

Service Manual



Getinge Ultrasonic

Ultrasonic Cleaning Units

• english •



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General

Carefully read the Service Manual before you carry out any repair works, in particular the *Important safety warnings*, *section 2*.

We assume that the person carrying out the described repair works is sufficiently educated in the field of safety and electronics skills. The basic safety instructions are not explicitly given for each repair work.

We reserve the right to carry out technical modifications on the units due to advanced development.

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The copy right remains with the editor.

1.1

How to use the Service Manual

For trouble shooting we recommend to use the table of possible malfunctions (*section 5*).

Further useful information on the operation of the unit can be found in the description of the unit (*section 4*).

Please observe the important safety warnings (*section 2*), and the information on initial operation (*section 17*).

In case of any further queries Getinge will be glad to assist. For our technical support and contact address please see the last page.

1.2

Contents of the Service Manual

Safety warnings	Carefully read and observe before you carry out any repair works
Product description	Description of operating elements and unit feature
Operation	Instructions on the intended use and operation of the present unit
Trouble shooting	Table of malfunctions, possible causes and remedies for the different unit types (no guarantee on completeness)
Repair	Easy-to-follow instructions on the replacement of faulty components; individual unit types are listed separately where necessary
Putting into operation / Trial run	Instructions on initial operation / putting into operation, cleaning media, heating of the cleaning liquid, etc.
Circuit diagrams	Appendix A contains circuit diagrams for each unit type showing the relevant data
Spare parts lists	Appendix B contains the spare parts lists, divided into separate lists for each unit type. The lists indicate the standard spare parts. Should you require any further components, please contact the manufacturer.

1.3 Demands on the service staff

The present Service Manual is intended for authorized service points and specialized service staff.

Legitimate users of the Service Manual are persons who do not require to be specifically instructed on the risks caused by electric equipment.

Special knowledge on electric unit and safety-relevant knowledge are prerequisite for carrying out any repair works on ultrasonic cleaning units.

1.4 Testing equipment, tools and measuring instruments

All testing and measuring tools and instruments must be connected to a grounded socket only.

Apart from the standard electromechanical tools the following measuring and testing equipment is required for carrying out the measuring and repair works described in the present Service Manual:

Multimeter	For electric measuring inside the unit, e.g. resistance and throughline measuring.
Torque wrench	Adjusting range up to approx. 100 Nm. For tests and repair works which require the opening of the transducer system. After opening, the transducer system must be screwed with the correct torque (see section Transducer system). The wrong torque can cause malfunctions and a breakdown of the unit.
Wattmeter	For checking the power consumption of the ultrasonic generator and the heating.
Adjustable interrupting transformer	Power 4 Ampere or more. For the separation of the unit from the mains and for the safe and controlled upward-adjustment of the mains voltage.
ESD protective measures	Certain components on the electronic PCB can be damaged through electrostatic charges. Therefore, it is absolutely necessary for the service staff to discharge statically before they touch the electronic PCB and to remain earthed when handling the component. The following items are required for arranging an ESD protected workplace:
Room	ESD work pad; ESD floor surface; Tools
Staff	ESD earthing connection from the wrist of the person to the work pad; ESD shoes
Packing	ESD protective bag; ESD boxes / cartons

2



Safety / alert

Important safety warnings

Carefully read and observe before inspection and reoperation of the unit!

Intended use	The present ultrasonic cleaning unit has been designed for the treatment of items and liquids only.
Authorized specialized staff	Repair and maintenance works which require the unit to be opened and connected must be carried out by authorized specialized staff only.
Check for damage	Check the unit and the mains cable for transport damages. In case of any visible damage do not operate the unit!
Placement	Place the unit on a dry and solid surface; ensure that the workplace is sufficiently ventilated. Keep workplace, unit housing and operating elements dry. Protect the unit from entering humidity!
Prevention of electrical accidents	Separate the unit from the mains before you open it. In order to prevent damages from persons and/or from the unit all connected electric measuring instruments and the ultrasonic unit must be connected via an interrupting transformer. Parts of the ultrasonic generator and the transducer system carry high-frequency AC voltage during operation. Due to piezoelectric effects there can be high voltages produced by exchanging the transducer disks. Earth these voltages before you touch the transducer disks.
Mains connection	100 – 120 V or 220 – 240 V 1 phase / 1 N / 1 PE shockproof grounded socket
Cleaning liquid	Fill the cleaning tank with a sufficient quantity of a suitable cleaning liquid before switch-on. Do not use flammable liquids directly in the cleaning tank: risk of fire and explosion!
Mains connection	For safety reasons, the present unit must be connected to a correctly grounded socket only. The technical details indicated on the nameplate must correspond with the available mains connection details, in particular those of the mains voltage and the current connected value.
Original spare parts	In order to guarantee compliance with the valid safety regulations and the CE conformity faulty parts must be replaced by original spare parts only.
Exclusion of liability	The manufacturer cannot be held liable for damages on persons, on the unit or on the workshop equipment caused by improper use or wrong repair.

3 Organizational details

3.1 Warranty

The warranty covers all claims based on material and manufacturing faults. Excluded from the warranty are:

- Transport damages; these must be reported to the forwarding agent immediately upon detection.
- Damages caused by improper use of the unit:
e.g. damages on the transducer tank caused by wrong cleaning media, cleaning items placed directly on the tank floor, dry running of the unit, etc.
- Damages caused by humidity which has entered the unit from outside.
- Unauthorized repair works on the unit.
- Improper use and/or operation against the Operating Instructions.
- Wear and tear; example: the transducer tank is a wear part with regard to the cavitation erosion around the sound-giving surfaces.

3.2 Warranty period

- | | |
|------------------|---|
| New units | The limitation period of warranty claims is 2 years (from the date of purchase). If no proof of purchase can be produced, Getinge can find out the date of manufacturing by means of the serial number (nameplate). |
| Repair | Getinge grant a limitation period of 2 years on all exchange parts and on any repair works carried out.

Please ensure that all documentation concerning the service works carried out are safely stored. |

3.3 Ordering of spare parts

Getinge guarantee the availability of spare parts according to the valid regulations over a period of 10 years after production and sale of a unit have stopped. Standard spare parts will be available for older units.

For your spare parts order we need to know the following data:

- Type of unit
- Voltage (115 V or 230 V)
- Serial number (nameplate)

3.4

How to find out the year of manufacturing

The year of manufacturing of a unit can be taken from the serial number indicated on the nameplate.

The serial number is required e.g. for revision purposes, for spare parts orders and for the determination of the warranty period.

- The first figure (A) – starting from the left – represents the decade.
- The second and third figures (B) – starting from the right – represent the month.
- The first figure (A) – starting from the right – represents the year.

Example:

S/N 1 0 4 8 0 0 0 4 3

A						B	C

April 2013

4 Product description

4.1 Unit features – front view



Illustration 4.1.1 Front view Getinge Ultrasonic 30

- A Maximum filling level indication** (indicates the recommended maximum filling level. This level should not be exceeded even with immersed cleaning items.
- B Plastic handles** (on Getinge Ultrasonic 30 and larger) for the safe transportation of the unit, even when heated.
- C Turning knob for draining the transducer tank** (on Getinge Ultrasonic 30 and larger)
Vertical position: drain open
Horizontal position: drain shut.
- D Operating elements** for the control of the unit functions description see *sections 4.2.*

4.2

Description operating elements

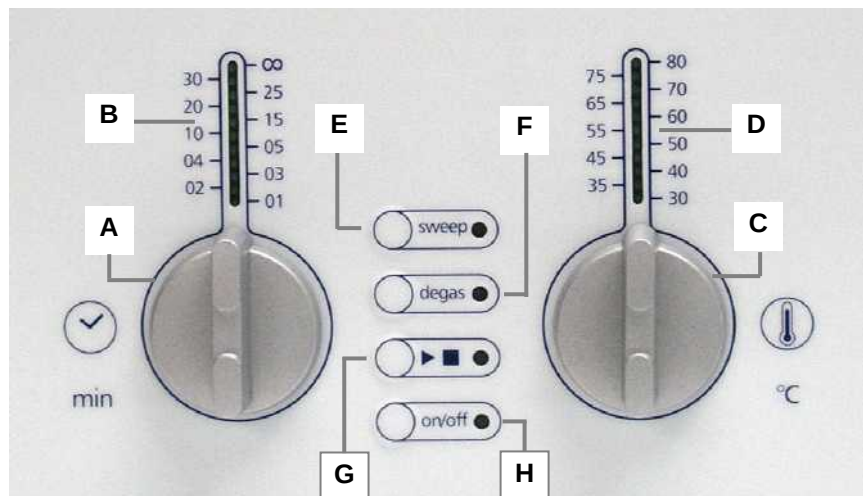


Illustration 4.2.1 View operating elements, unit with heating

- A Turning knob cleaning period** * Available options: short-term operation: 1; 2; 3; 4; 5; 10; 15; 20; 25; 30 min (with automatic switch-off).
Permanent operation ∞ . Switch-off by hand.
For reasons of safety the unit is automatically switched off after 12 h permanent operation.
- B LED display cleaning period** for set period and remaining period indication.
- C Turning knob temperature** * on units with heating.
Temperature range adjustable in 5 °C steps between 30 and 80 °C.
- D LED display temperature** on units with heating.
Display of set temperature and actual temperature of the liquid.
- E Key sweep function** for the optimum sound field distribution in the cleaning bath. Sweep LED.
- F Kea degas function** (by hand and Auto Degas – see *Table 4.7*) Degas function for the efficient degassing of the cleaning liquid and for special laboratory cleaning jobs. Degas LED.
- G Key ultrasonic operation** and temperature-controlled ultrasonic operation. Ultrasound LED
- H Key on/off** for switching the unit on and off.
On/off LED

* setting of the required value: turn **clockwise**
reset: turn **anti-clockwise**

4.3 Technical details

	Mains voltage unit variants (Vac)	Ultrasound frequency (kHz)	Power consumption total (W)	Ultrasonic power RMS (W)	Ultrasonic maximum peak power* (W)	Heating power (W)
30	100-120 220-240	37	280	80	320	200
40	100-120 220-240	37	340	140	560	200
60	100-120 220-240	37	550	150	600	400
70	100-120 220-240	37	750	150	600	600
80	100-120 220-240	37	750	150	600	600
90	100-120 220-240	37	550	150	600	400
100	100-120 220-240	37	550	150	600	400
120	100-120 220-240	37	1000	200	800	800
130	100-120 220-240	37	1100	300	1200	800
150	100-120 220-240	37	300	300	1200	-
180	100-120 220-240	37	1000	200	800	800
300	100-120 220-240	37	1500	300	1200	1200

*: Impulse sound; 30 – 300: Double half-wave sound. The form of signal has been adapted to the geometry of the transducer tank. Depending on the form of signal the peak of the ultrasonic power is 4 or 8-fold.

4.4

Operating and display functions

For your information: Specific displays of the unit types Getinge Ultrasonic 30 - 300 are listed separately.

