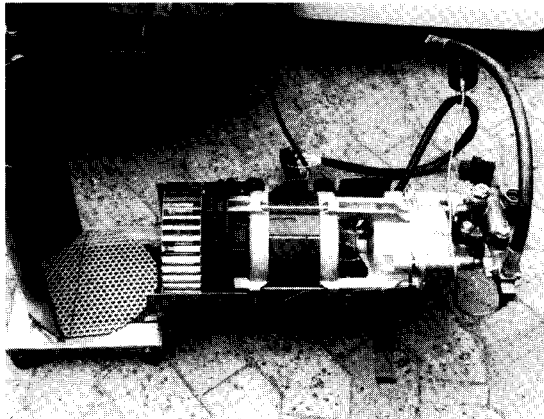


The covering of the motor is dismantled by removing all screws, e.g. by means of an electric screwdriver.

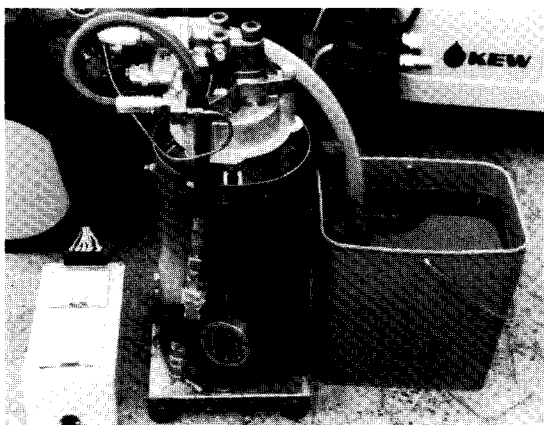
Water inlet and outlet are dismantled.

Electric plug for the motor and solenoid valve for steam are pulled out.

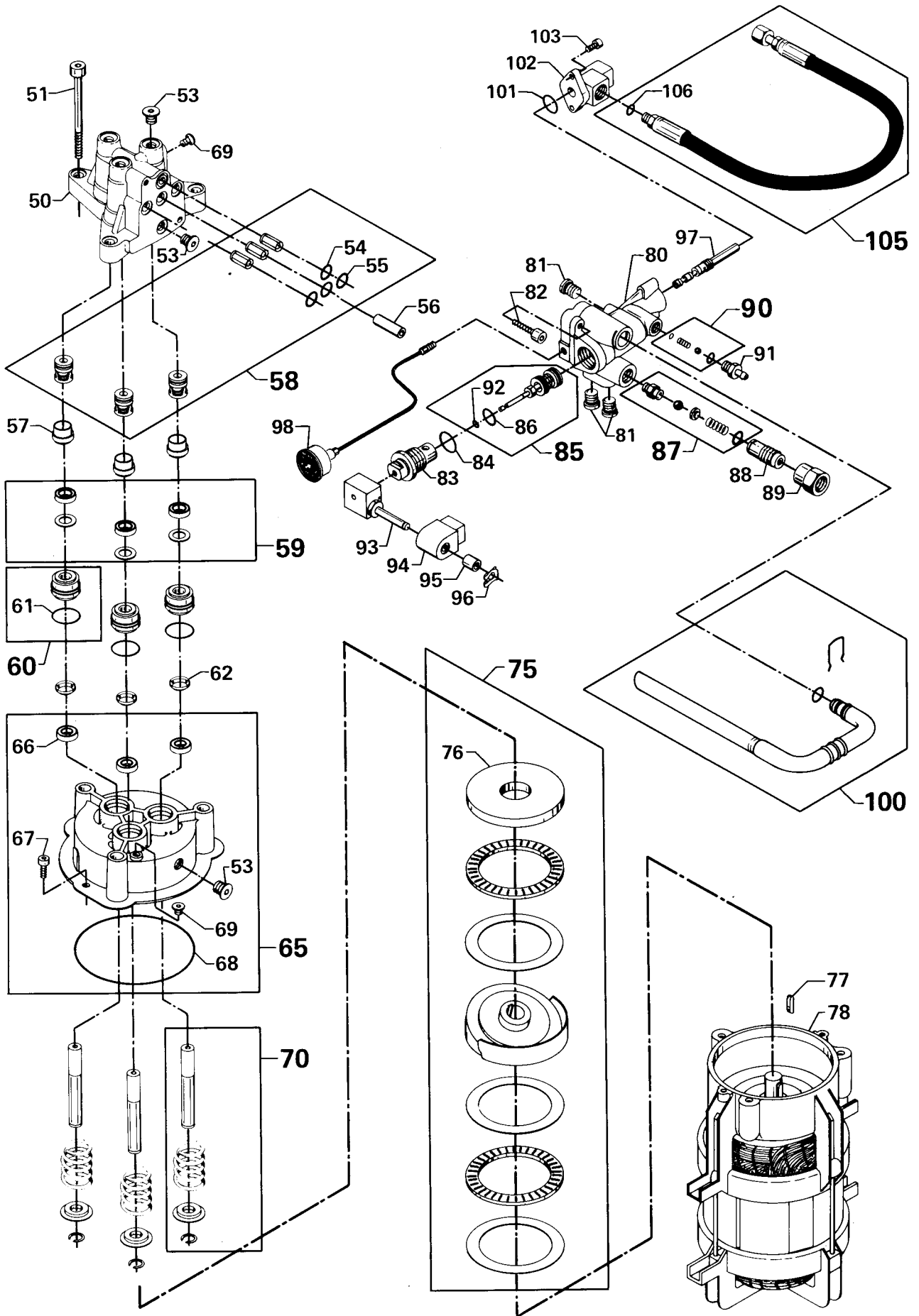
At mounting it is important to make sure that the fan gasket for boiler is in place.

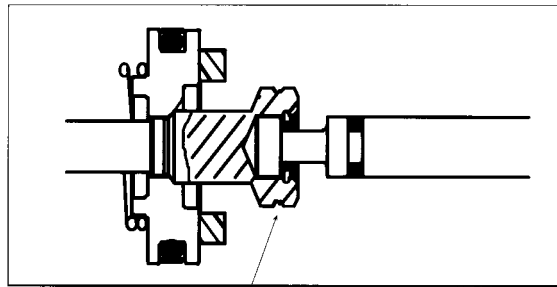
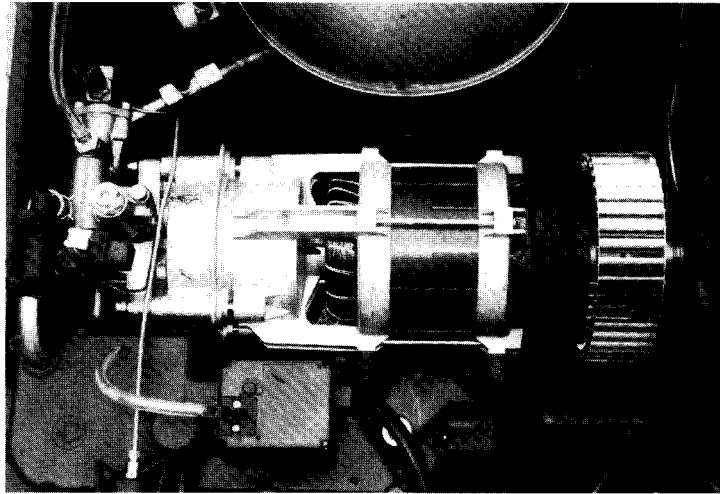


The motor pump unit with fan, but without oil pump, is placed in special tool. From the shown position the oil is drained off by loosening the cylinder bolts.



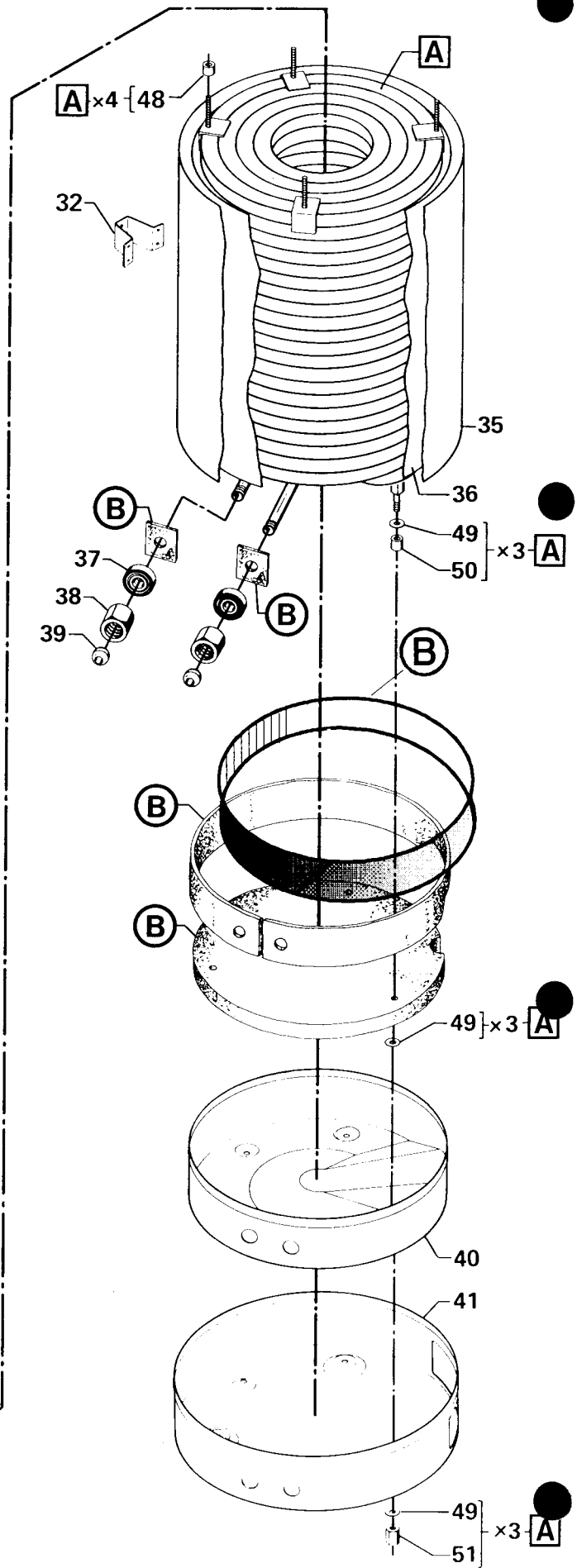
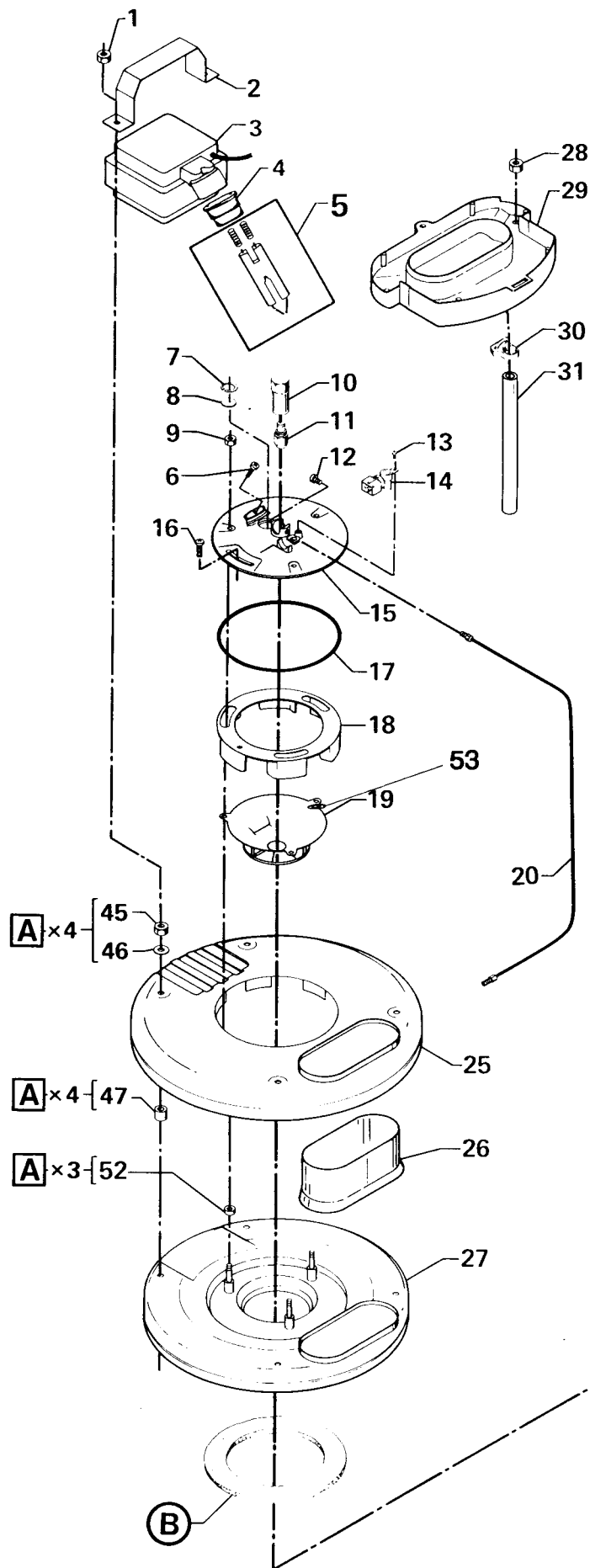
For continued repair and test run, the pump is raised to a vertical position and attached.