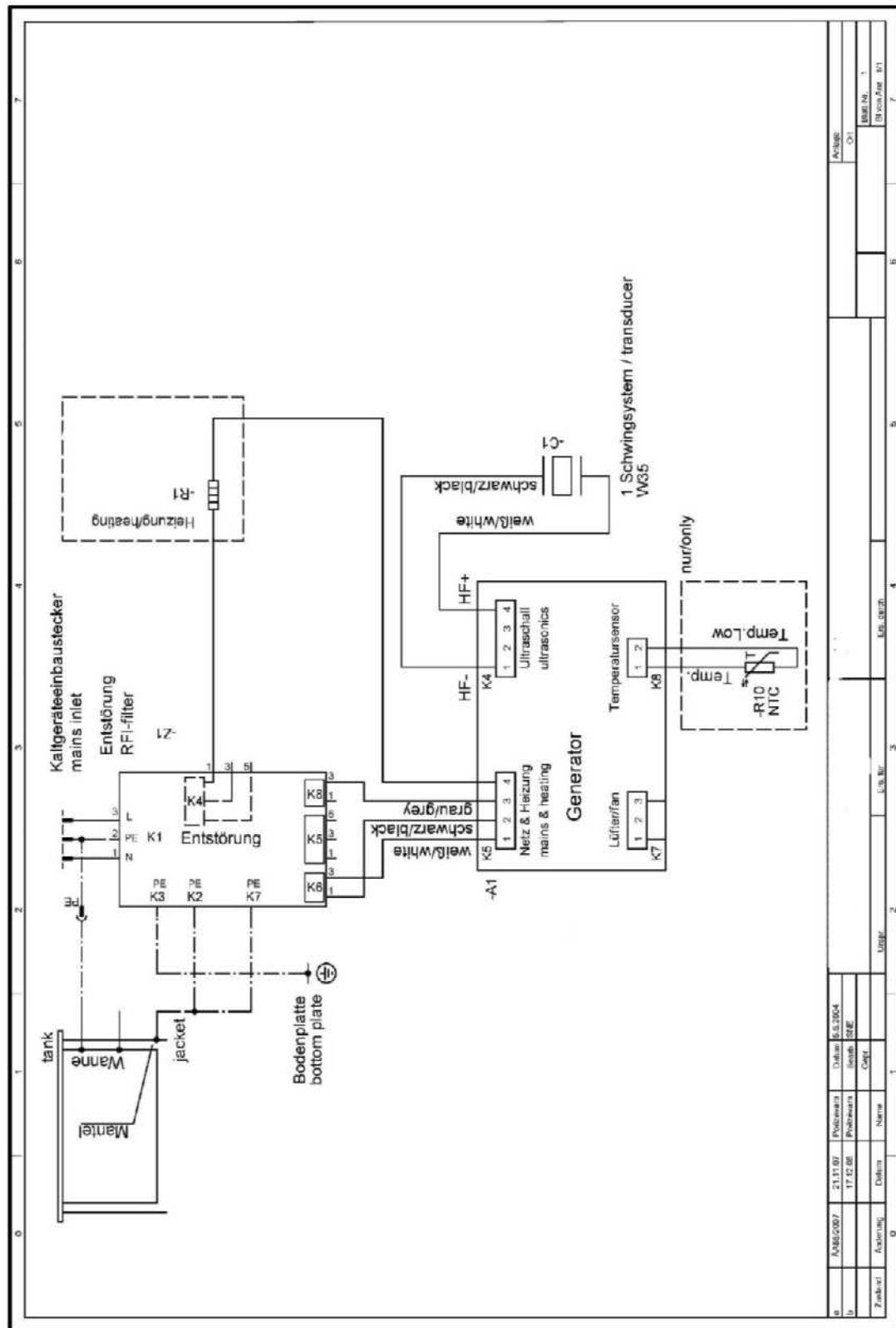
Action	To do	Result	Display
Switch on the unit	press on/off key	unit is ready for operation	on/off LED is on
Switch off the unit	press on/off key	unit is off	all displays dark
Start the ultrasound - now -	set the required period at the turning knob for cleaning period press ►■ key (ultrasound)	ultrasound operates	LED ultrasound is on set period is indicated by LED LED indicating remaining period flashes (only in timer operating mode)
Start the ultrasound - temperature-controlled*; with revolution of cleaning bath – * if set temperature > actual temperature; only on units with heating	set required period set temperature at turning knob keep key ►■ pressed (> 2 sec.)	heating operates ultrasound starts automatically when the set temperature is reached set period of ultrasonic activity runs down	LED ultrasound flashes LED set period flashes LED ultrasound is turned on when set temperature is reached LED set period is turned on LED remaining period flashes
Stop ultrasound by hand	set required period to „0“ or press ►■ key	ultrasound is turned off	LED ultrasound is turned off LED set period is turned on

Action	To do	Result	Display
Switch on heating* *only on units with heating	set required temperature	heating operates	LED set temperature is turned on LED actual temperature flashes and moves towards set temperature When actual = set temperature only the LED set temperature is on When actual > set temperature the LED actual temperature starts flashing again
Switch off heating by hand	set temperature to „0“ position	heating switches off	LED actual temperature flashes
Switch on sweep function* * Sweep and degas cannot be operated at the same time	set the required period press ►■ key press Sweep key	ultrasound operates in sweep mode	LED ultrasound is turned on LED sweep is turned on LED set temperature is turned on LED remaining period flashes
Switch on degas function* * Sweep and Degas cannot be operated at the same time	set the required period press ►■ key press Degas key	ultrasound operates in degas mode	LED degas is turned on LED ultrasound is turned on Getinge Ultrasonic 30 - 300: LED set period is turned on LED remaining period flashes

Action	To do	Result	Display
Switch off sweep-function	press Sweep key	sweep function is switched off ultrasound continues operation in standard mode	LED sweep is turned off LED ultrasound is turned on LED set period is turned on LED remaining period flashes
Switch off degas function	press Degas key	Degas function is off Ultrasound continues operating in standard mode	LED degas is turned off LED ultrasound is on LED set temperature is on LED remaining period flashes
Switch on Auto-Degas function* * Sweep and Degas cannot be operated at the same time	press ►■ key keep Degas key pressed (> 2 sec.)	Ultrasound operates in Auto-Degas mode for 10 minutes and switches off subsequently	LED degas flashes LED ultrasound is turned on

4.5

Circuit diagram Getinge Ultrasonic



5 Trouble shooting / Table of malfunctions

Find out if the malfunction is caused by a fault on the unit or by improper use. Examples for malfunctions due to improper use:

Improper use

- The cleaning result is not satisfactory:
The cleaning medium, the cleaning temperature or the duration of the cleaning cycle are not suitable for the cleaning task.
The cleaning result can also be impaired by a wrong or insufficient filling level and/or very dirty cleaning liquid.
- The unit does not heat up correctly:
For an efficient heating up of the cleaning liquid switch on the ultrasound (see *section 4.5. Start the ultrasound – temperature-controlled*; with revolution of the cleaning bath*) and use a cover.

Faulty unit

Check and find out if the fault is in the heating or in the ultrasonic system.

Check housing and bottom plate of the unit for any visible damage and check the tank for leaks before you connect the unit to an interrupting transformer.

Then connect the unit to an adjustable interrupting transformer for a functional check. You can easily and safely check the unit for a short circuit by slowly adjusting the mains voltage upwards and observing the current consumption. At the same time you can find out which functions of the unit have broken down.

LED display malfunction

Various malfunctions are indicated by a flashing LED display:

Ultrasound malfunction

Getinge Ultrasonic 30 - 300: LED display cleaning period flashes fast („running light“) / LED display in the ultrasound key flashes fast:

There is a fault on the PCB *control*, on the connection between *ultrasound >> transducer system* or on the transducer system.

Temperature malfunction

Getinge Ultrasonic 30 - 300: LED display heating temperature flashes fast („running light“) / LED display in the ultrasound key flashes fast:

There is a fault in the temperature measuring, e.g. interrupted connection to temperature gauge or a faulty gauge.

5.1 Table of malfunctions

Malfunction	Cause	Measuring	Result >> Action
No unit function: No ultrasound and no heating (on units with heating) and all LED displays dark	Broken/interrupted mains cable or mains supply socket damaged or interruption on pcb interference filter or interruption in connecting cable PCB interference filter >> PCB control or fault on PCB control	1. measure mains supply voltage	
		Check if there is mains voltage at input interference filter. How to proceed: Open the unit (see section 6) Measure the voltage at the fuses on the input side (see illustration 5.1.A) or check the fuse for throughline with ohmmeter	No mains moltage at input side of fuses: Check the mains cable for damage and check electric throughline Check mains supply socket for damage and check electric throughline Action: Replace faulty parts by original spare parts Voltage at input side of fuses: (see illustration 5.1.A) Continue with 2.
		2. Check fuses on interference filter	
		Measure mains voltage on output side of fuses or check throughline of fuses	Fuses are OK Continue with 3. Fuses are faulty: Check fuse data (see spare parts list) Fuses are faulty and fuse data are wrong: Mount fuses with correct data Fuses are faulty, fuse data are correct: There is a short circuit in the unit (e.g. heating element; PCB control, PCB; interference filter). Check for transport damage or humidity inside the unit. Continue with 5.

		Measuring	Result >> Action
		3. Check PCB interference filter for interruption	
		Measure mains voltage at output of PCB interference filter: How to proceed: Check if there is mains voltage between the contacts of the voltage supply to the heating element and of the voltage supply PCB interference filter. (See <i>illustration 5.1.B.</i>) or check fuse through-line with ohmmeter	No mains voltage at output of PCB interference filter: There is an electrical fault on the PCB interference filter. Action: Replace PCB interference filter by original spare part. How to proceed: see section 9 There is mains voltage at the output of the PCB interference filter: There is probably a fault on the PCB control. Possible the connecting cable between PCB interference filter and PCB control is interrupted.
		4. Check mains voltage of PCB control	
		4. Check voltage supply from control PCB	
		Check connecting cable between PCB interference filter and PCB control for interruption How to proceed: Pull off the plug of the connection wire (from interference filter) and measure at the contacts 1 (white) + 2 (black).	No mains voltage: The connecting cable between PCB interference filter and PCB control has been interrupted. Action: Replace complete cable No mains voltage at input PCB control: PCB control is faulty. Action: Replace PCB control (see section 9)

... No unit function: No ultrasound and no heating (on units with heating) and all LED displays dark		Measuring	Result >> Action
		5. Check unit for short circuit (of fuses on PCB interference filter faulty, fuse data correct)	
		Probably there is a short circuit in the unit (PTC heating element; PCB control; PCB interference filter).	
		How to proceed: The individual components must be checked separately.	
		6. check filter PCB for short circuit	
		How to proceed: Check for scorplings / traces of water in the mains socket Mount new fuses into PCB interference filter Pull off the connecting cable between PCB interference elimination and PCB control, preferably at the PCB control. Separate the supply wire from the PTC heating element at the respective plug contact on the PCB interference filter. Connect the unit to the mains for testing purposes.	Fuses on PCB interference filter are blown again: Short circuit on PCB interference filter. Replace interference filter (see <i>section 9</i>) Fuses on PCB interference filter are not blown: PCB interference filter is OK. Short circuit is probably in PTC heating element or PCB control Continue with 7.
		7. Check heating element for short circuit	
		Separate the heating element from the mains How to proceed: Separate the supply wire from the heating element at the respective plug contacts on the interference filter. Connect the unit to the mains.	Fuses on the interference filter are not blown: Short circuit in the heating element. Replace the heating element (see <i>section 13</i>) Fuses on the interference filter are blown: Heating element is OK. Probably short circuit in PCB control Continue with 8