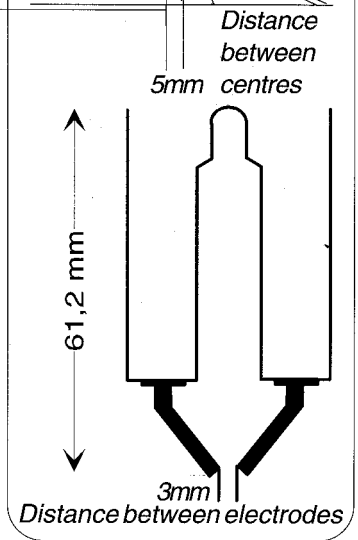
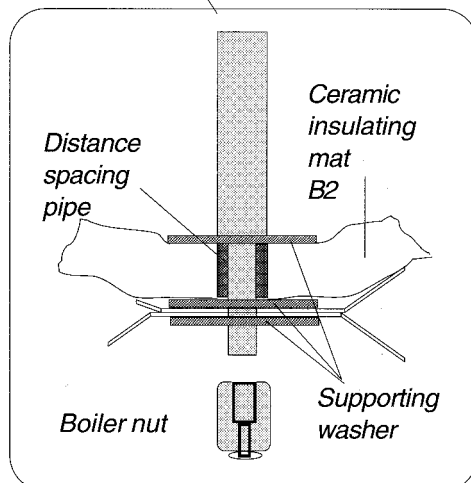
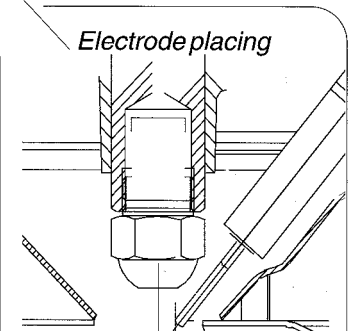
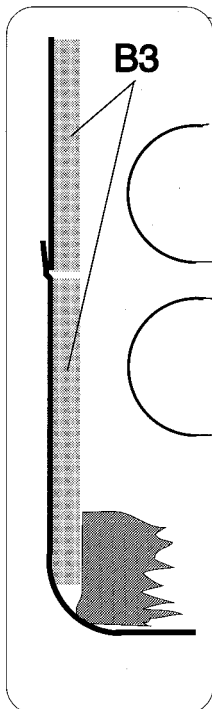
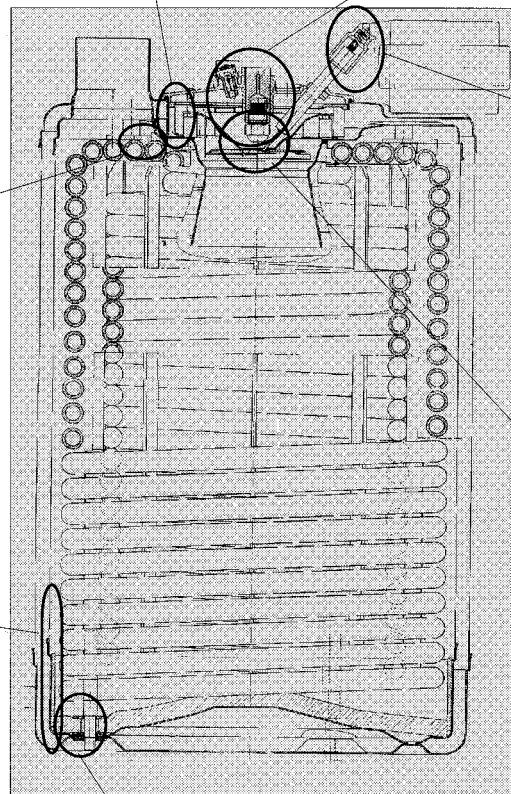
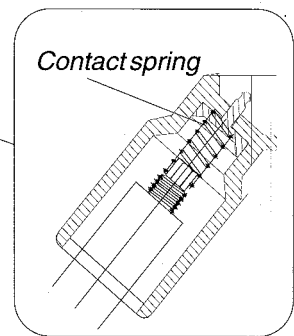
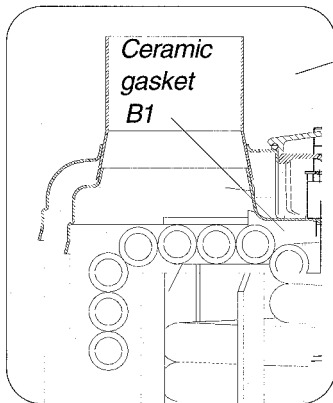
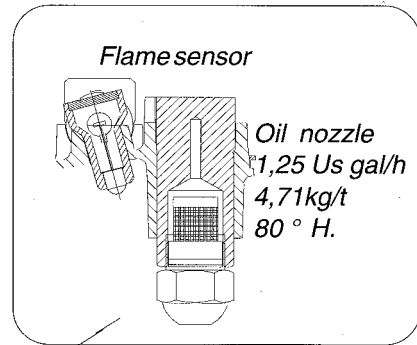
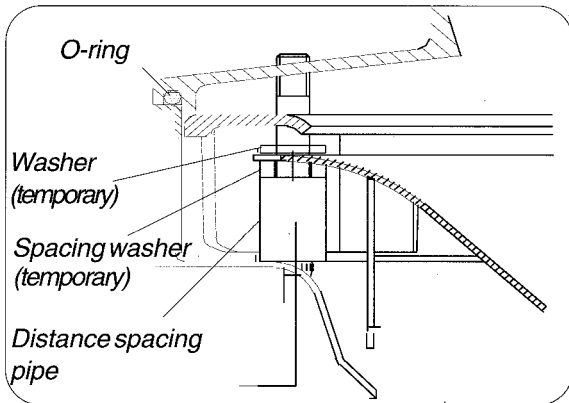


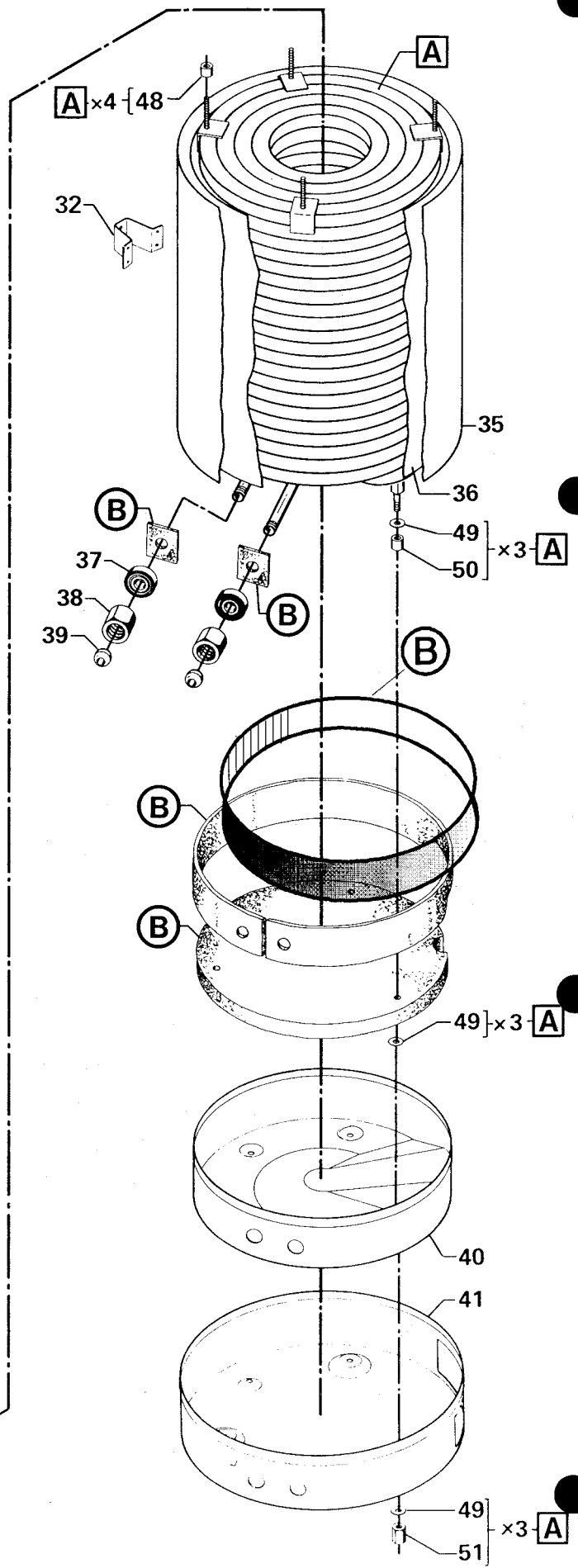
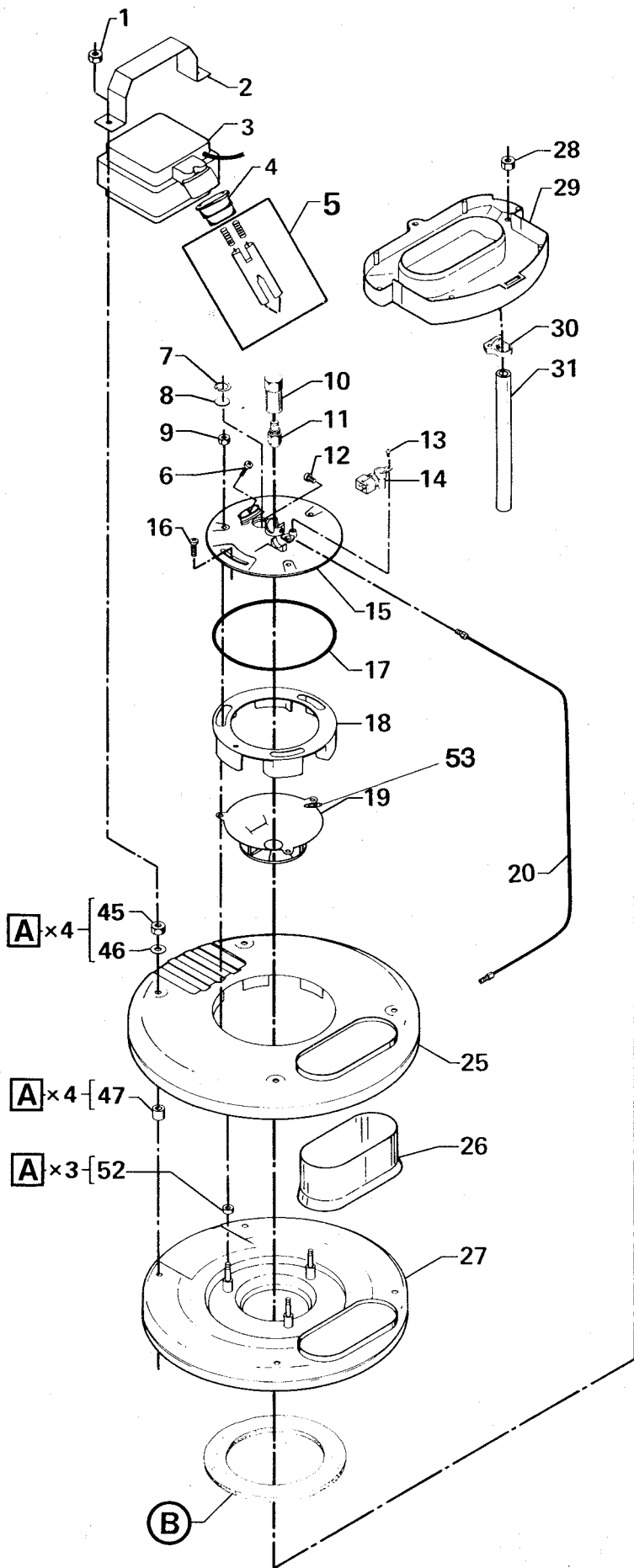


Marker grooves:	1 groove 3040H	2 grooves 1840H / 1640H
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WOBBLE DISC MARKING			
MACHINE TYPE	16	18	30
50Hz	56	57	58
60Hz	59	60	61
GB only	62		

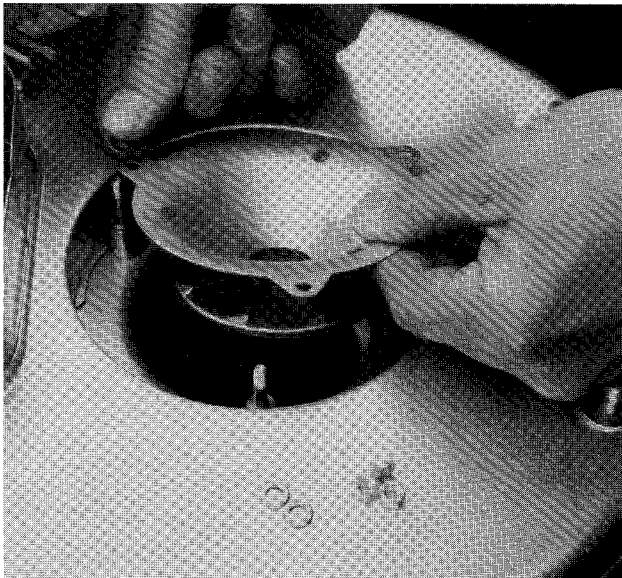
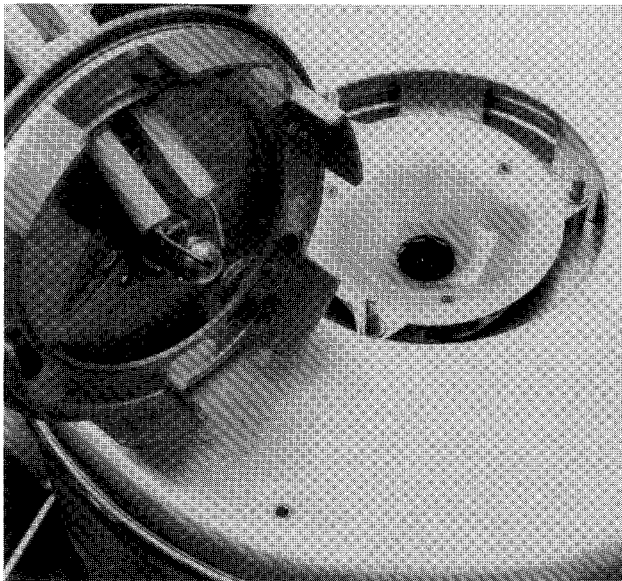






Dismounting - cleaning - assembly

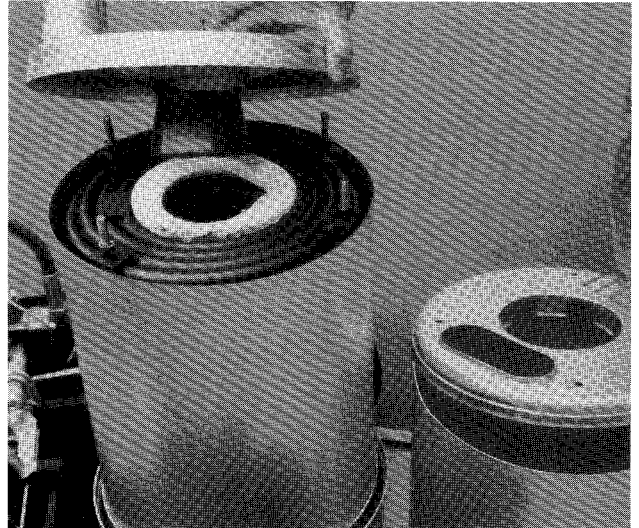
The ignition transformer is dismantled and put down into the bottom cabinet. Before the water shield pos. 29 is disengaged, the top cabinet is supported or dismantled.