...		8. Check PCB control for short circuit	
No unit function: No ultrasound and no heating (on units with heating) and all LED displays dark		Separate PCB control from the mains How to proceed: Pull off the connecting cable between PCB interference filter and PCB control, preferably at the plug of the PCB control. Connect the unit to the mains.	Fuses on the PCB interference filter are not blown: Short circuit on PCB control. Replace PCB control (see section 8). Fuses on PCB interference filter are blown again: Check unit for: loose or wrongly plugged cables, loose unit components, entered humidity.
Malfunction	Cause	Measuring	Result >> Action
No ultrasound and Display LEDs for ultrasound are flashing in malfunction indicating mode	Faulty PCB control	Check voltage supply of PCB control	
		How to proceed: Pull off the plug of the connecting cable (from PCB interference filter) and measure at contacts 1 (white) + 2 (black).	No mains voltage: Action: Replace complete cable Check PCB interference filter and connecting cable for faults (continue with 3. and 4) Mains voltage at input of PCB control: PCB control is faulty. Action: Replace PCB control (see section 8)

Malfunction	Cause	Measuring	Result >> Action
No ultrasound and Display LEDs for ultrasound are flashing in malfunction indicating mode	Faulty PCB control	Check voltage supply of PCB control	
		How to proceed: Pull off the plug of the connecting cable (from PCB interference filter) and measure at contacts 1 (white) + 2 (black).	No mains voltage: Action: Replace complete cable Check PCB interference filter and connecting cable for faults (<i>continue with 3. and 4</i>) Mains voltage at input of PCB control: PCB control is faulty. Action: Replace PCB control (see <i>section 8</i>)

Malfunction	Cause	Measuring	Result >> Action
No ultrasound and Display LEDs for ultrasound are flashing in malfunction indicating mode	Faulty PCB control Faulty transducer system Electric cable to transducer system is interrupted Connection between the transducer systems (if more than one) is interrupted	1. Check electric cables of the transducer system	
		How to proceed: Check connecting cables between PCB control and transducer system with ohmmeter for throughline.	No electric throughline can be measured: Replace cable Electric throughline can be measured: Continue with 2.
		2. Check transducer system visually	
		How to proceed: Carry out the following visual checks: Check transducer system for damages, scorchings, tears of the PXE disks, poor connections between the electric cables	Visible faults in the transducer system: Repair the transducer system (see <i>section 14 Replacement of piezoceramics</i>) No visible faults in the transducer system: Probably faulty PCB control. How to proceed: Continue with replacement of PCB control (see <i>section 8</i>)
		3. Replace PCB control	
		Very probably faulty PCB control.	How to proceed: Continue with replacement of PCB control (see <i>section 8</i>).
Malfunction	Cause	Measuring	Result >> Action
Heating element does not heat up or Heating element heats up permanently (Set value LED for heating is turned on)	Interruption in the heating supply cable Faulty triac on PCB control	1. Check heating supply cable	
		Measure mains voltage at output of PCB interference filter How to proceed: Check if there is mains voltage between the respective contacts of the voltage supply to the heating element	No mains voltage: Check PCB interference filter for interruption. Mains voltage: Probably the triac on the PCB control is faulty How to proceed: Continue with 2

		2. Check triac on PCB control	
		How to proceed: Check triac for short circuit with ohmmeter (see <i>illustration 5.4.B</i>)	Short circuit on triac How to proceed: Continue with replacement of PCB control (see <i>section 8</i>) or with repair of triac.
Heating does not heat up and LEDs for heating are flashing in malfunction indicating mode	Faulty temperature sensor Faulty supply cable temperature sensor	Check temperature sensor and supply cable	
		Measure resistance of the temperature sensor with ohmmeter: At 25 °C approx. 10 kOhm (see <i>illustration 5.3.A</i>)	Faulty temperature sensor: If the measured resistance is not within this range the component is faulty. How to proceed: Continue with replacement of temperature sensor
Malfunction	Cause	Measuring	Result >> Action
No unit function: and LED dispys for heating and ultrasound are flashing in malfunction indicating mode	Fault in the programme or Faulty PCB control	Check PCB control	
		How to proceed: Switch unit off and on again	Malfunction indication continues: Continue with repalcement of PCB control (see <i>section 8</i>) Unit function OK, no malfunction indicated: Malfunction has been remedied

Measuring points
interference filter
Getinge Ultrasonic
30-300

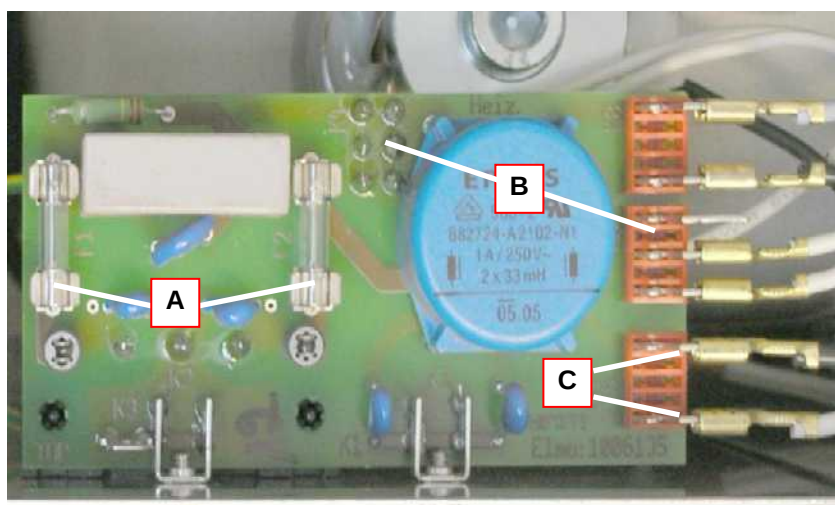


Illustration 5.2. Measuring points PCB interference filter

**Measuring points
PCB control
temperature sensor**



Illustration 5.3. Measuring points PCB control

- A** Measuring points temperature sensor. For measuring pull off contact. At 25 °C approx. 10 kOhm
- B** Measuring points triac (outside connections). At a measured resistance below 100 Ohm the triac is faulty.

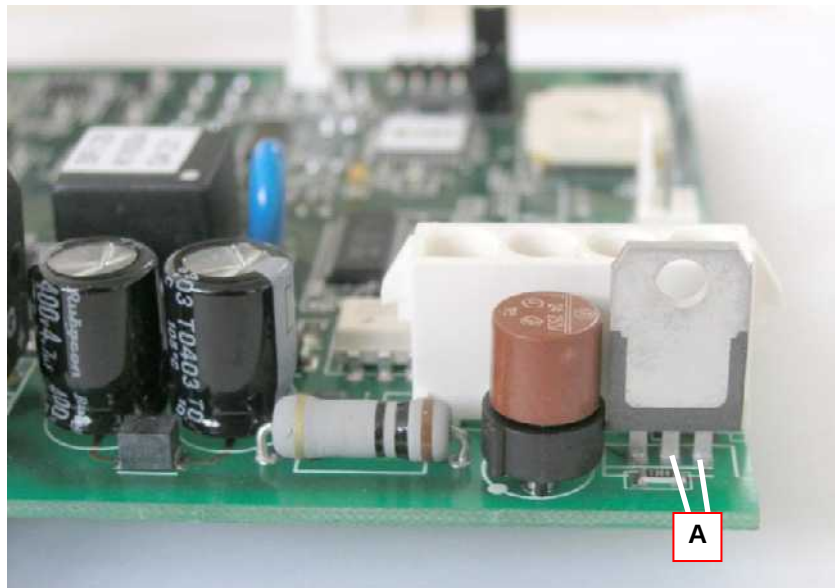


Illustration 5.4. Measuring points triac (here PCB control S10H)

6

How to open the unit



Live parts inside the unit.

Risk of electrocution!

- Opening of the unit by authorized specialized staff only.
 - Always pull the mains plug before you open the unit.
 - For checks that require the unit to be connected use a mains interrupting transformer.
-

6.1

Getinge Ultrasonic 30, 40, 70, 80

Fastening of bottom plate



The bottom plate with the unit feet is fastened to the unit housing by clips. In addition, the bottom plate is screwed to the cooling body of the PCB control by two screws.

How to proceed

1. Pul the mains plug!
2. Place the unit onto the workplace upside down.
3. Unscrew the two visible recessed head screws (*illustration 6.2.A*). Not on S 450 H and S 900 H.
4. On several unit types there are further fastening screws that need to be loosened (*illustration 6.2.B*).
5. Carefully lever the bottom plate loose with a screw driver or a similar tool (*illustration 6.1*).

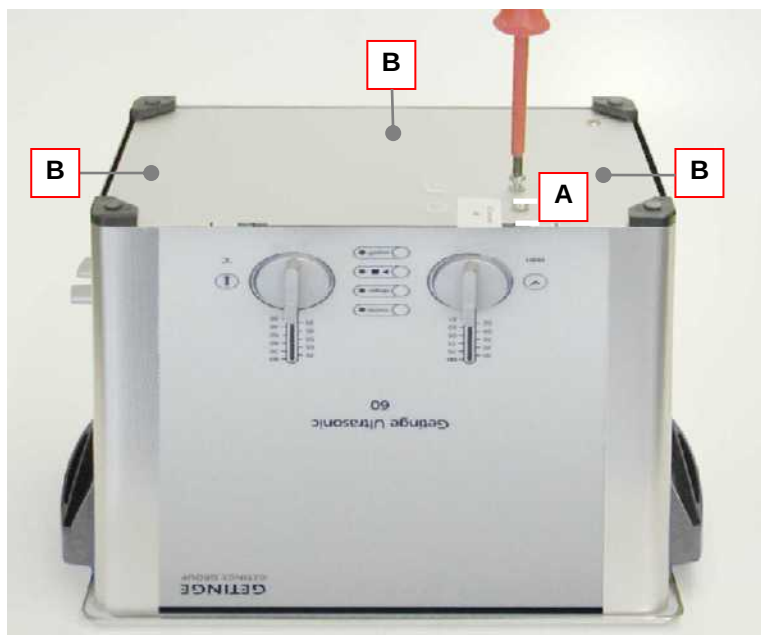


Illustration 6.2. Unscrew the two recessed head screws

6.2

Getinge Ultrasonic 60, 100 – 300

Fastening of bottom plate



How to proceed

The bottom plate is screwed to the unit through the unit feet. In addition, the bottom plate is screwed to the cooling body of the PCB control with 2 screws.

1. Pull the mains plug!
2. Place the unit onto the workplace upside down.
3. Unscrew the 4 unit feet.
4. Unscrew the two visible recessed head screws.
5. Carefully lever the bottom plate loose with a screw driver or a similar tool (*illustration 6.1.*).