The oil furnace pos.20 is loosened and turned clear of the boiler.

The air distributor is carefully dismantled. Note various washers and bushes (temporary).

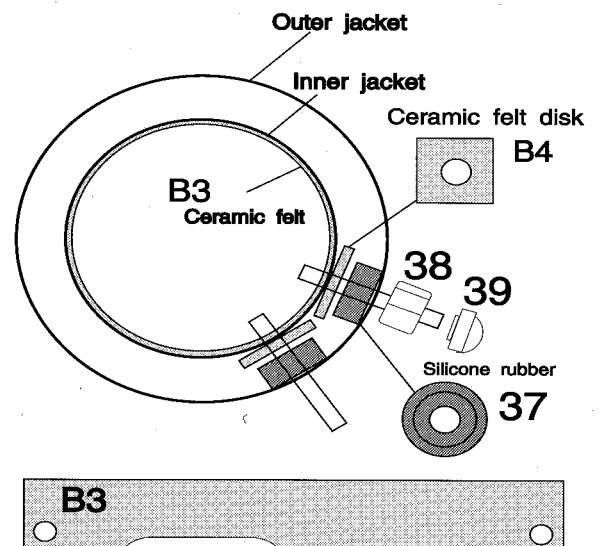
Remove the screw under container rack on the oil tank. Hereby the tank is disengaged from the outer boiler jacket. Loosen the 2 spring hooks of the tank at the bottom and lift off the tank.

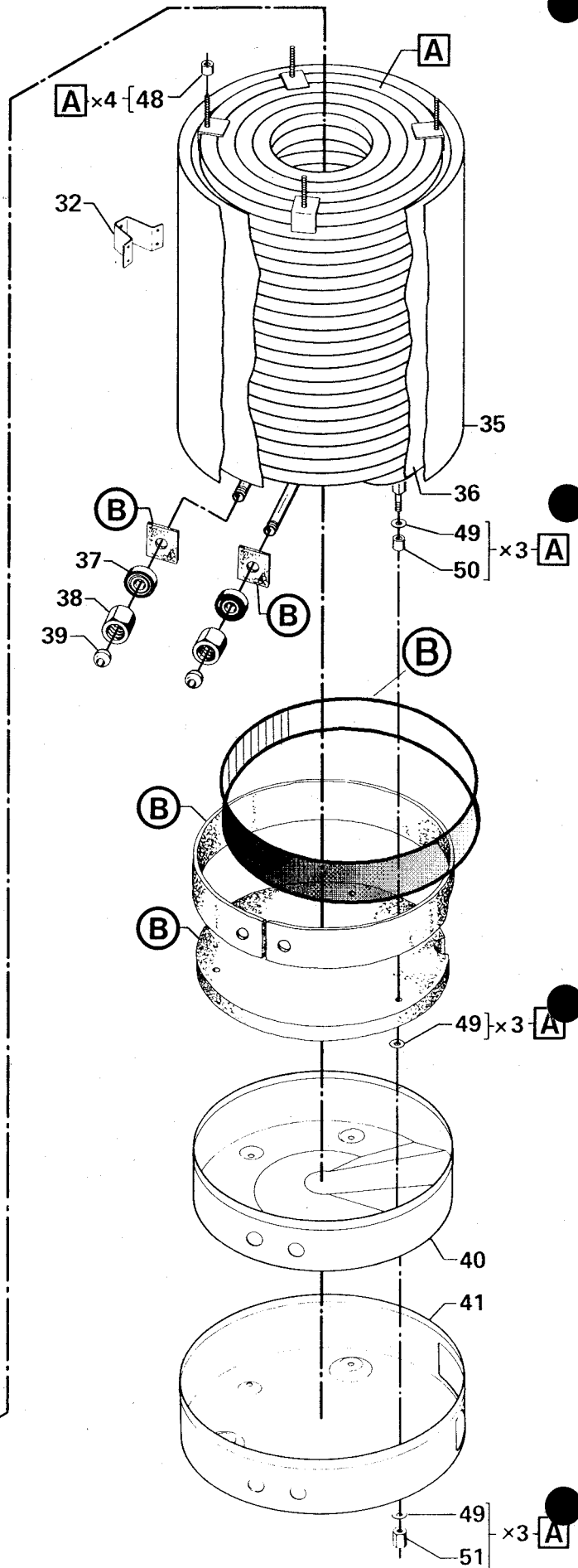
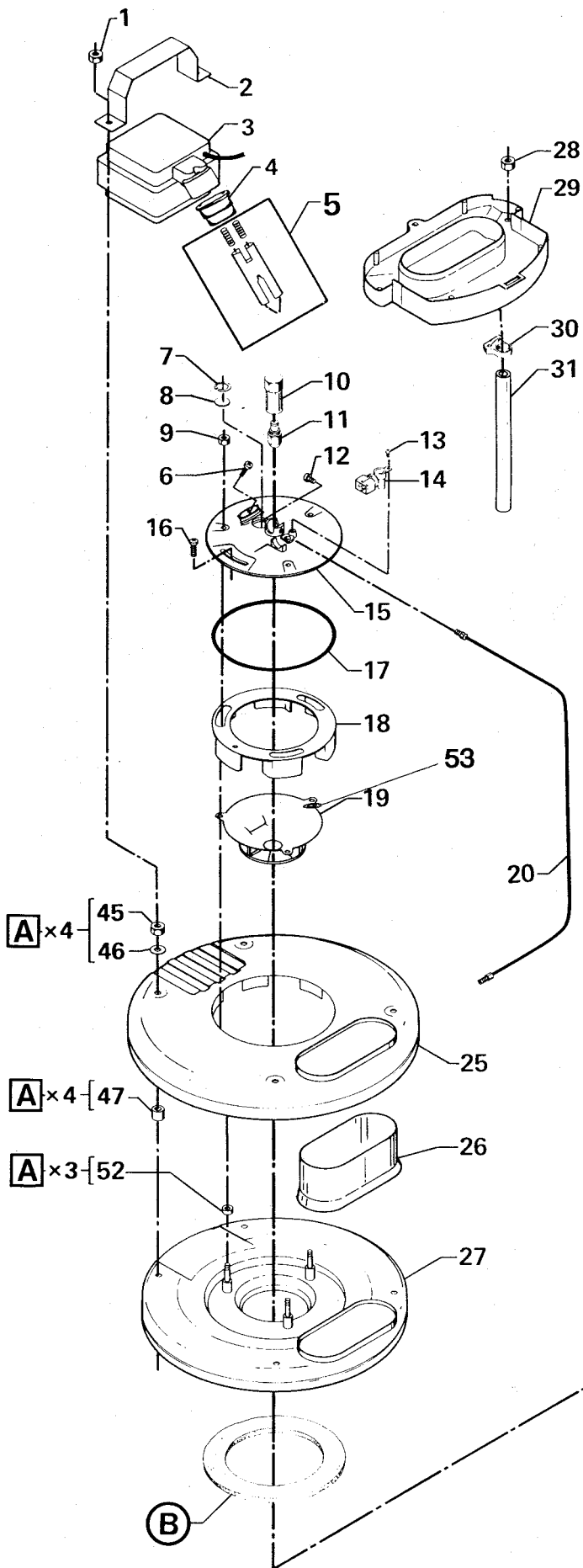


The tube coil of the boiler is mounted with 3 Allen screws (6 mm), pos. 44 and 45, which are loosened from the bottom. Inlet and outlet from the boiler are loosened, and the tube coil with inner and outer bottom is lifted clear of the bottom cabinet.

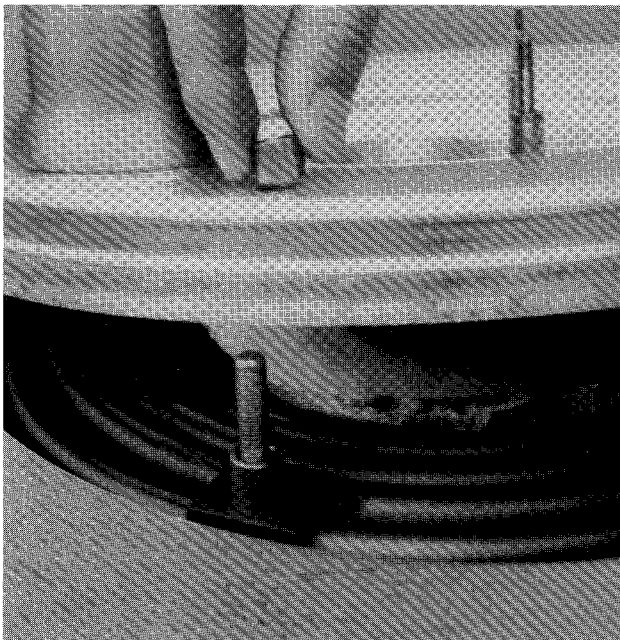
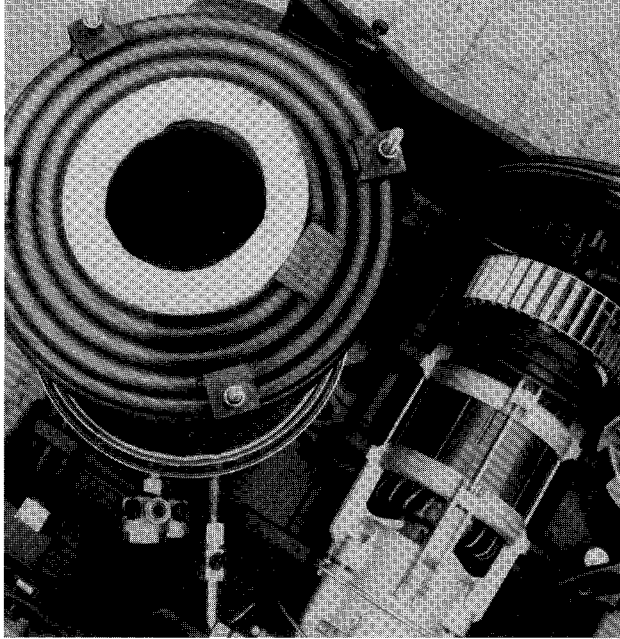
Top gasket B1 is removed, and the coil is turned around and washed down.

If the ceramic mats B2 or B3 are defective, the two bottoms are dismantled, and all B-gaskets are replaced. When doing so it is necessary to loosen the nipples pos. 39. If necessary, heat them in order to soften the Loctite.





At mounting of the boiler the bottom with various gaskets is assembled first. The nipples pos. 39 are mounted with Loctite. The tube coil is placed in bottom and mounted with screws. Union nut on inlet and outlet pipe is greased before fastening.



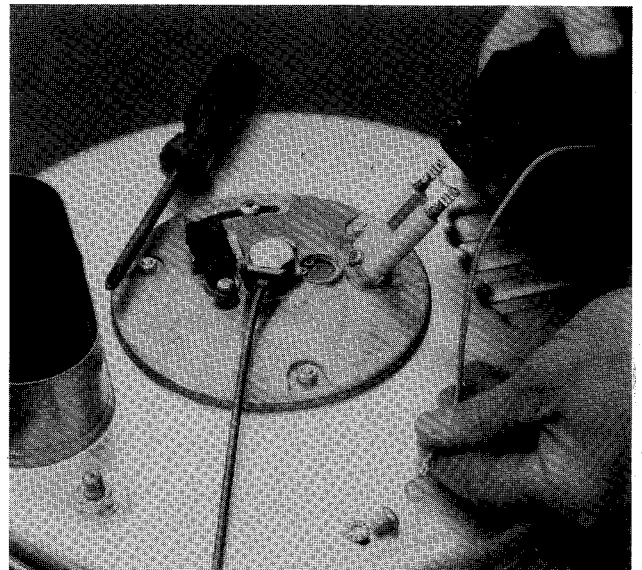
Inner jacket pos. 36 is pressed in place. Gasket B1 and top cover are mounted. Remember distance pipe pos. 48.

Outer jacket 35 is placed with weld on a level with mark in the bottom pos. 41.

Distance pipe pos. 47 is placed, and top cover pressed home and fastened with a screw.

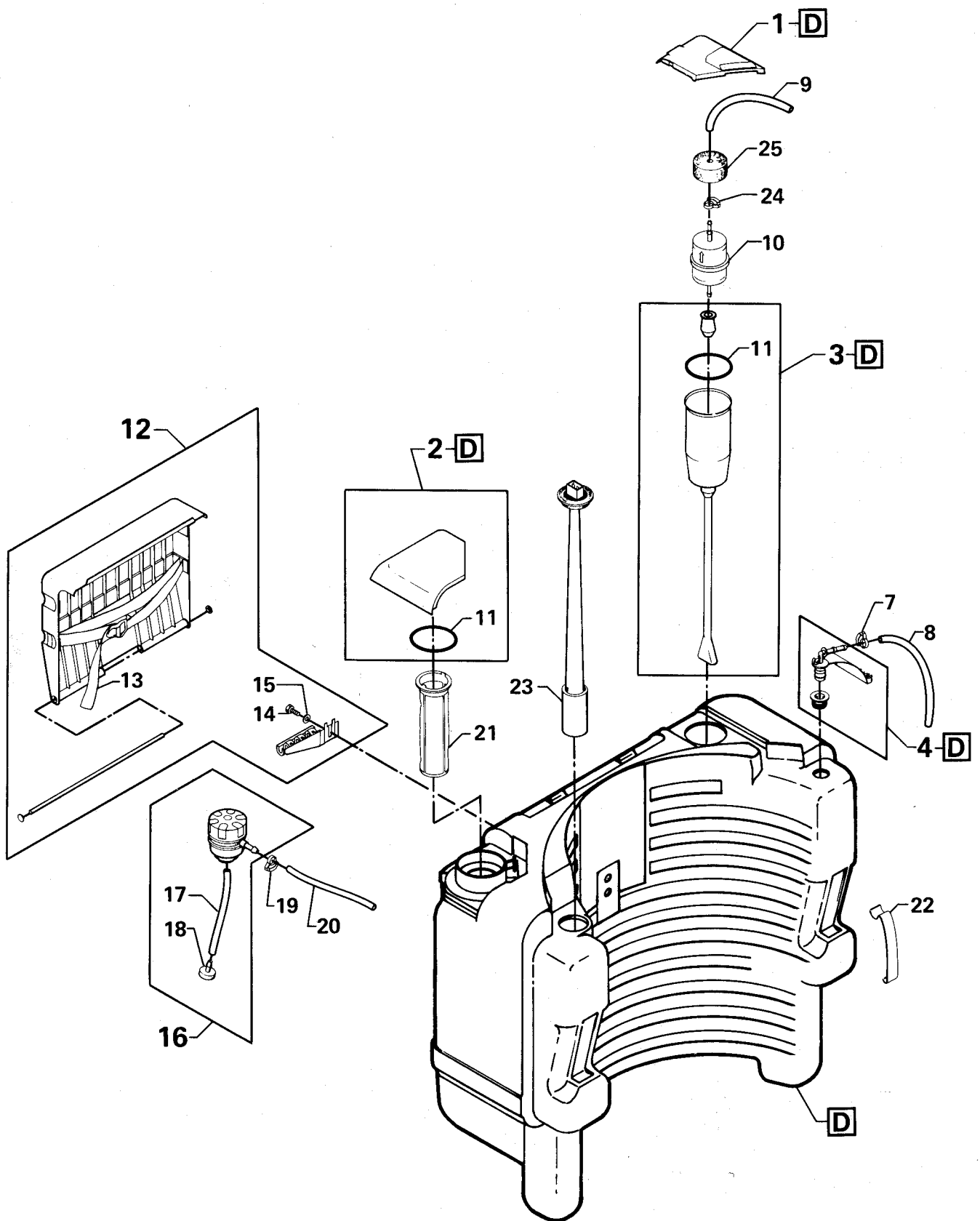
Before air distributor pos. 19 is placed, then remember to place additional distance pipe pos. 52 (temporary solution). When the air distributor is in place, 3 spacing washers pos. 53 are placed on the bolts.

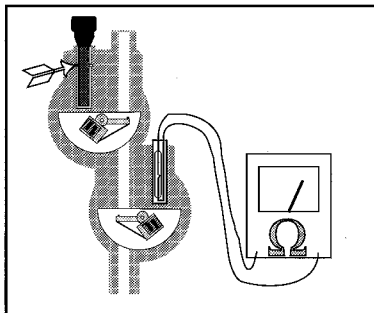
Before the boiler cover pos. 15 is put into place, the double ignition electrode is pressed completely home. It is centred round the nozzle and fastened.



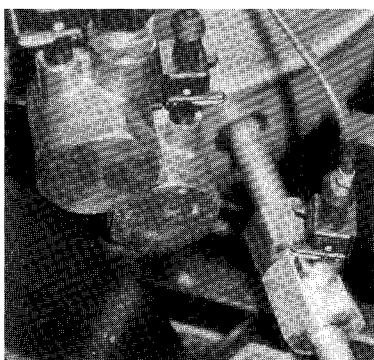
The ignition transformer is placed carefully and tightened. The water shield pos. 29 is mounted, and drain pipe pos. 31 is led down into the bottom and secured away from the air inlet to the motor.

The tank is put back and tightened to outer jacket with screw under container rack.

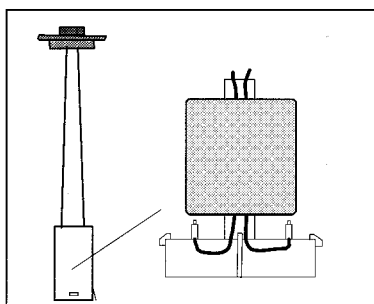




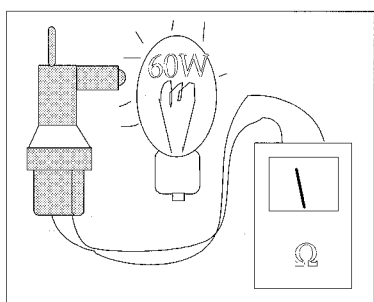
Separate the **B1/B2** flow switches and clean the magnet of metal particles, if any. Make sure that the magnets can turn easily and make contact when the distance to housing is approx. 2 mm. The free ends of the magnets are to be N and S respectively. This can be checked by finding out whether the surfaces attract each other. Check that the reed-switches are as far as they will go so that the locking tap is engaged with the groove (arrow)



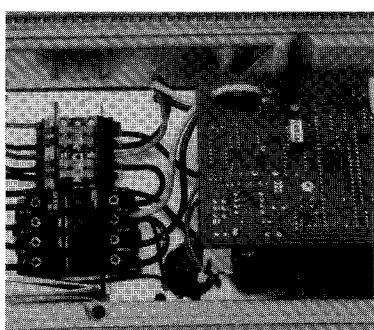
B3 temperature sensor type PT 500 is placed in the outlet pipe from boiler. The sensor can be checked with an ohmmeter. At 20°C the resistance is approx. 539 Ω. The plug is marked with a red band around the wire.



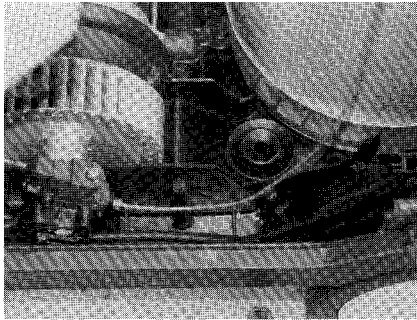
B4 level switch pos. 23 mounted in oil tank is checked with an ohmmeter. Lift the pipe clear of the tank and check whether there is contact.



B5 flame sensor is cleaned. The light sensitivity is checked by placing a 60W source of light in a distance of 10 mm from the sensor. With an ohmmeter the distance is read, OK at 900 to 1200 Ω. OK, in the dark when the resistance is 100 to 120 Ω.

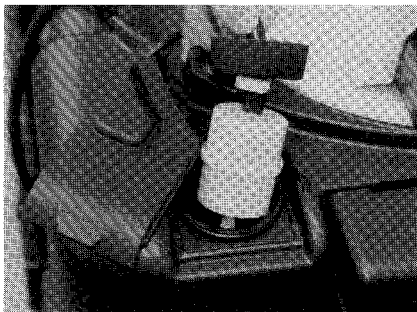


B6 phase sequence pressure switch makes contact at pressure higher than 25 mm VS. In a condition with no pressure the switch is to be open. Fine adjustment can be done on screw between contact plugs.



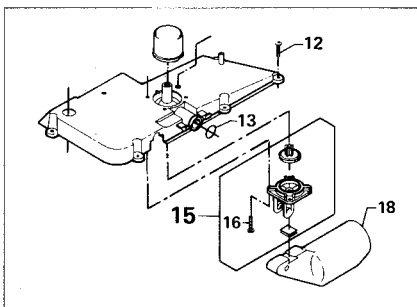
The oil pump

Both SUNTEC type AS47C75 and Danfoss type MS11 are used. See Service/Technical Information Nos. 65 and 85. Rep. kit contains filter and gaskets.



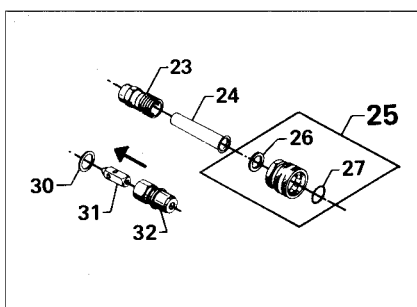
Oil filters

Replace minimum at each service visit. Check gasket in suction pipe. Make sure that filter tap fits tightly in suction pipe.



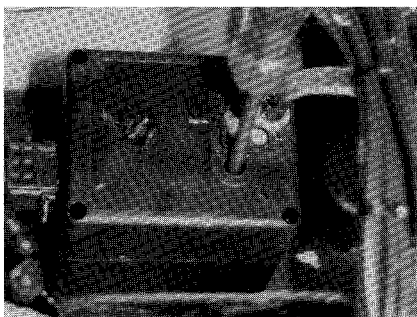
Float valve

Check that the float is tight. If the valve is leaky, rep. kit is used.



Water outlet nipple / non-return valve / water inlet filter

At mounting of new nipple make sure that the cone of the non-return valve is turned inward. Filter in water inlet is cleaned and checked for damage.

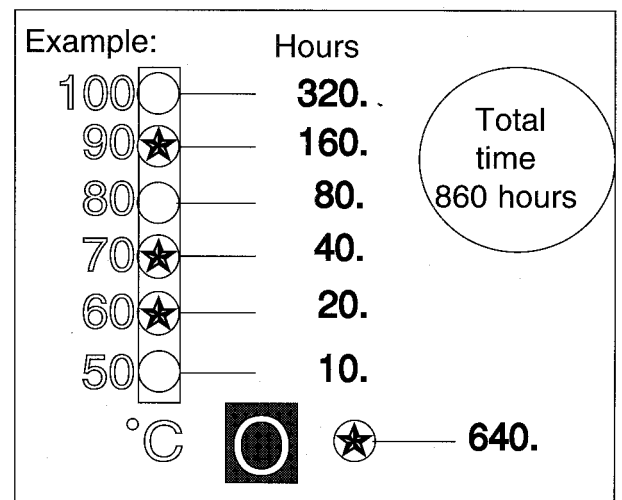
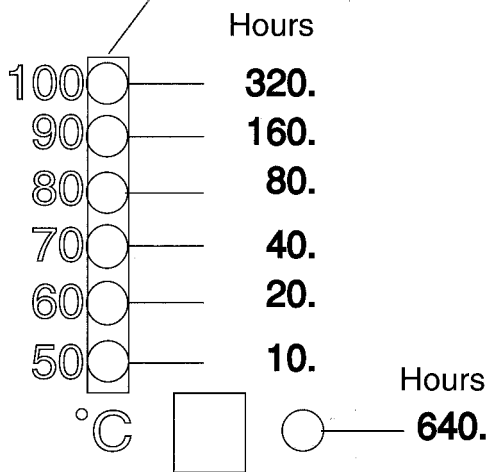
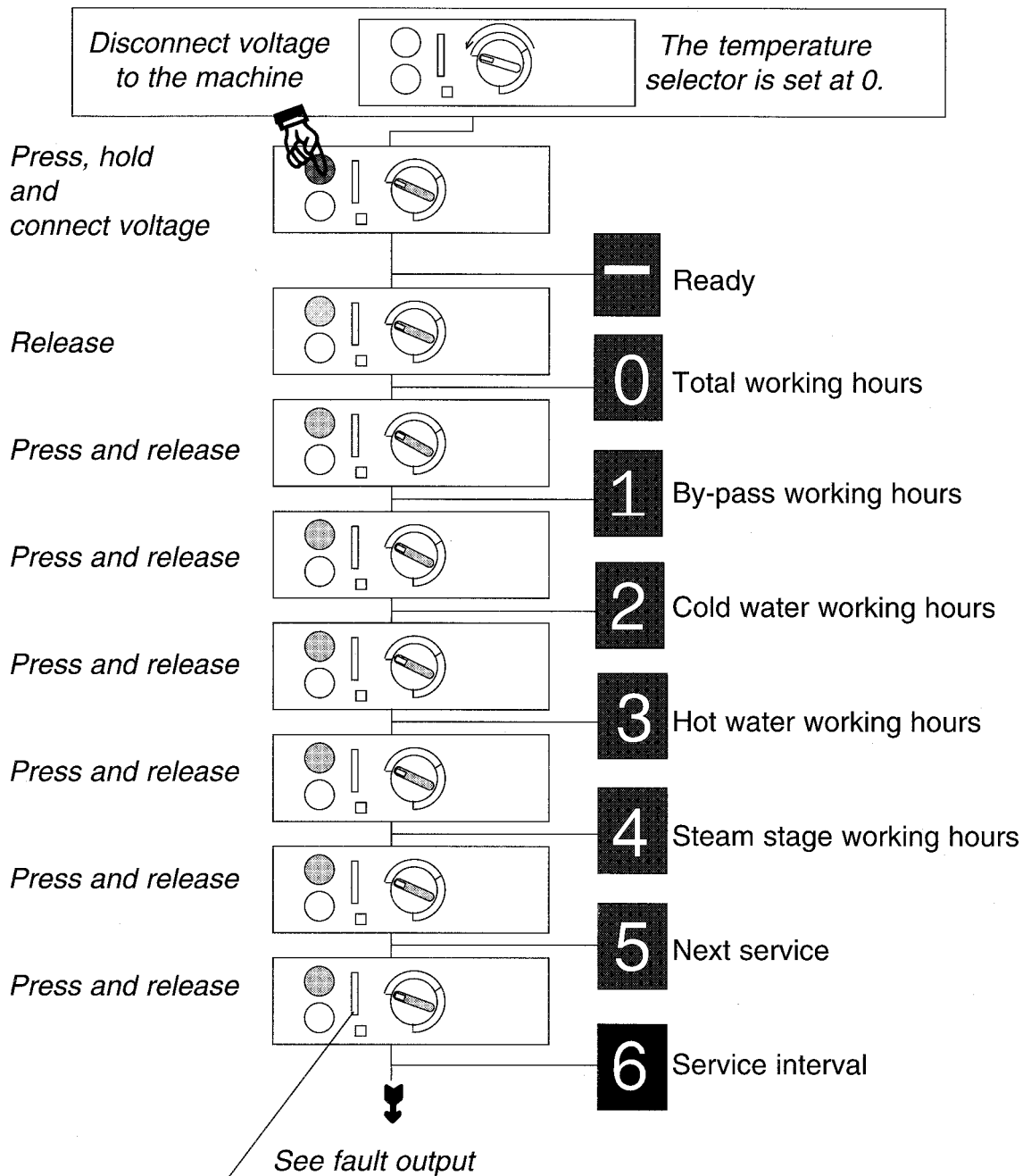
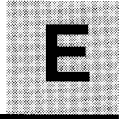