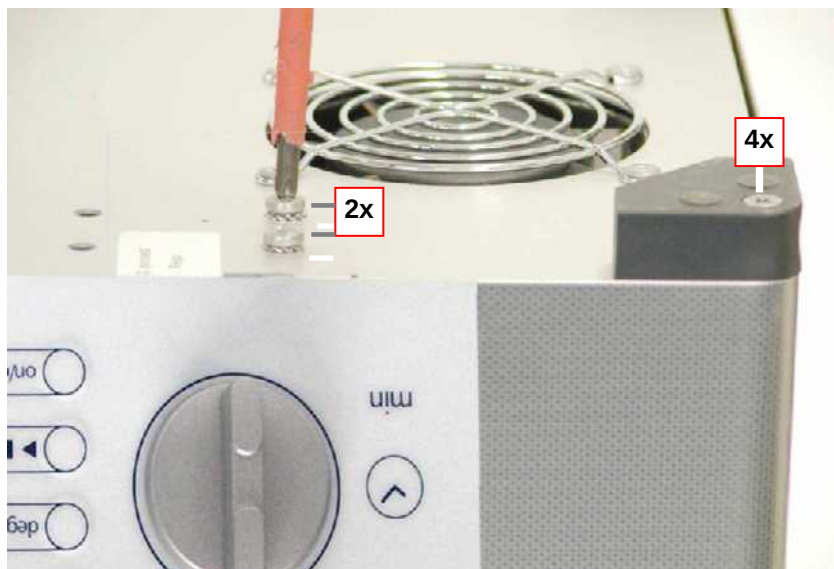


Illustration 6.3. Unscrew the two recessed head screws and the 4 unit feet

6.3

How to close the unit /

How to mount the bottom plate

Follow the instructions on opening the unit in reverse order.

Ensure that all electric wires are connected correctly and no electric wires are pinched by the bottom plate before you close the unit.

7

How to remove / replace the turning knobs

Fastening



The turning knobs are plugged onto the unit front. The turning knobs are connected to the relevant potentiometer on the PCB control by a shaft.

7.1

How to remove the turning knobs

There are two ways to remove the turning knobs:

Without opening the unit

This method is useful if only the turning knobs are to be replaced. However, when pulling the turning knobs off, it is possible that the shaft (*illustration. 7.2.A.*) slides out of the shell of the turning knob (*illustration 7.4.B.*) and remains connected to the potentiometer on the PCB control. If this happens the shaft can be pulled out with pliers or side nippers.

How to proceed

Pull off the turning knob exactly square to the unit.



Illustration 7.1. Pull off the turning knob

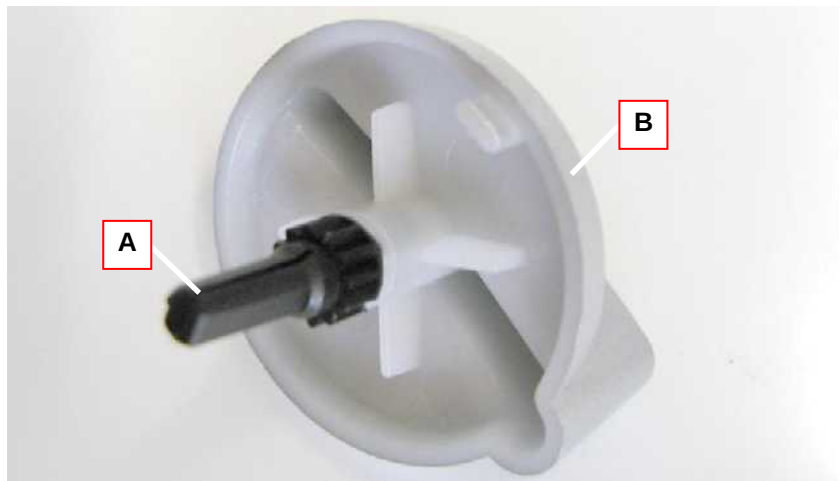


Illustration 7.2. View turning knob

With opening the unit This method is useful if the unit must be opened anyway, e.g. for repair purposes (exchange of PCB control).

Proceed as follows

1. Pull the mains plug!
2. Open the unit as described in *section 6*.
3. Push the shaft of the turning knob out from inside (A) and pull the knob off from outside at the same time (B).

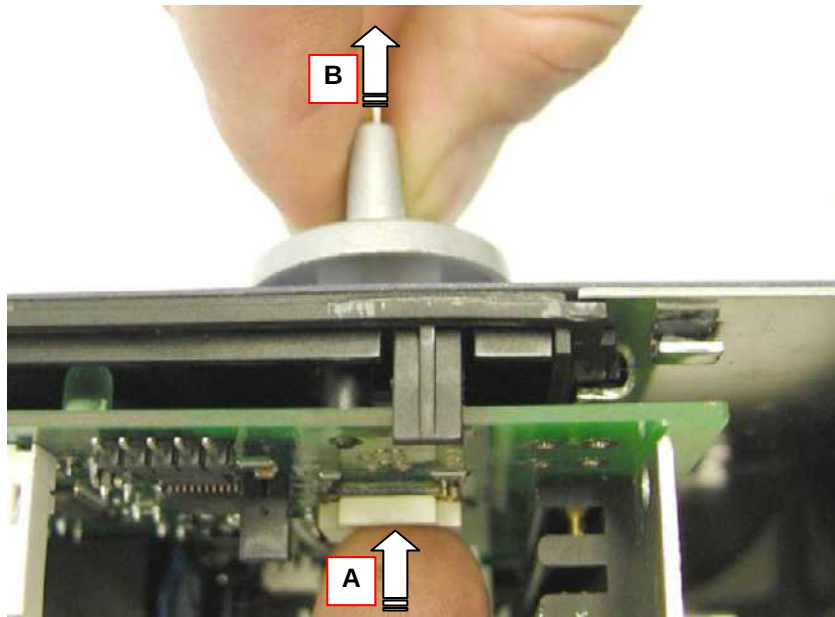


Illustration 7.3. Pull off the turning knob with opened unit.

7.2

How to mount the turning knobs

How to proceed

Put the turning knob square onto the unit. Ensure that the turning knob is positioned correctly: The cog of the turning knob (A) must correspond with the stop position on the PCB support (B).

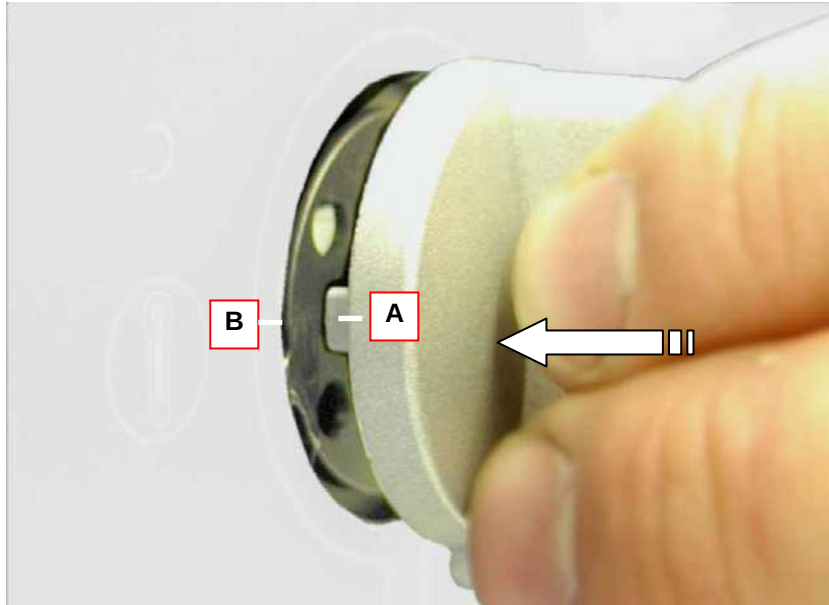


Illustration 7.4. Put on the turning knob

8

How to replace the PCB control



The PCB control is clipped into the unit. It can be removed without any tool.



NOTE

Some of the electronic components on the PCB control are sensitive against electrostatic charging. These charges may destroy the component. Therefore, for the correct handling of the PCB control please observe the instructions on ESD protection (*section 1.4*).

8.1

Electric connections

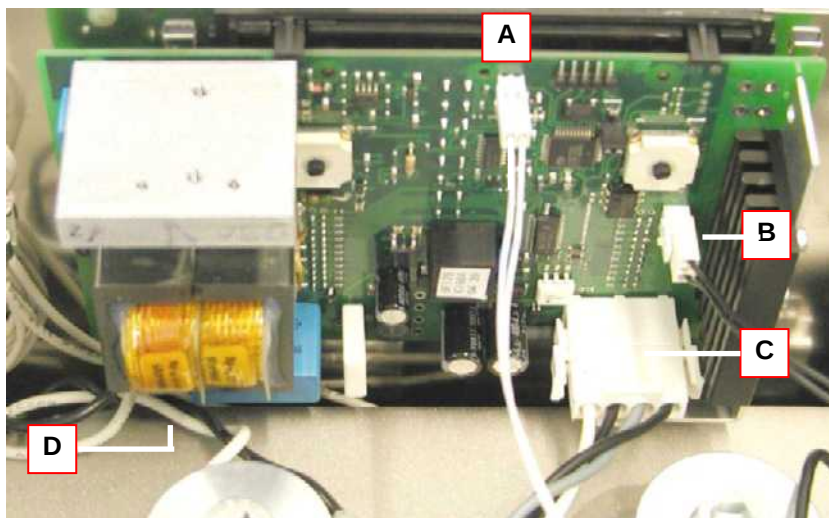


Illustration 8.1. Connections PCB control

- A Connection temperature gauge**
- B Connection fan (on S120H and larger)**
- C Voltage supply PCB (mains voltage)**
- D Connection transducer system(s) (high frequency)**

8.2

How to remove the PCB control

How to proceed

1. Open the unit as described in *section 6*.
2. Remove the turning knobs as described in *section 7.1*.
3. Carefully bend the two clips (*illustration 8.2.A*) of the PCB support upwards and remove the PCB control by tilting it to the inside.
4. Separate the electric plug connections and take the PCB control out of the unit.
Note: All plug connections are coded and cannot be interchanged.

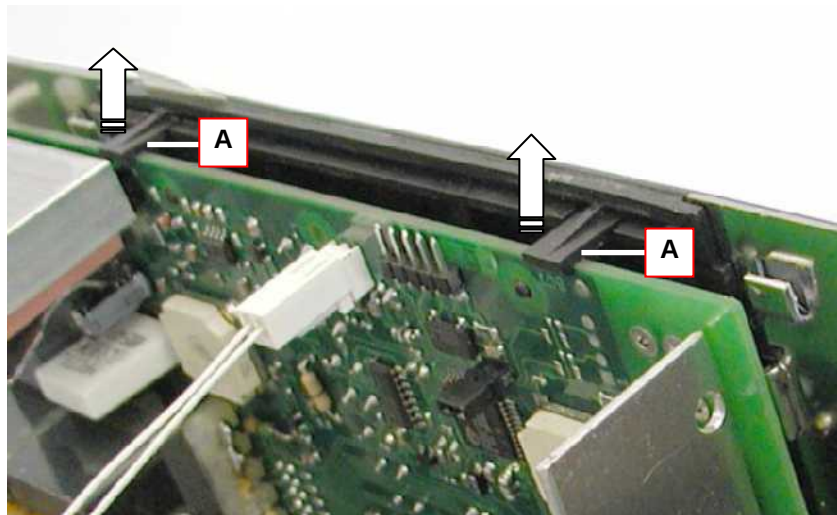


Illustration 8.2. Bend the two clips upwards ...

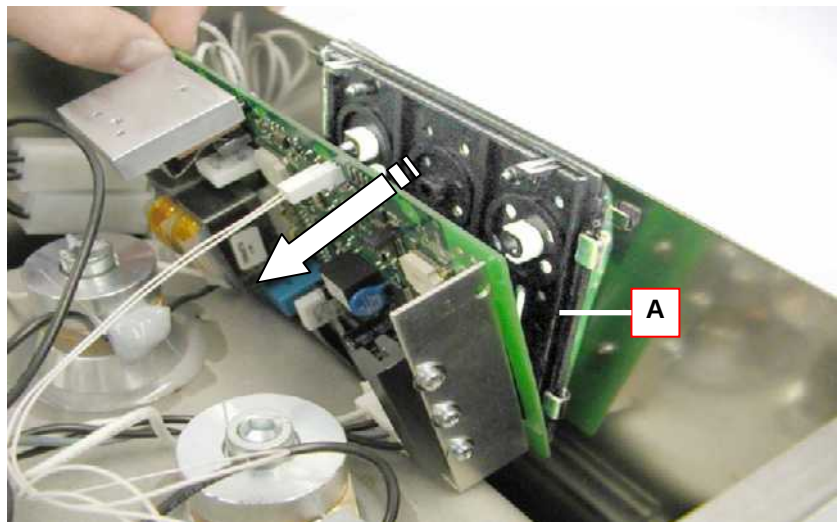


Abb. 8.3. ... and tilt the PCB control to the inside

8.3 How to mount the PCB control

- How to proceed**
1. Connect the electric plug connections (see *illustrations 8.1. and 8.4.*). Note: All plug connections are coded and cannot be interchanged when mounted.
 2. Place the PCB control into the groove of the lower fixation of the PCB support (*illustration 8.3.A.*). The horizontal adjustment of the component depends on the lighted diodes on the PCB control and the recesses in the PCB support and the potentiometers.
 3. Clip the correctly positioned PCB control into the upper fastening clips (see *illustration 8.2. / 8.3.*).
 4. Mount the turning knobs as described in *section 7.2.*
 5. Close the bottom plate as described in *section 6.4.*

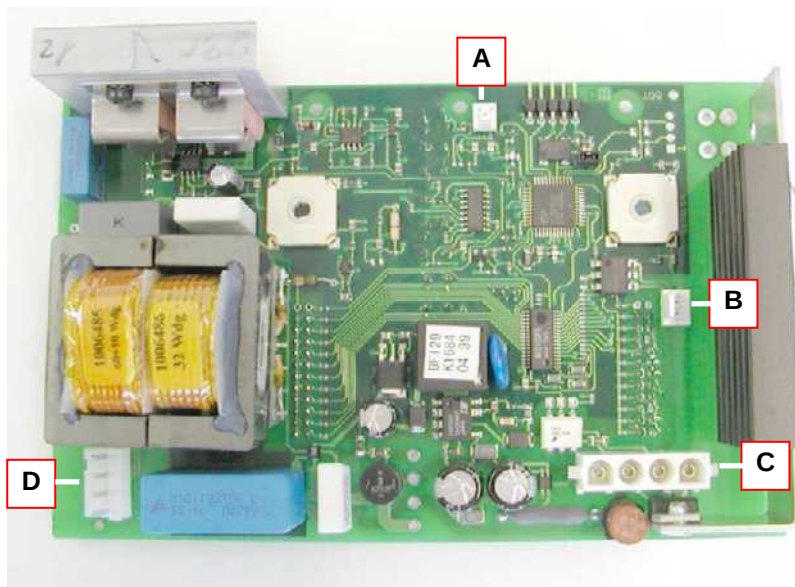


Illustration 8.4. Electric connections on PCB control

- A Connection for temperature gauge**
- B Connection for fan** (on S120H and larger)
- C Voltage supply PCB / voltage supply heating element(s)** (mains voltage)
- D Connections transducer system(s)** (high frequency)

9 How to replace the PCB interference filter

9.1 Getinge Ultrasonic 30 - 40

The PCB interference filter is screwed to the back of the unit.
The mains input socket is soldered to the PCB interference filter and must be replaced with the PCB.

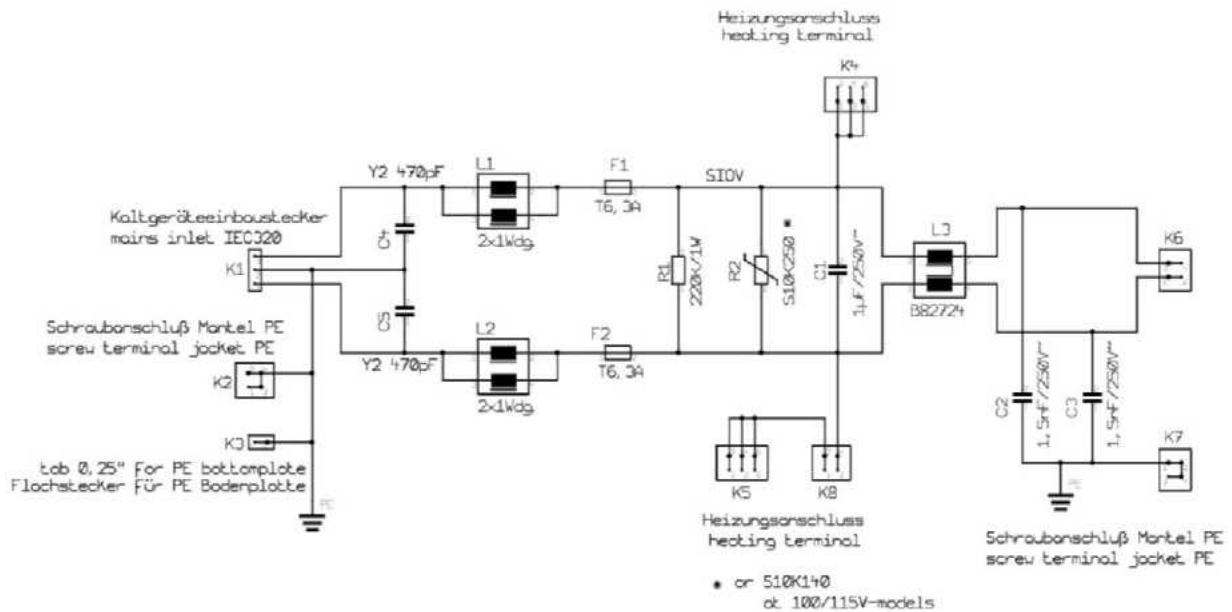


Illustration 9.4. Circuit diagram version 11.2005 and later

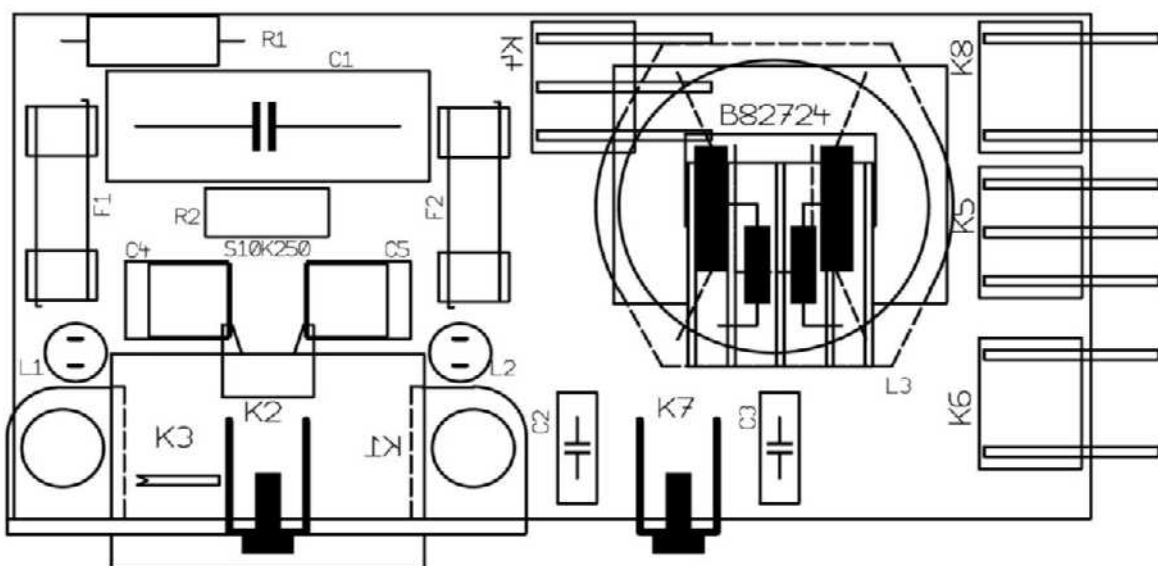


Illustration 9.5. block diagram

9.1.1

How to remove the PCB interference filter

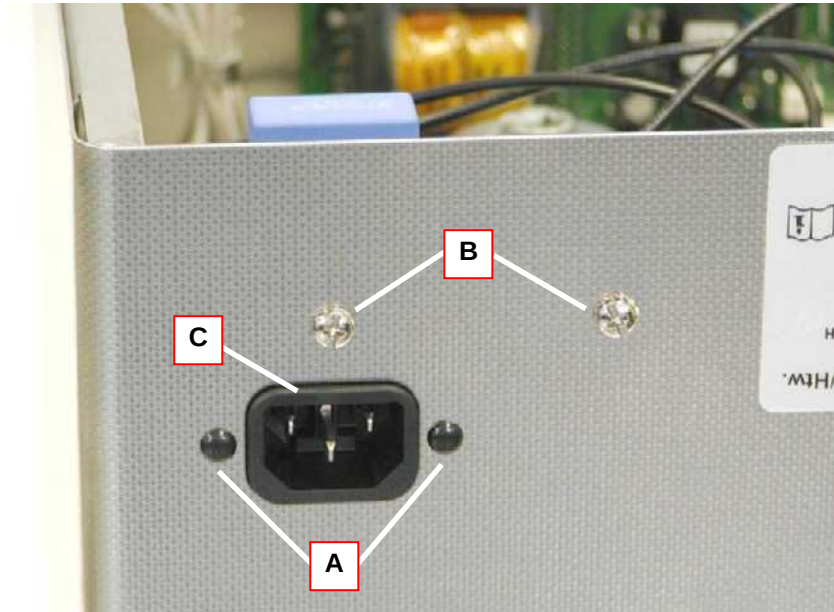


Illustration 9.6. Fastening of the PCB interference filter

How to proceed

1. Open the unit as described in *section 6*.
2. Mark the electric plug connections (to avoid interchanging when they are reconnected) and loosen them.
3. Pull both two-part plastic pins (*illustration 9.6.A*) that arrest the mains input socket. For this, lever the pins out of the housing, e.g. with a knife (*illustration 9.7.A*).
4. Unscrew the two screws (*illustration 9.6.B*) that fasten the PCB interference filter to the back of the unit.
5. Take the PCB interference filter out of the unit.