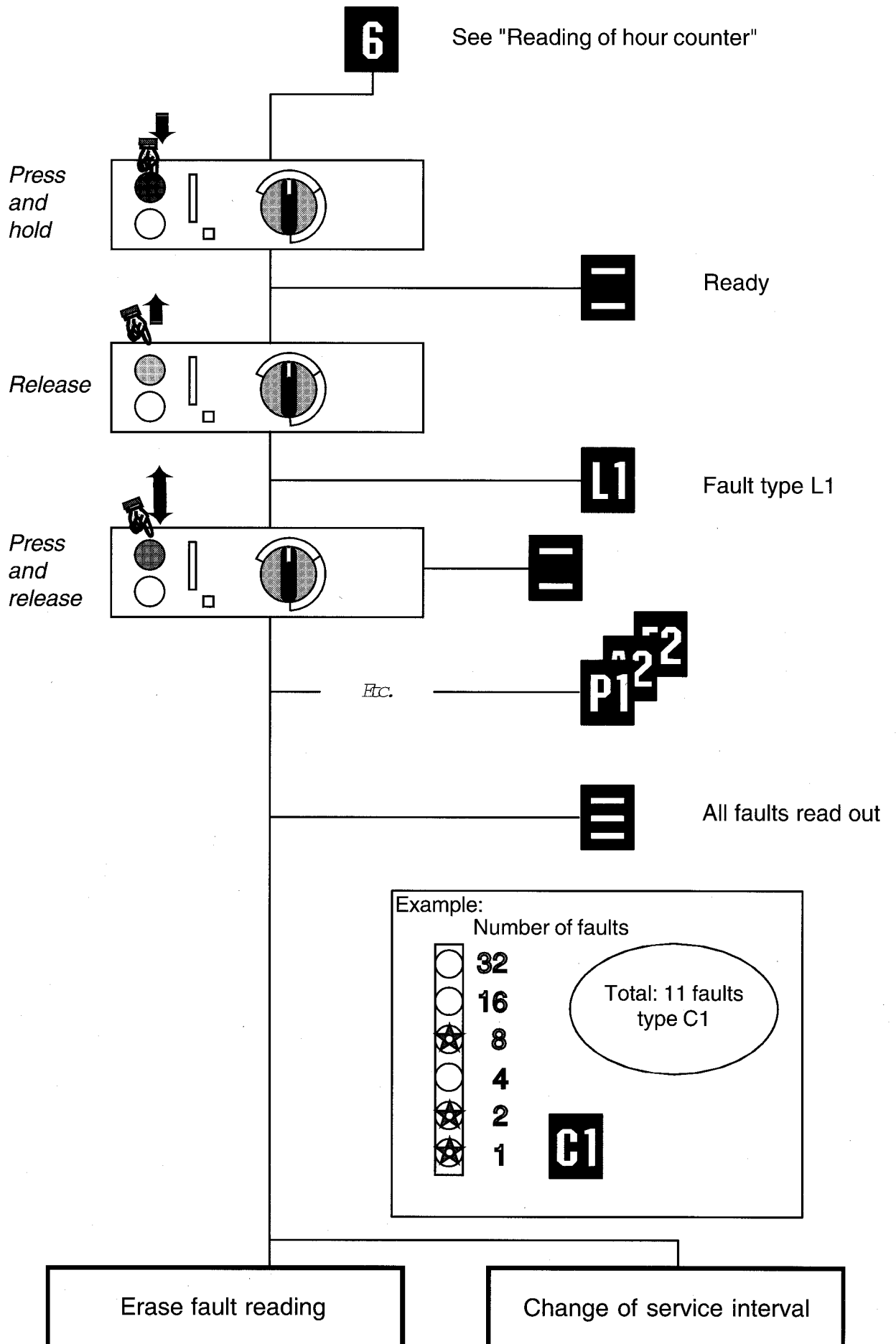
Softening pump

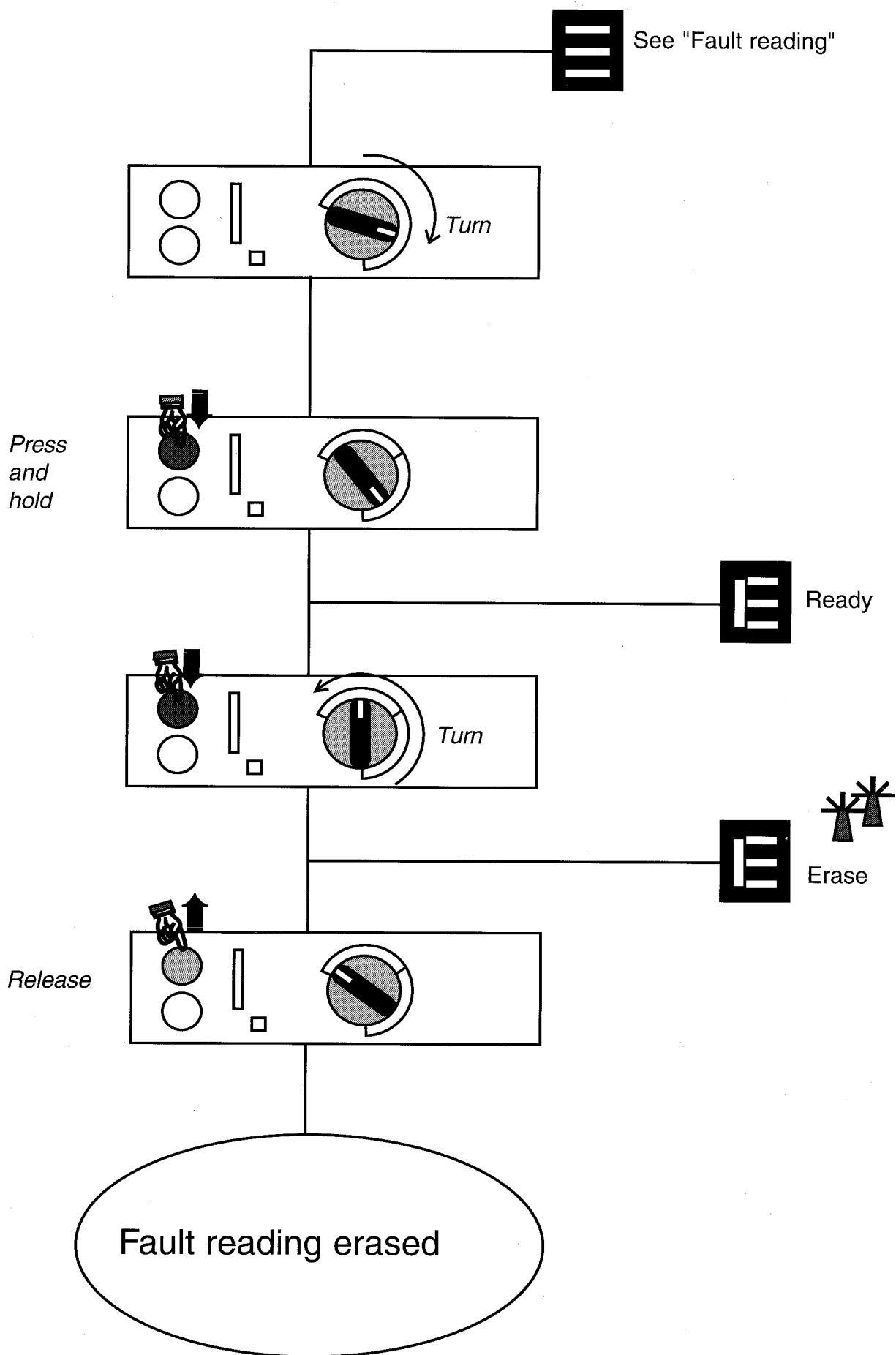
Adjustment is made by removing rubber plug, and with a screwdriver turn clock-wise for max. capacity. Check that the pump is working.

Hours readout

Service

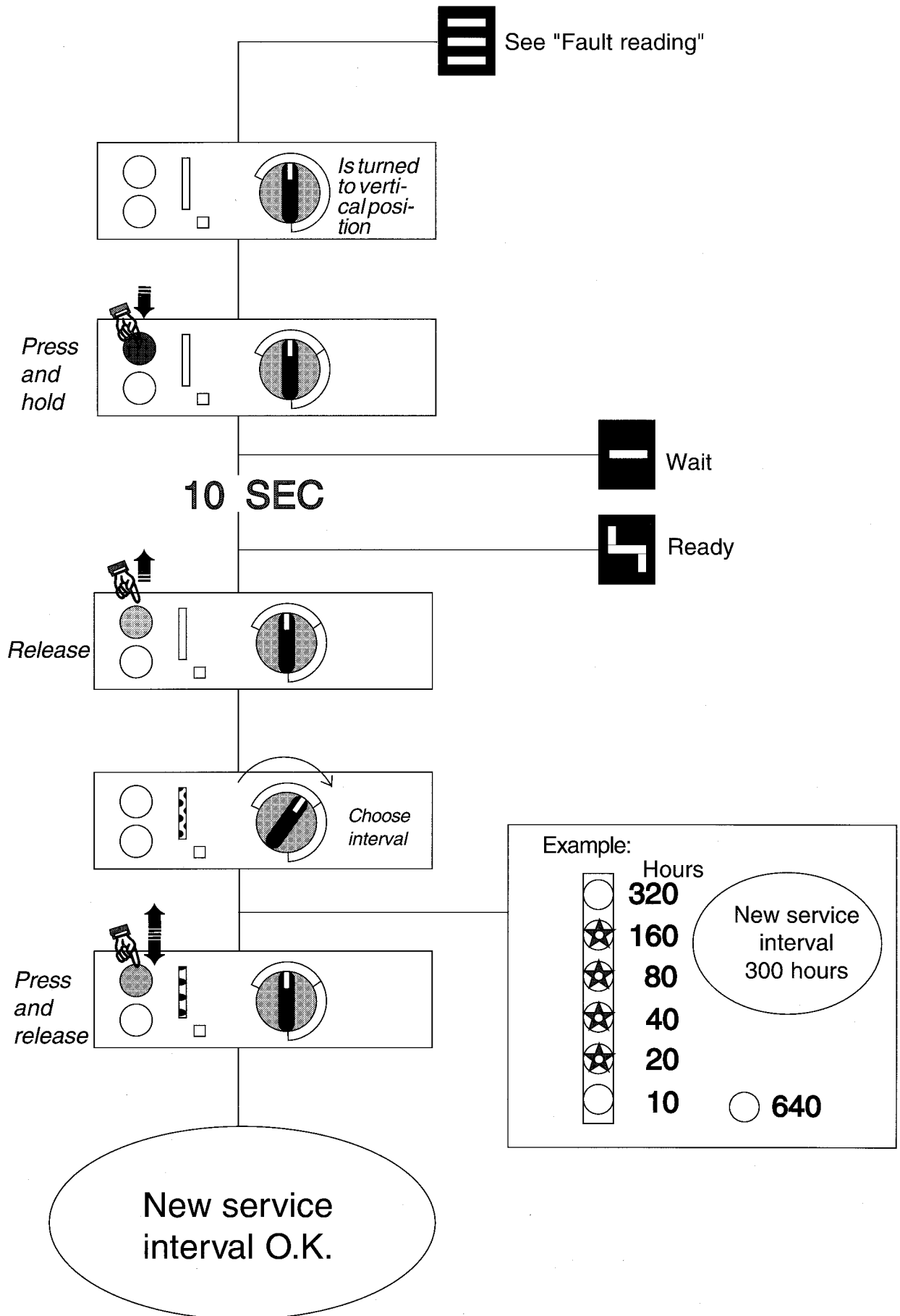
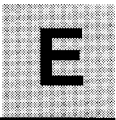






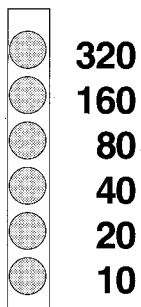
Service interval

Service

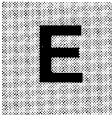


WORKING HOURS			
Type: _____		Serial no.: _____	
		Date of prod.: _____	
Read-out / output	Date:	Date:	Date:
0. Total operation			
1. By-pass			
2. Cold water			
3. Hot water			
4. Steam stage			
5. Time for service			
6. Service interval			

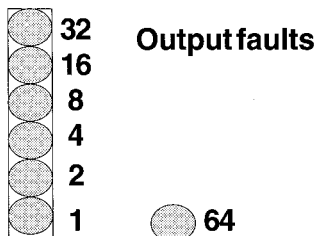
Hours

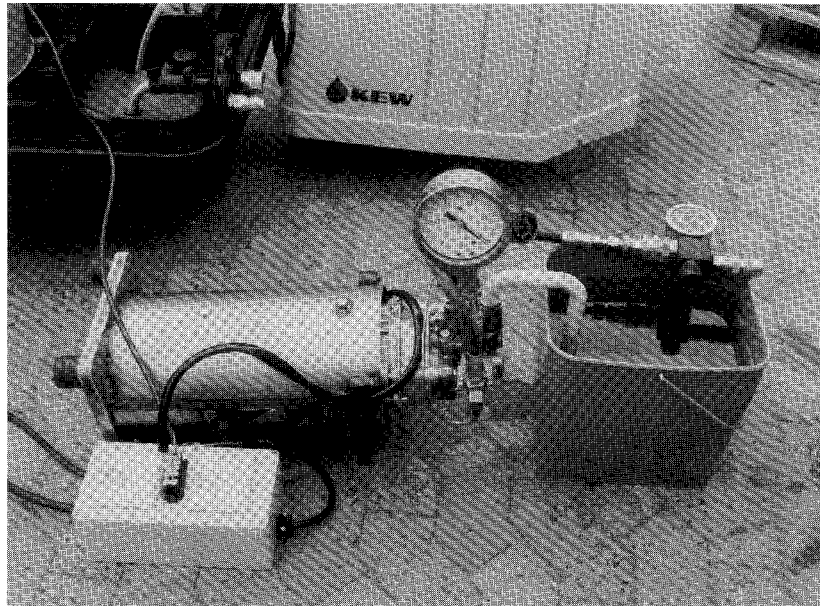


 640



FAULT SEQUENCE						
Fault code		Number	Second	Number	Second	Number
First	Second					
=						
A						
C						
F						
L						
P						
U						
		Machine type:	Serial no.:		Date of production:	



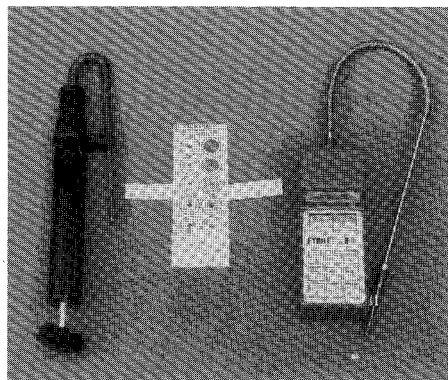


The motor pump is tested and adjusted in the fixture as shown on the illustration. The steam stage is not tested until the motor pump has been mounted on the machine.