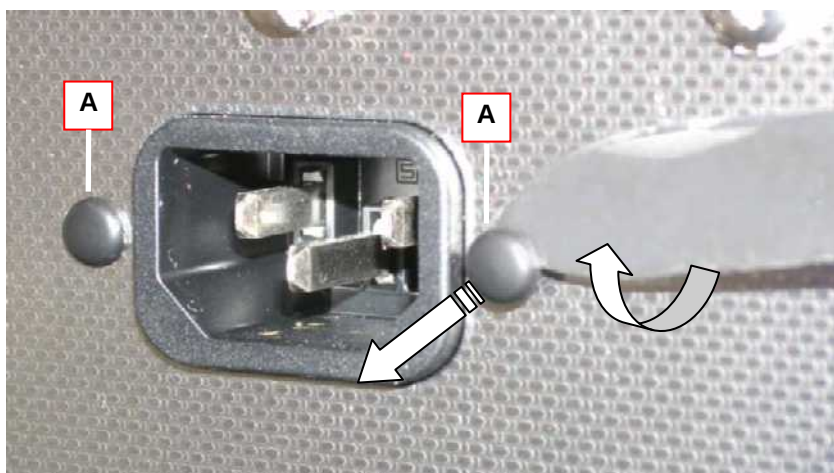


Illustration 9.7. Removal of the plastic pins

9.1.2

How to mount the PCB interference filter

When ordered as spare part only the new version of the PCB interference filter is delivered (manufactured in 2006 or later). If an older version had been mounted in the unit please note that the connections for the heating element(s) have been modified.

How to proceed

1. Position the PCB in the unit and fasten it to the back of the unit with the two screws (*illustration 9.6.B*).
2. Insert the two plastic pins (*illustration 9.7.A*) that arrest the mains input socket. Insert the inner part first (*illustration 9.8.A*), then insert the outer part (*illustration 9.8.*).
3. Connect the electric plug connections to the plug contacts. Ensure that all connections are plugged correctly.
If the unit had been fitted with an old PCB interference filter, it is now recommendable to connect the heating elements directly to the PCB interference filter (*illustration 9.9.B and D*).
4. Check again if all contacts and positioning of PCB are correct.
5. Close the bottom plate as described in *section 6.4*.



Illustration 9.8. Insert plastic pins

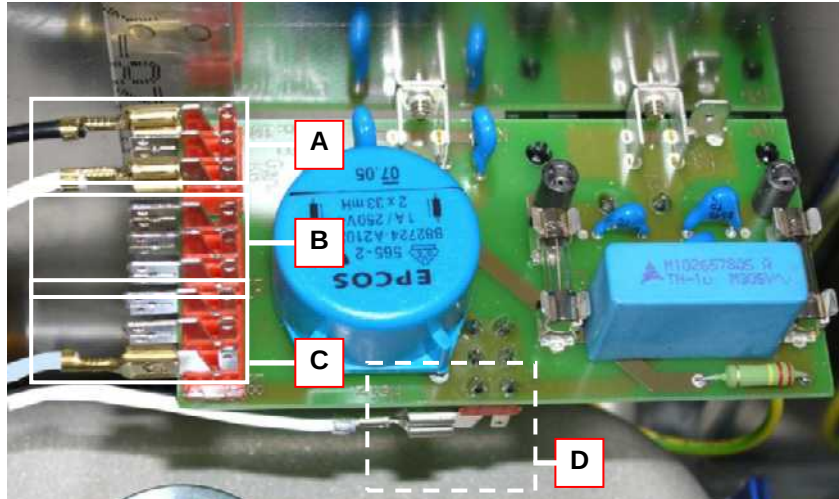


Illustration 9.9. Electric connections for 1 heating element (e.g. S 30 H)

- A** Voltage supply for PCB control (phase – black).
- B** Voltage supply for PCB control (zero – white).
- C** Connection for heating control (grey).
- D** Connection for heating control (white).

9.2

Getinge Ultrasonic 60 - 100

The PCB interference filter is screwed to the back of the unit.
The mains input socket is soldered to the PCB interference filter
and must be replaced with the PCB.

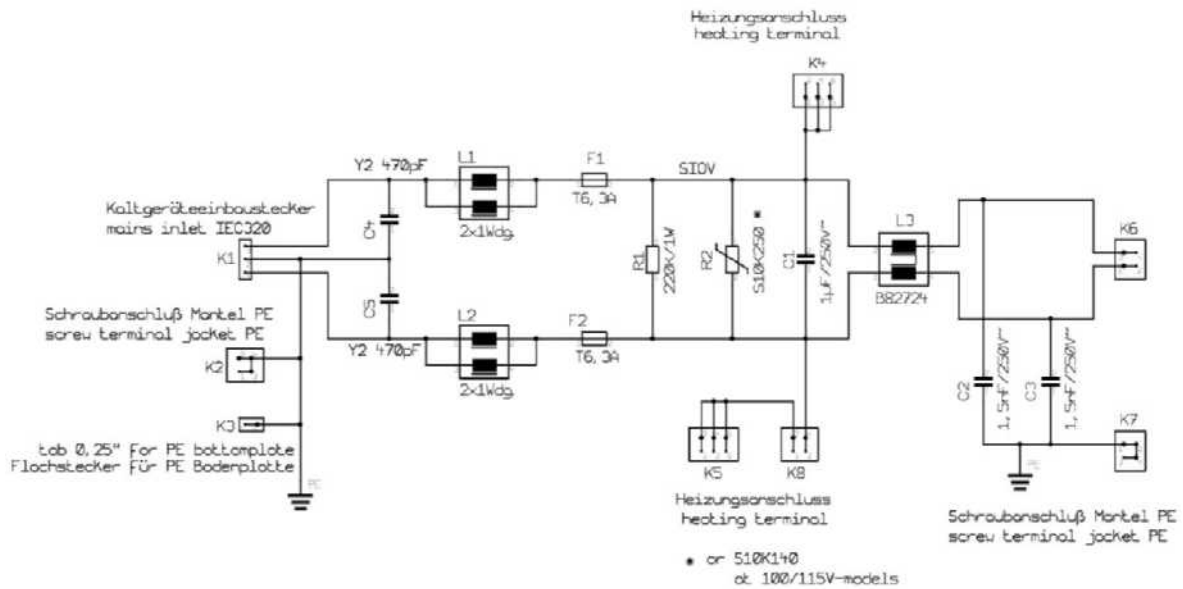


Illustration 9.13 Circuit diagram version of 11.2005 or later

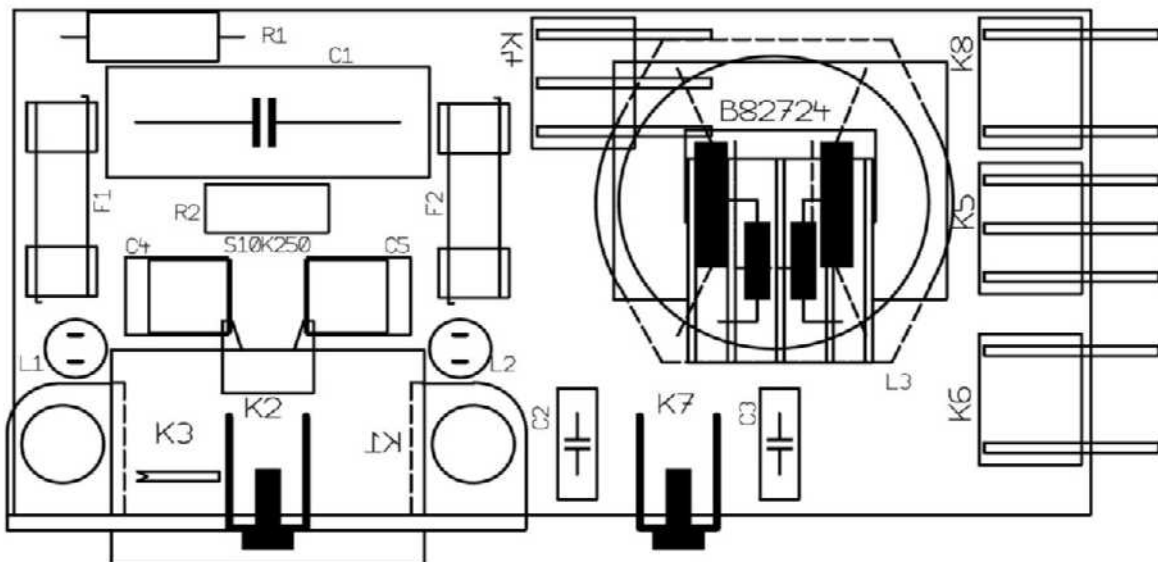


Illustration 9.14. block diagram

9.2.1 How to remove the PCB interference filter

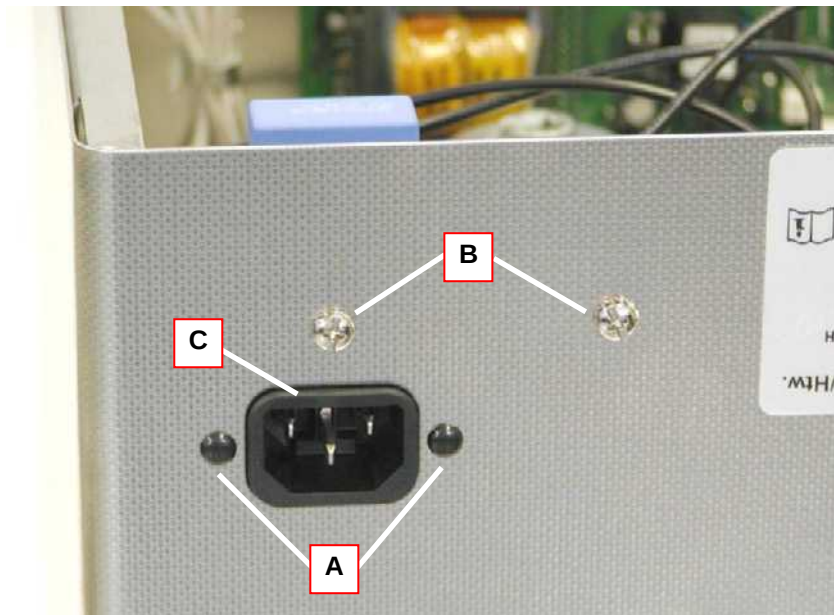


Illustration 9.15. Fastening of PCB interference filter

How to proceed

1. Open the unit as described in *section 6*.
2. Mark the electric plug connections (to avoid interchanging when they are reconnected) and loosen them.
3. Pull both two-part plastic pins (*illustration 9.15.A*) that arrest the mains input socket. For this, lever the pins out of the housing, e.g. with a knife (*illustration 9.16.A*).
4. Unscrew the two screws (*illustration 9.15.B*) that fasten the PCB interference filter to the back of the unit.
5. Take the PCB interference filter out of the unit.

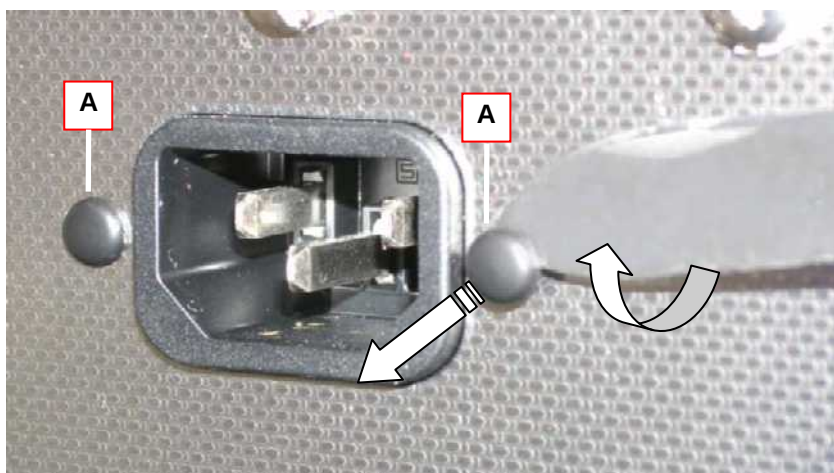


Illustration 9.16. Removal of the plastic pins

9.2.2

How to mount the PCB interference filter

When ordered as spare part only the new version of the PCB interference filter is delivered (manufactured in 2006 or later). If an older version had been mounted in the unit please note that the connections for the heating element(s) have been modified.

How to proceed

1. Position the PCB in the unit and fasten it to the back of the unit with the two screws (*illustration 9.15. B*).
2. Insert the two plastic pins (*illustration 9.16.A*) that arrest the mains input socket. Insert the inner part first (*illustration 9.17.A*), then insert the outer part (*illustration 9.17.B*).
3. Connect the electric plug connections to the plug contacts. Ensure that all connections are plugged correctly. If the unit had been fitted with an old PCB interference filter, it is now recommendable to connect the heating elements directly to the PCB interference filter (*illustration 9.18. / illustration 9.19.B and D*).
4. Check again if all contacts and positioning of PCB are correct.
5. Close the bottom plate as described in *section 6.4*.



Illustration 9.17. Insert plastic pins

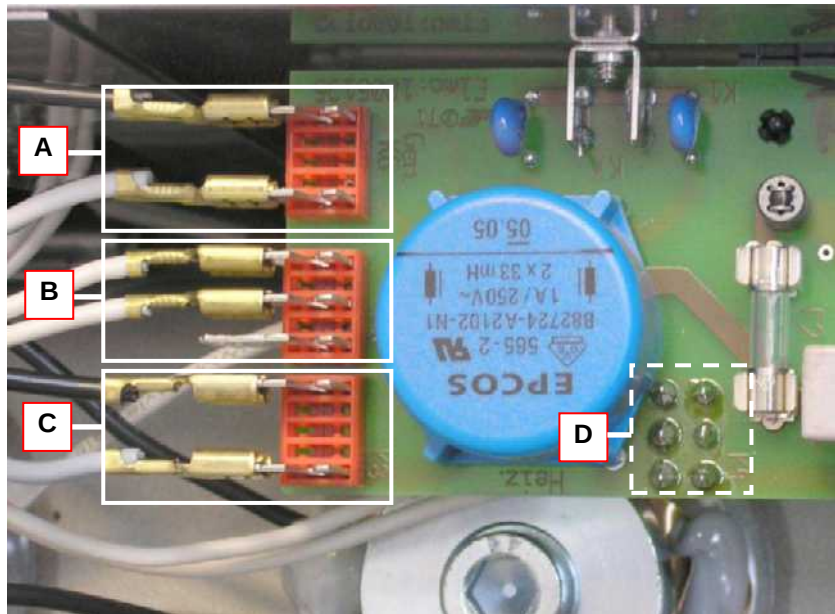


Illustration 9.18. Electric connections with 2 heating elements

- A** Voltage supply for PCB control (black/white). Polarization of the cables is irrelevant.
- B** Connections for 1 – 3 heating elements. All contacts are bridged and have the same potential: One cable per heating element is connected.
- C** Connections for heating control (black/grey). Polarization of the cables is irrelevant.
- D** Connections for 1 – 3 heating elements (underneath the PCB). All contacts are bridged and have the same potential: One cable per heating element is connected.

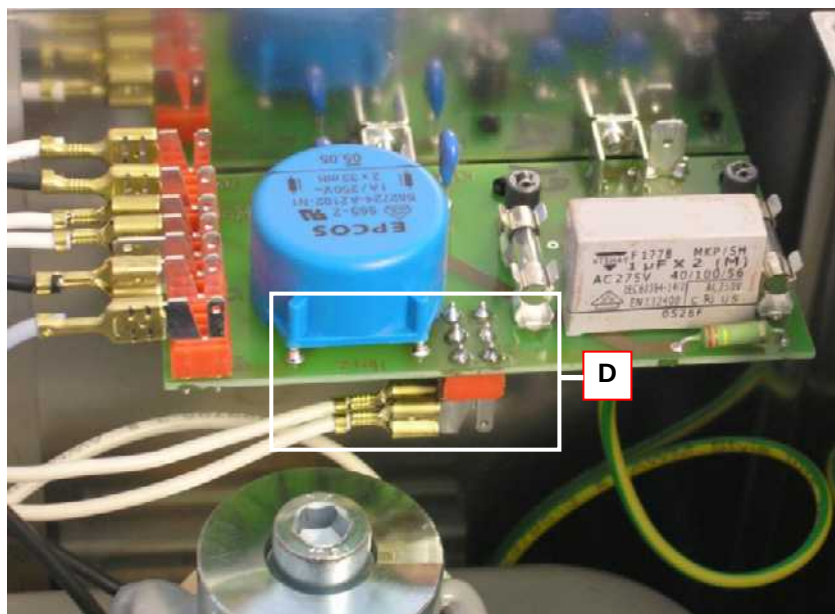


Illustration 9.19. Electric connections with 2 heating elements

9.3 Getinge Ultrasonic 120 - 300

The PCB interference filter is screwed to the back of the unit. The mains input socket is soldered to the PCB interference filter and must be replaced with the PCB.

9.3.1 How to remove the PCB interference filter

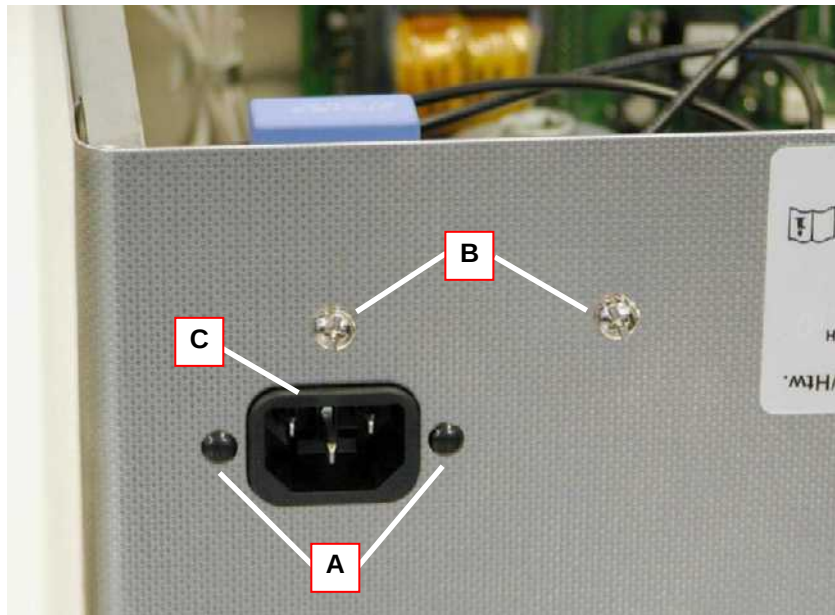


Illustration 9.21. Fastening of PCB interference filter

- How to proceed**
1. Open the unit as described in *section 6*.
 2. Mark the electric plug connections (to avoid interchanging when they are reconnected) and loosen them.
 3. Pull both two-part plastic pins (*illustration 9.21.A*) that arrest the mains input socket. For this, lever the pins out of the housing, e.g. with a knife (*illustration 9.22.A*).
 4. Unscrew the two screws (*illustration 9.21.B*) that fasten the PCB interference filter to the back of the unit.
 5. Take the PCB interference filter out of the unit.

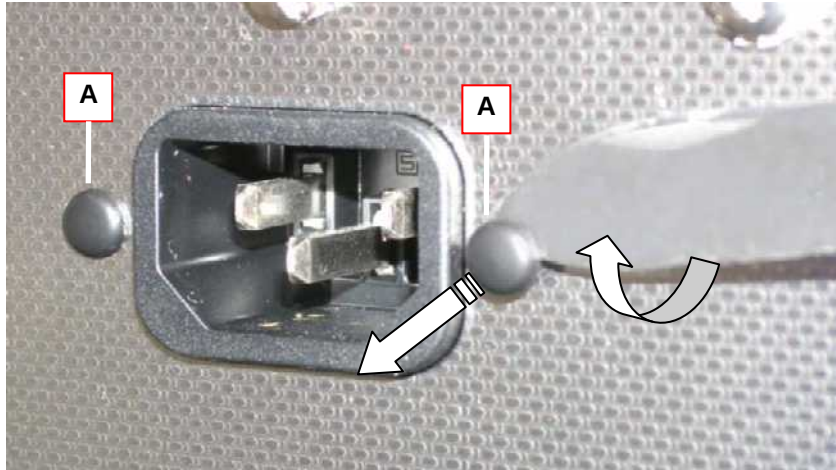


Illustration 9.22. Removal of the plastic pins

9.3.2

How to mount the PCB interference filter

When ordered as spare part only the new version of the PCB interference filter is delivered (manufactured in 2006 or later). If an older version had been mounted in the unit please note that the connections for the heating element(s) have been modified.

How to proceed

1. Position the PCB in the unit and fasten it to the back of the unit with the two screws (*illustration 9.21.B*).
2. Insert the two plastic pins (*illustration 9.22.A*) that arrest the mains input socket. Insert the inner part first (*illustration 9.23.A*), then insert the outer part (*illustration 9.23.B*).
3. Connect the electric plug connections to the plug contacts. Ensure that all connections are plugged correctly. If the unit had been fitted with an old PCB interference filter, it is now recommendable to connect the heating elements directly to the PCB interference filter (*illustration 9.31.B and D*).
4. Check again if all contacts and positioning of PCB are correct.
5. Close the bottom plate as described in *section 6.4*.



Illustration 9.23. Mount plastic pins

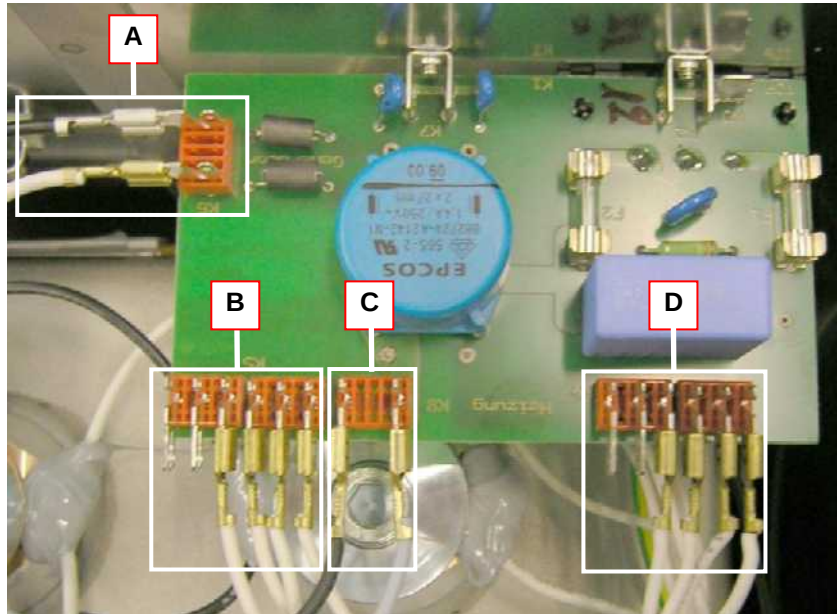


Illustration 9.24. Electric connections with 4 heating elements

- A Voltage supply for PCB control** (black/white). Polarization of the cables is irrelevant.
- B Connections for up to 6 heating elements.** All contacts are bridged and have the same potential: One cable per heating element is connected.
- C Connections for heating control** (black/grey). Polarization of the cables is irrelevant.
- D Connections for up to 6 heating elements.** All contacts are bridged and have the same potential: One cable per heating element is connected.