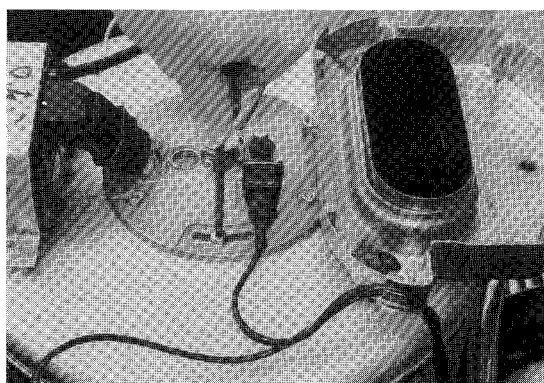
Connect the machine to the water and power supply. This is carried through in suction mode. Open the test manometer A completely and start the machine.

To be done				Readings		
Measuring		Test mano. A	Nozzle	Pressure mano. A	Amp./Volt	Vacuum
Pump pressure	1	Open	05			
Opening pressure	2	Close slowly	05			
By-pass pressure	3	Closed	05			
Injector level	4	Open slowly	-			
Injector, max.	5	Open	-			
Bearing friction	6	Turn off water	-			
Suction capacity	7*	Turn off water	-			

7* Place the meter in the water inlet



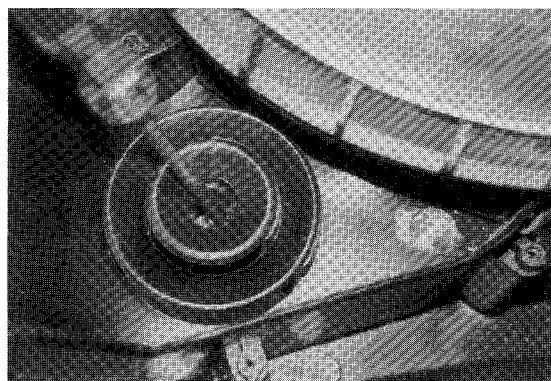
Test equipment
BACHARACH emission computer, type Fyrite II, and soot meter.



Before the machine is started, the air control is pre-adjusted to approx. 3 on the scale.

Set the temperature selector to cold operation. Connect water, electricity, and high pressure nozzle 05.

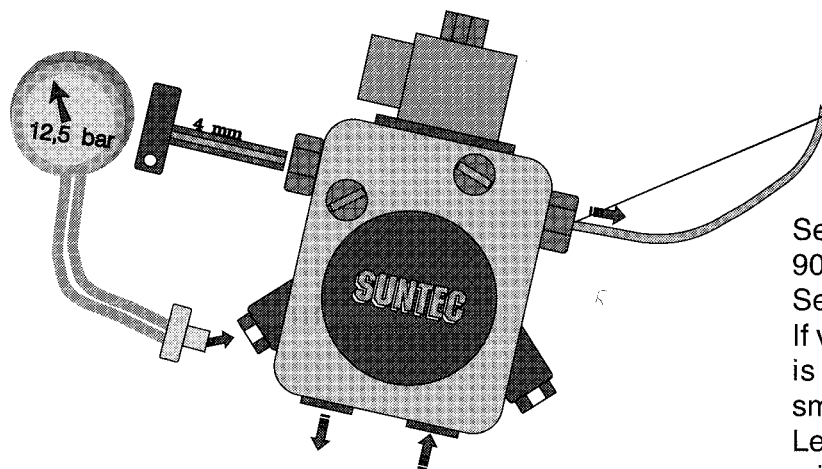
Start the machine



Check the air pressure, and if necessary adjust it to approx. 50-60 mm WS, by removing or inserting plugs in air nozzle in bottom cabinet. (The plugs are a temporary solution until another adjustment form will be introduced).

50Hz machines have 5 plugs.

60Hz machines have 0 plugs.



Set the temperature selector at max. 90° C, and the burner will ignite. Set the oil pressure at 12,5 bar. If visible smoke is generated, the air is adjusted upwards until it is smokeless, i.e. max. 4 on the scale. Let the machine run for at least 3 minutes.

At inlet temperature 6°C -> 16°C, temperature indicator lamp 70°C is to light up.

At inlet temperature 16°C -> 26°C, temperatur indicator lamp 80°C is to light up.

If the above-mentioned temperatures have not been reached, the oil pressure is adjusted to max. 13.5 bar. The air is adjusted upward, so that it is smokeless. If the temperature has not been reached after approx. 1 minute, check chapter D, Performance faults.

Fine adjustment

While the machine runs steadily with max. working pressure and max. 90°C set at temperature control, a test with Bacharach equipment is made according to the instructions.

The results are written down in diagram, combustion test, on the next page.

The temperature selector is set at max. 150°C. Water flow is stopped and opened again igen. By so doing the water quantity is reduced. Measure the water quantity, if necessary. See data. Make sure that the top lamp 100°C lights up, and steam hisses out of the nozzle.

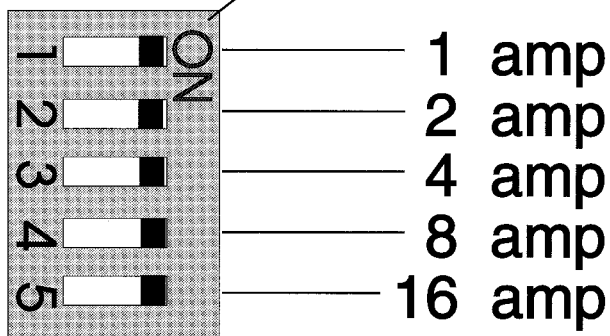
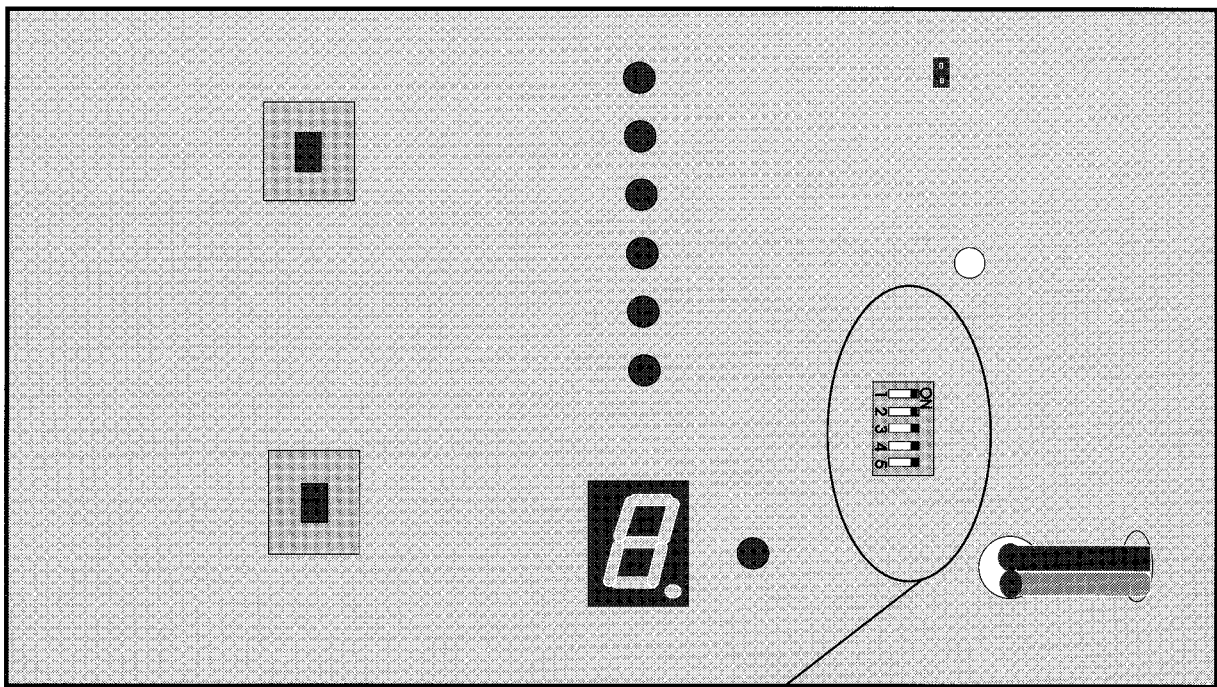
COMBUSTION TEST										
	Unacceptable				Good		Better		Best	
CO ₂ %	<8		<9		10		11		12	
O ₂ %	11		8.6		7.2		6		4.5	
Soot scale	>4		>3		2		1		0	
Smoke temp. (t)	>260		>240		220		200		180	
CO ppm	200		150		100		50		25	
Loss %	>13		>12		11		10		9	
Type no.: _____ Serial no.: _____ Date of production: _____										
Enter the results in the fields							Before rep. <input checked="" type="radio"/>	After <input type="radio"/>	<input checked="" type="checkbox"/>	
Adjusted by KEW technician: _____							Date: _____			
Next visit: _____							Date: _____			

TEST EQUIPMENT: _____

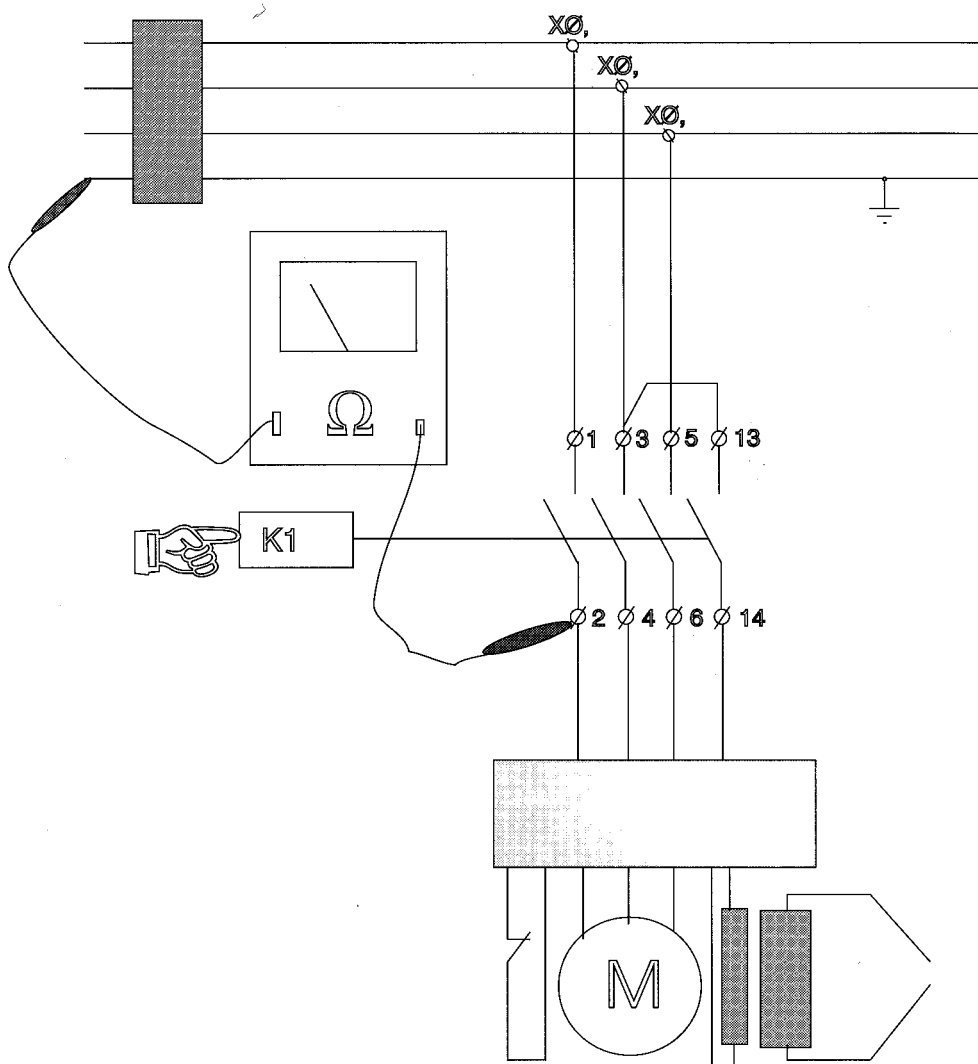
Smoke temp (t) = outlet temperature - inlet temperature.

The inlet temperature is measured at the air nozzle in bottom cabinet.

Adjustment of motor protection



Read the power consumption of the machine on the type plate, and round off to the next whole number. Adjust the 5 switches so that total value corresponds with this.



Insulation test

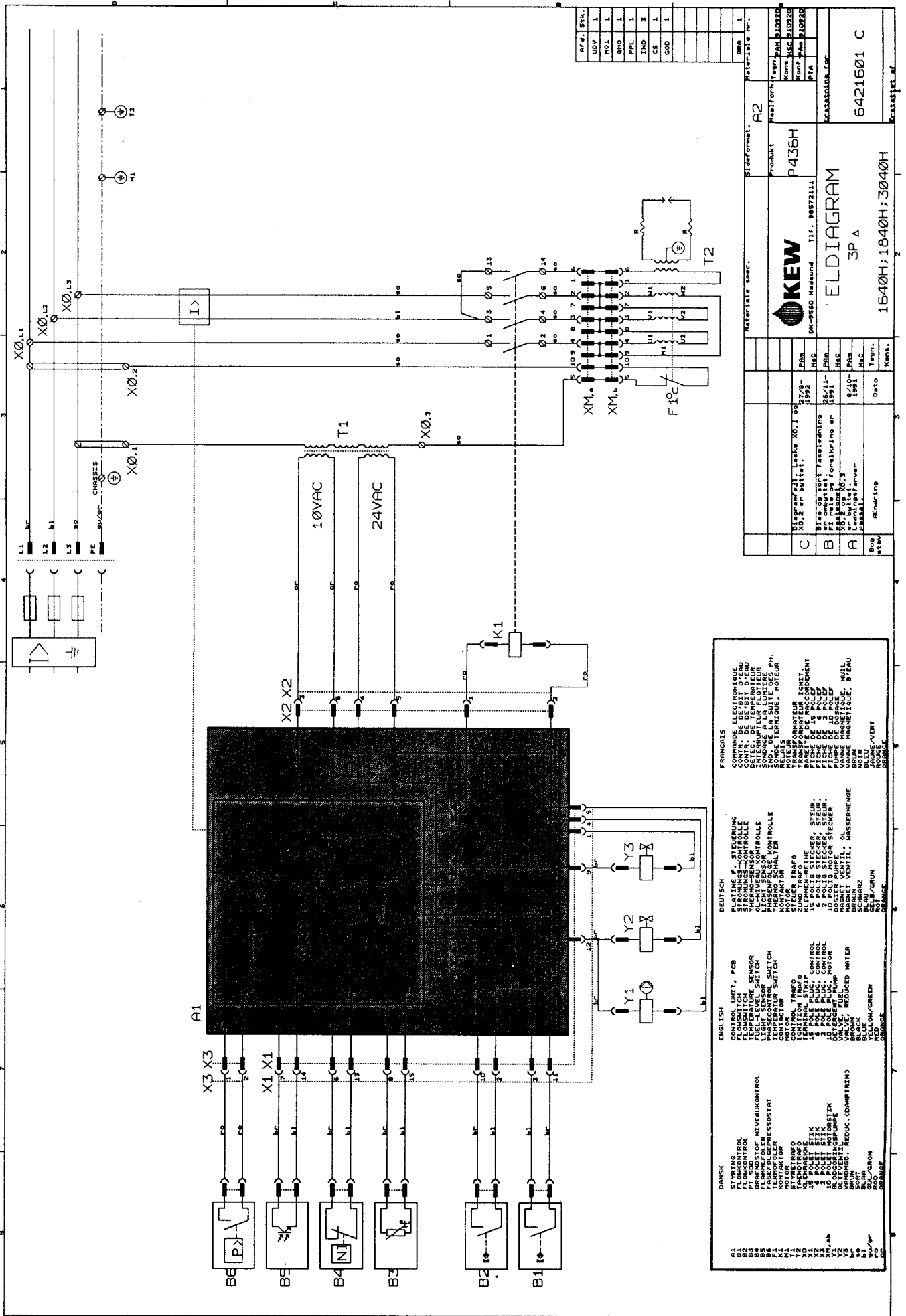
The electric plug is disconnected the mains voltage. The gauge is connected with earth on plug. Contactor is pressed down manually. Test the individual phases. The resistance is to be higher than 1 MΩ.

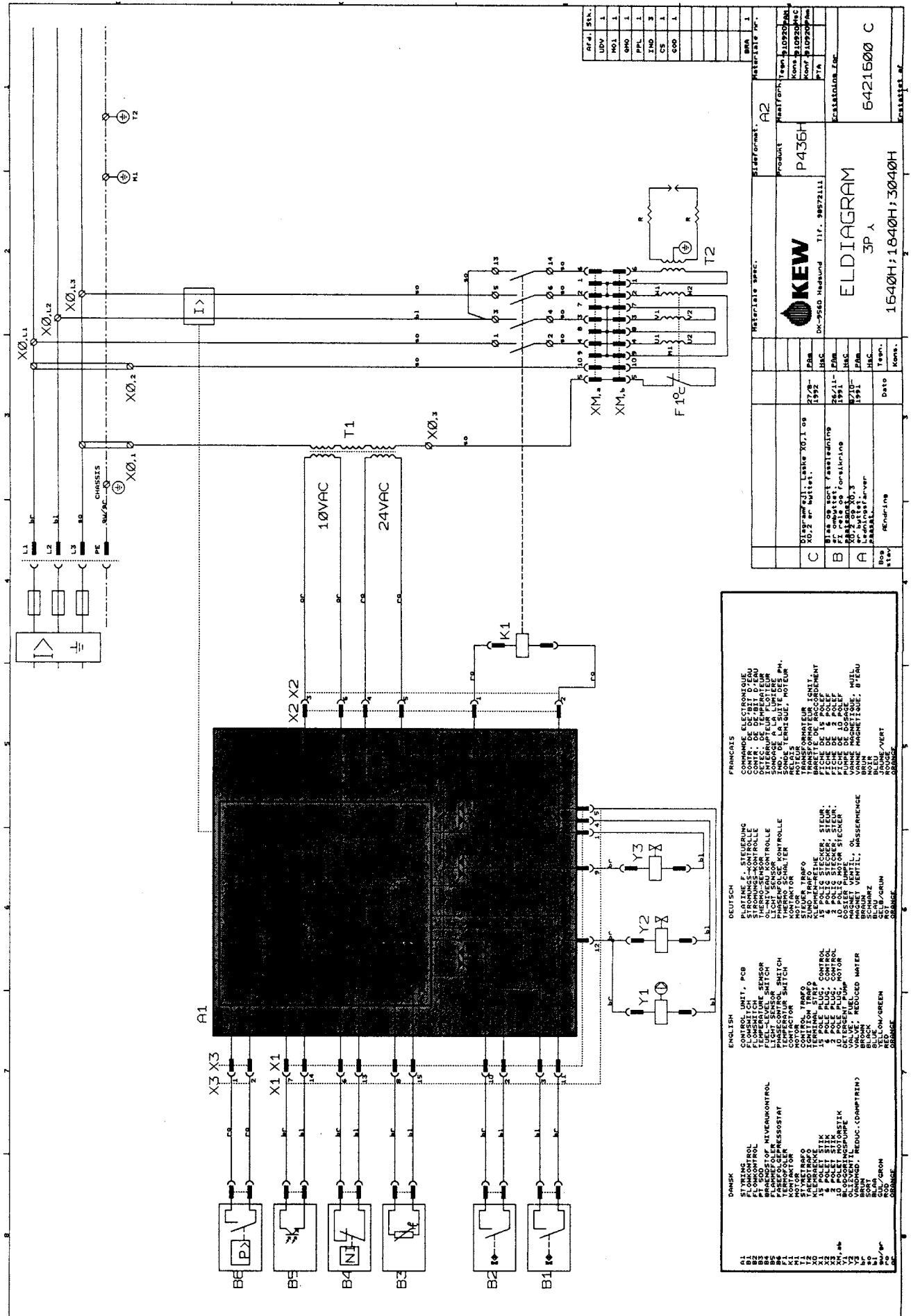
Earth connection test

Check the earth connection with an earth wire tester by measuring between the machine's outlet nipple and contact plug for earth.

The resistance is to be smaller than 0.1 Ω.

N.B.: an earth wire tester makes a circuit with 25 amp.



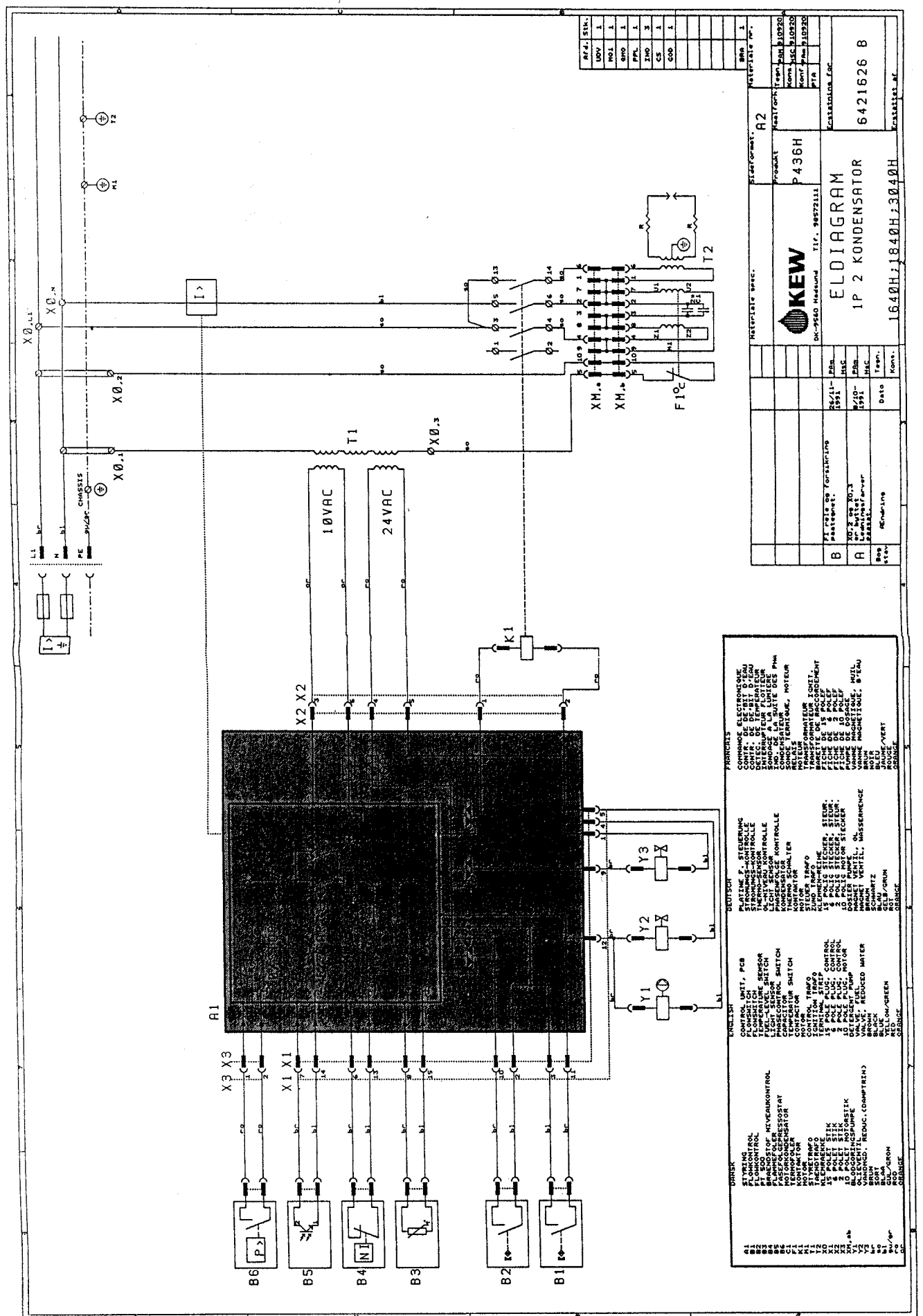


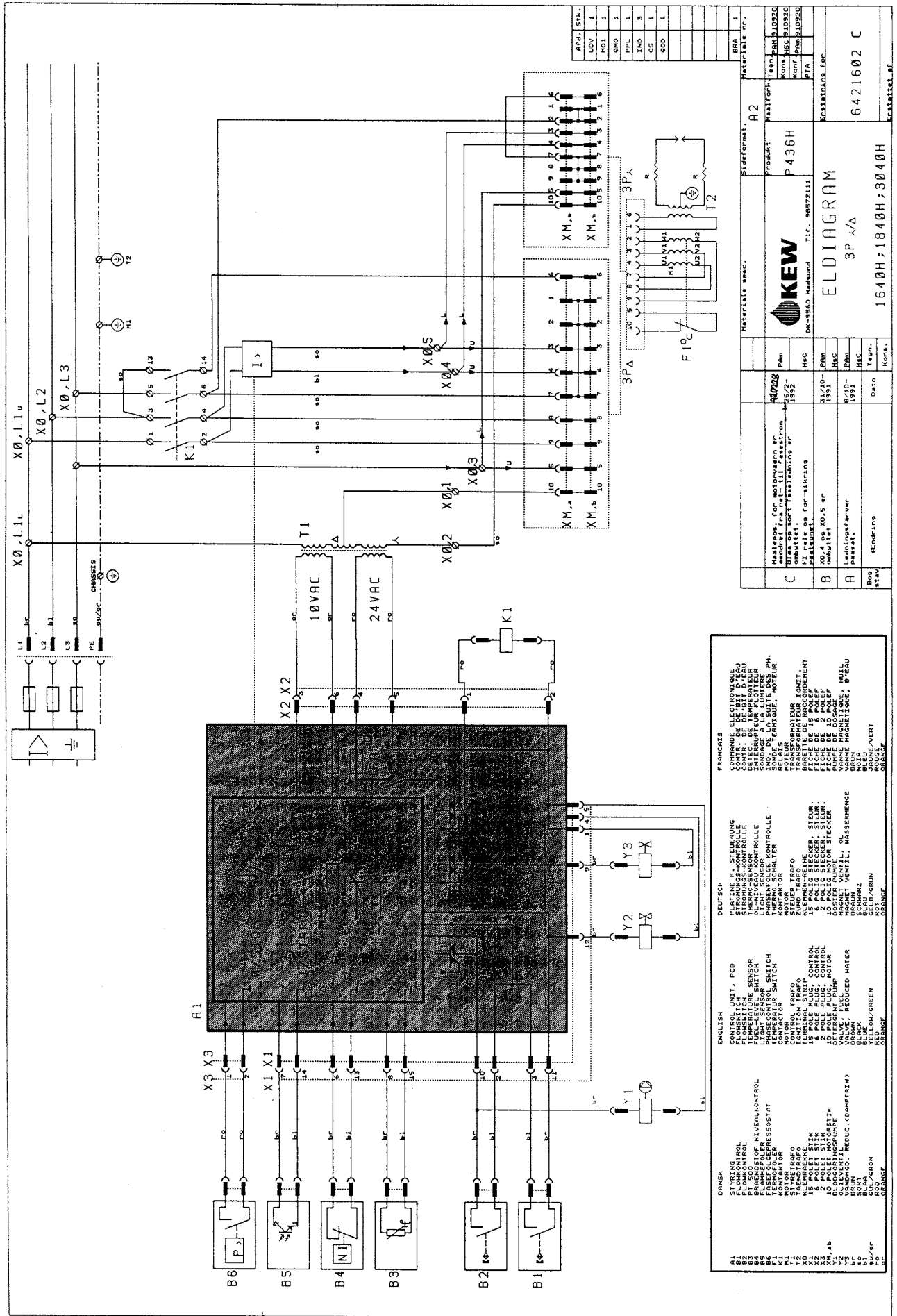
Code	DANSK	ENGLISH	DEUTSCH	FRANCOIS
A1	STYRING	CONTROL UNIT, PCB	PLATINE P. STEUERUNG	COMMANDE ELECTRONIQUE
B1	FLØDKONTROL	FLOWSWITCH	STRÖMINGS-KONTROLLE	CONT. DE DEBIT D'EAU
B2	TEMPERATURKONTROL	TEMPERATURE SENSOR	THERMO-SENSOR	DETECT. DE TEMPERATURE
B3	FLØSØND	FLOW SENSOR	STRÖM-SENSÖR	SONDE A LA LUMIERE
B4	TEMPERATURKONTROL	TEMPERATURE SENSOR	THERMO-SENSOR	DETECT. DE TEMPERATURE
B5	FLØSØND	FLOW SENSOR	STRÖM-SENSÖR	SONDE A LA LUMIERE
B6	FLØSØND	FLOW SENSOR	STRÖM-SENSÖR	SONDE A LA LUMIERE
B7	FLØSØND	FLOW SENSOR	STRÖM-SENSÖR	SONDE A LA LUMIERE
B8	FLØSØND	FLOW SENSOR	STRÖM-SENSÖR	SONDE A LA LUMIERE
B9	FLØSØND	FLOW SENSOR	STRÖM-SENSÖR	SONDE A LA LUMIERE
B10	FLØSØND	FLOW SENSOR	STRÖM-SENSÖR	SONDE A LA LUMIERE
B11	FLØSØND	FLOW SENSOR	STRÖM-SENSÖR	SONDE A LA LUMIERE
B12	FLØSØND	FLOW SENSOR	STRÖM-SENSÖR	SONDE A LA LUMIERE
B13	FLØSØND	FLOW SENSOR	STRÖM-SENSÖR	SONDE A LA LUMIERE
B14	FLØSØND	FLOW SENSOR	STRÖM-SENSÖR	SONDE A LA LUMIERE
B15	FLØSØND	FLOW SENSOR	STRÖM-SENSÖR	SONDE A LA LUMIERE
B16	FLØSØND	FLOW SENSOR	STRÖM-SENSÖR	SONDE A LA LUMIERE
B17	FLØSØND	FLOW SENSOR	STRÖM-SENSÖR	SONDE A LA LUMIERE
B18	FLØSØND	FLOW SENSOR	STRÖM-SENSÖR	SONDE A LA LUMIERE
B19	FLØSØND	FLOW SENSOR	STRÖM-SENSÖR	SONDE A LA LUMIERE
B20	FLØSØND	FLOW SENSOR	STRÖM-SENSÖR	SONDE A LA LUMIERE

Code	Model	Year	Material spec.
C	50.37 mm 21.18 mm 10.1 08	1992	DK-9540 Husand TIF. 99271111
B	51.18 mm 21.18 mm 10.1 08	1991	DK-9540 Husand TIF. 99271111
A	50.37 mm 21.18 mm 10.1 08	1991	DK-9540 Husand TIF. 99271111
B	51.18 mm 21.18 mm 10.1 08	1991	DK-9540 Husand TIF. 99271111
A	50.37 mm 21.18 mm 10.1 08	1991	DK-9540 Husand TIF. 99271111

Product Information:

- Model: P436H
- Material spec.: ELDIAGRAM 3P A
- Dimensions: 1540H; 1.840H; 3040H
- Part No.: 6421500 C





DANSK	ENGLISH	DEUTSCH	FRANCAIS
B1	STOP	STOP	ARRÊT
B2	STOP	STOP	ARRÊT
B3	STOP	STOP	ARRÊT
B4	STOP	STOP	ARRÊT
B5	STOP	STOP	ARRÊT
B6	STOP	STOP	ARRÊT
B7	STOP	STOP	ARRÊT
B8	STOP	STOP	ARRÊT
B9	STOP	STOP	ARRÊT
B10	STOP	STOP	ARRÊT
B11	STOP	STOP	ARRÊT
B12	STOP	STOP	ARRÊT
B13	STOP	STOP	ARRÊT
B14	STOP	STOP	ARRÊT
B15	STOP	STOP	ARRÊT
B16	STOP	STOP	ARRÊT
B17	STOP	STOP	ARRÊT
B18	STOP	STOP	ARRÊT
B19	STOP	STOP	ARRÊT
B20	STOP	STOP	ARRÊT
B21	STOP	STOP	ARRÊT
B22	STOP	STOP	ARRÊT
B23	STOP	STOP	ARRÊT
B24	STOP	STOP	ARRÊT
B25	STOP	STOP	ARRÊT
B26	STOP	STOP	ARRÊT
B27	STOP	STOP	ARRÊT
B28	STOP	STOP	ARRÊT
B29	STOP	STOP	ARRÊT
B30	STOP	STOP	ARRÊT
B31	STOP	STOP	ARRÊT
B32	STOP	STOP	ARRÊT
B33	STOP	STOP	ARRÊT
B34	STOP	STOP	ARRÊT
B35	STOP	STOP	ARRÊT
B36	STOP	STOP	ARRÊT
B37	STOP	STOP	ARRÊT
B38	STOP	STOP	ARRÊT
B39	STOP	STOP	ARRÊT
B40	STOP	STOP	ARRÊT
B41	STOP	STOP	ARRÊT
B42	STOP	STOP	ARRÊT
B43	STOP	STOP	ARRÊT
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B45	STOP	STOP	ARRÊT
B46	STOP	STOP	ARRÊT
B47	STOP	STOP	ARRÊT
B48	STOP	STOP	ARRÊT
B49	STOP	STOP	ARRÊT
B50	STOP	STOP	ARRÊT
B51	STOP	STOP	ARRÊT
B52	STOP	STOP	ARRÊT
B53	STOP	STOP	ARRÊT
B54	STOP	STOP	ARRÊT
B55	STOP	STOP	ARRÊT
B56	STOP	STOP	ARRÊT
B57	STOP	STOP	ARRÊT
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B59	STOP	STOP	ARRÊT
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B65	STOP	STOP	ARRÊT
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B68	STOP	STOP	ARRÊT
B69	STOP	STOP	ARRÊT
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B73	STOP	STOP	ARRÊT
B74	STOP	STOP	ARRÊT
B75	STOP	STOP	ARRÊT
B76	STOP	STOP	ARRÊT
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B78	STOP	STOP	ARRÊT
B79	STOP	STOP	ARRÊT
B80	STOP	STOP	ARRÊT
B81	STOP	STOP	ARRÊT
B82	STOP	STOP	ARRÊT
B83	STOP	STOP	ARRÊT
B84	STOP	STOP	ARRÊT
B85	STOP	STOP	ARRÊT
B86	STOP	STOP	ARRÊT
B87	STOP	STOP	ARRÊT
B88	STOP	STOP	ARRÊT
B89	STOP	STOP	ARRÊT
B90	STOP	STOP	ARRÊT
B91	STOP	STOP	ARRÊT
B92	STOP	STOP	ARRÊT
B93	STOP	STOP	ARRÊT
B94	STOP	STOP	ARRÊT
B95	STOP	STOP	ARRÊT
B96	STOP	STOP	ARRÊT
B97	STOP	STOP	ARRÊT
B98	STOP	STOP	ARRÊT
B99	STOP	STOP	ARRÊT
B100	STOP	STOP	ARRÊT

Material no.	6421602 C
Product	ELDIAGRAM
Part no.	3P Δ
Manufacturer	KEW
Material spec.	DK-9550 Hørsund Tlf. 98572111
Material no.	6421602 C
Product	ELDIAGRAM
Part no.	3P Δ
Manufacturer	KEW
Material spec.	DK-9550 Hørsund Tlf. 98572111
Material no.	6421602 C
Product	ELDIAGRAM
Part no.	3P Δ
Manufacturer	KEW
Material spec.	DK-9550 Hørsund Tlf. 98572111

Nr./No.	Betegnelse / Designation / Bezeichnung / Désignation	1640H	1840H	3040H		
1118512	Rep.sæt, sikkerhedsventil/Rep.kit, Safety valve/ Rep.satz, Sicherheitsventil/Kit de rép., soupape de sûreté	x	x	x		
1119200	Rep.sæt, kontraventil/Rep.kit, non return valve/ Rep.satz, Rückschlagventil/Kit de rép., clapet anti retour	x	x	x		
1119201	Rep.sæt, keramikstempel/Rep.kit, ceramic piston/ Rep.satz, Keramischer druckkoben/Kit de rép., piston ceramique	3	(3) 60Hz			
1119202	Rep.sæt, keramikstempel/Rep.kit, ceramic piston/ Rep.satz, Keramischer druckkoben/Kit de rép., piston ceramique		(3) 50Hz	3		
1119209	Rep.sæt, ventilsystem/Rep.kit, valvesystem/ Rep.satz, Ventilsystem/Kit de rép., système de clape	x	x	x		
1119211	Repsæt, Kørehåndtag H & V/Rep.kit, steering handle R + L/ Rep.satz, Handbügel R + L/Kit de rép, poignée de guidage D+G	x	x	x		
1119212	Rep.sæt, Støttering/U-manchet/ Rep.kit, Back-up ring/U-seal/ Rep.satz, Stützring/U-Manschette/Kit de rép., Anneau d'appui/U-raccord	1	1	1		
1119214	Rep.sæt, Filter & pakning/Rep.kit, Screen & gasket (Suntec)/ Rep.satz, Filter & Dichtung/Kit de rép, Filtre & joint	x	x	x		
1119216	Rep.sæt, indikator/Rep.kit, indicator/ Rep.satz, Indikator/it de rép, indicateur	x	x	x		
1119217	Rep.sæt, Filter & pakning/Rep.kit, Screen & gasket (Danfoss)/ Rep.satz, Filter & Dichtung/Kit de rép, Filtre & joint	x	x	x		
1119218	Rep.sæt, kabinetskrue/Rep.kit, cabinet screw/ Rep.satz, Gehäuse schraube/Kit de rép, Vis p. capot	x	x	x		
1119219	Rep.sæt, kabelafastning/Rep.kit, Cable lead-in/ Rep.satz, Zugentlastung/Kit de rép, Despositif d'attaque auxil.	x	x	x		
1119220	Rep.sæt, skråskive/lejer/Rep.kit, wobble disc/bearings/ Rep.satz, Taumelscheibe/Lagern/Kit de rép., disque oblique/roulements 50Hz, GB	x				
1119221	Rep.sæt, skråskive/lejer/Rep.kit, wobble disc/bearings/ Rep.satz, Taumelscheibe/Lagern/Kit de rép., disque oblique/roulements 50Hz		x			
1119222	Rep.sæt, skråskive/lejer/Rep.kit, wobble disc/bearings/ Rep.satz, Taumelscheibe/Lagern/Kit de rép., disque oblique/roulements 50Hz			x		
1119223	Rep.sæt, skråskive/lejer/Rep.kit, wobble disc/bearings/ Rep.satz, Taumelscheibe/Lagern/Kit de rép., disque oblique/roulements 60Hz	x				
1119224	Rep.sæt, skråskive/lejer/Rep.kit, wobble disc/bearings/ Rep.satz, Taumelscheibe/Lagern/Kit de rép., disque oblique/roulements 60Hz		x			
1119225	Rep.sæt, skråskive/lejer/Rep.kit, wobble disc/bearings/ Rep.satz, Taumelscheibe/Lagern/Kit de rép., disque oblique/roulements 60Hz			x		
1119226	Rep.sæt, skråskive/lejer/Rep.kit, wobble disc/bearings/ Rep.satz, Taumelscheibe/Lagern/Kit de rép., disque oblique/roulements 50Hz, GB			x		
1119227	Rep.sæt, ventilkegle/Rep.kit, piston / Kolben, Kompl. 1640H,/Piston, compl. 1840H	1	1			
1119228	Ventilkegle, kompl./Piston, compl. / Kolben, Kompl. 3040H/Piston, compl.3040H			1		
1119229	Rep.sæt, tilgangsvinkel/Rep.kit, inlet elbow/ Rep.satz, Einlaßwinkel/Kit de rép., coude du entrée	x	x	x		
1119230	Rep.sæt, instrumentpanel/Rep.kit, control panel 1640H/ Rep.satz, Armaturen Brett/Kit de rép, tableau de commande	x				