10 How to replace the potentiometer for the cleaning period / for temperature

Setting of the cleaning period and the temperature is carried out via potentiometer which are soldered to the PCB control.

Cause of breakdown A breakdown can be caused by heavy mechanical forces such as shock or transport damages.

To replace the component it is necessary to open the bottom plate and to take out the PCB control. Proceed as follows:

- How to proceed**
1. Open the unit as described in section 6.
 2. Pull off the turning knob as described in section 7.
 3. Remove the PCB control as described in section 7.
 4. Carefully unsolder the faulty potentiometer (*soldering points see illustration 10.1.*).
 5. Position the new potentiometer on the 4 soldering points and solder it. Coding by 2 plastic pins at potentiometer.
 6. Mount the PCB control as described in section 8.1.
 7. Mount the turning knob as described in section 7.2.
 8. Mount the bottom plate; close the unit. Ensure that all plug contacts are correctly plugged and that no cables are pinched.

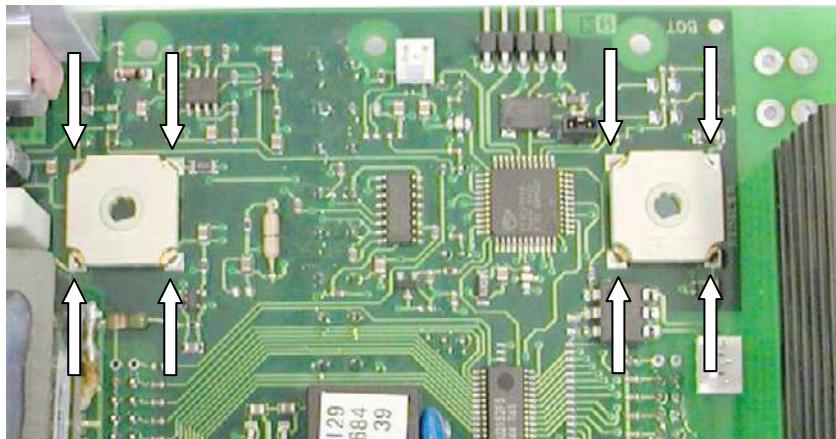


Illustration 10.1. Soldering points for potentiometer

11

How to replace the front panel



The front panel consists of adhesive foil. There is no further adhesive necessary.

The unit does not require to be opened.

How to proceed

To replace the front panel proceed as follows:

1. Pull off the turning knobs as described in *section 7*.
2. Carefully pull off the front panel (*see illustration 11.1.*).
3. Put on the new adhesive front panel.
4. Mount the turning knobs.

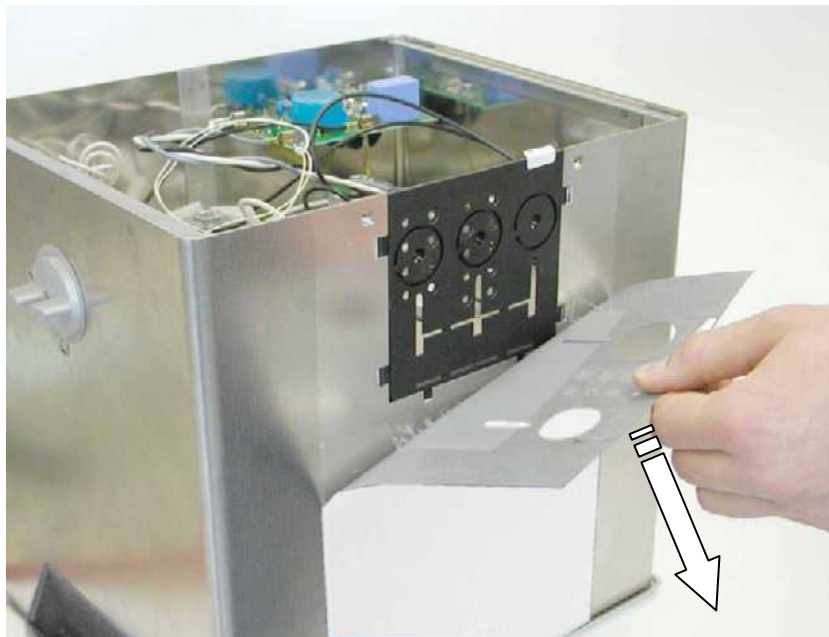


Illustration 11.1. Pull off the front panel. (Illustration with open unit)

12

How to replace the PCB support



Cause of breakdown

The PCB support fastens the PCB control in the unit.

The plastic material of this component can break by mechanical forces, e.g. shock, or due to transport damages.

Consequence

The operating keys no longer operate perfectly.

How to proceed

1. Open the unit as described in *section 6*.
2. Pull off the turning knob as described in *section 7*.
3. Remove the PCB control as described in *section 8*.
5. Carefully pull off the front panel (see *illustration 11.1*).
4. Take out the faulty PCB support, remove it upwards (see *illustration 12.1*).
5. Push the new PCB support downwards into the housing.
6. Remount the front panel.
7. Mount the PCB control as described in *section 8*.
8. Mount the turning knob as described in *section 7.1*.
9. Mount the bottom plate; close the unit. Ensure that all plug contacts are plugged correctly and that no cable is pinched.

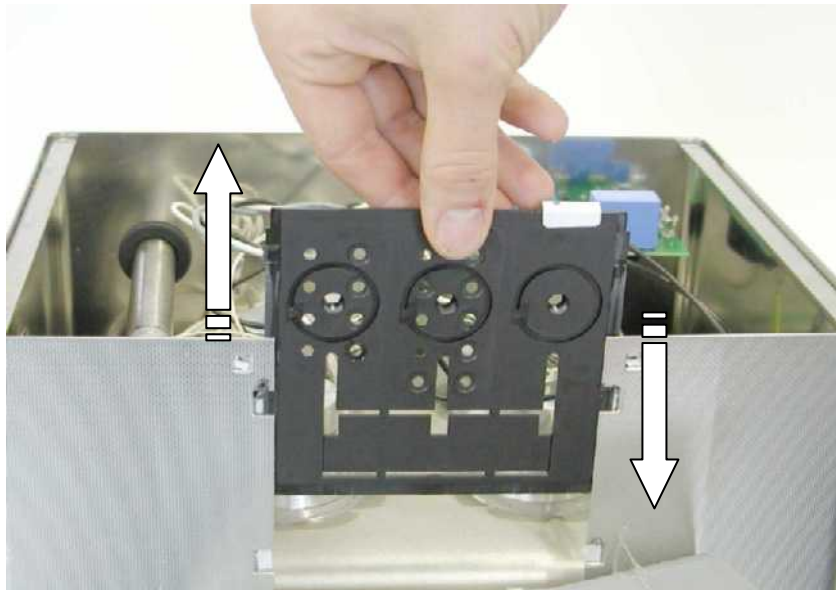


Illustration 12.1. Pull out / push the PCB support vertically into the housing

13

How to replace the heating



The PTC heating element is safe to run dry. If the level of the liquid falls below the position of the heating element, it automatically reduces the current consumption and thereby reduces the heating energy.

Cause of breakdown

The performance of the heating element does not change during its service life. The only possible cause of a breakdown of this type of heating is a short circuit in the component (humidity, faulty insulation, etc.)

Consequence

No function:

In most cases the fault current breaker or the fuse automatic of the relevant socket is released.

The fuses on the interference filter are faulty.

Exchange of component

The aluminum casing of the heating element is pushed into to supporting rails and secured against displacement with silicone. On many units the heating element can be replaced without removal of the transducer tank tank.

Exceptions: Getinge Ultrasonic 60, 100, 120, 180; 300. On these units the transducer tank must be removed first as described in *section 15*.

On all other units proceed as follows:

How to proceed

1. Open the unit as described in *section 6*.
2. Find the faulty heating elements (if there are more than one heating element), e.g. by separately connecting the individual heating elements to the voltage supply. **Caution:** in addition to the electric supply cable to the heating element, the earthing must be provided.
3. Loosen the connecting cables from the faulty heating element.
4. Cut the silicone fixation (which secures the heating element against displacement) in the area between the support rails and the heating element see *illustration 13.1.A / 13.2.A / 13.3.A*.
5. Push the aluminum profile of the heating element horizontally out of the guiding rails, e.g. with a large fork wrench, a wood block, etc. and a plastic hammer.
6. Use a file to round off the two edges of the aluminum profile of the new heating element where it will enter the supporting rails.
7. Carefully push the heating element into the supporting rails.
8. Secure the heating element against displacement with silicone.

**Removed tank
Getinge Ultrasonic
30-300**

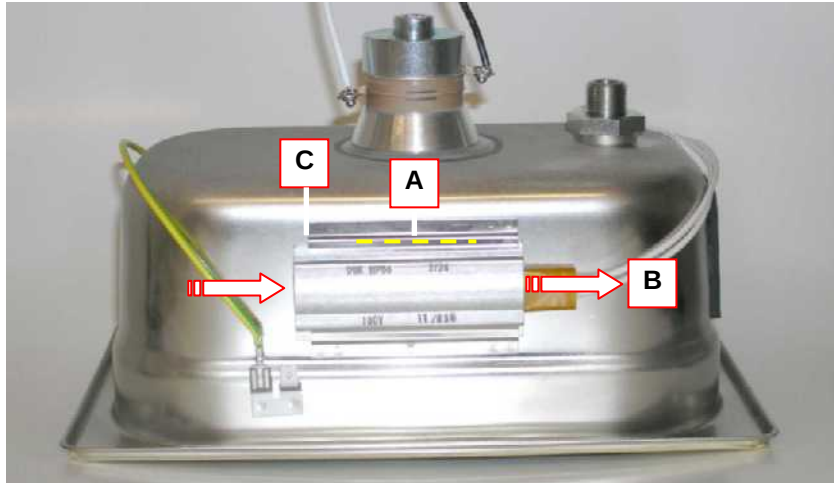


Illustration 13.1. Transducer tank removed, with horizontally mounted heating element. Broken lines: cut the silicone fixation (A). Push the heating element out of the support rails as indicated by the arrows.

- A** Cut the silicone fixation (A) with a knife.
- B** Push the heating element in direction (B) out of the supporting rails.



Prepare the new heating element: The new heating element can be pushed in more easily if the edges of the aluminum profile have been rounded off with a file.

- B** Insert the new heating element (*position C*) into the supporting rails. Push it into the supporting rails, be careful not to jam the heating element. Then secure against displacement with silicone.

**Tank unremoved
Getinge Ultrasonic
30-300**

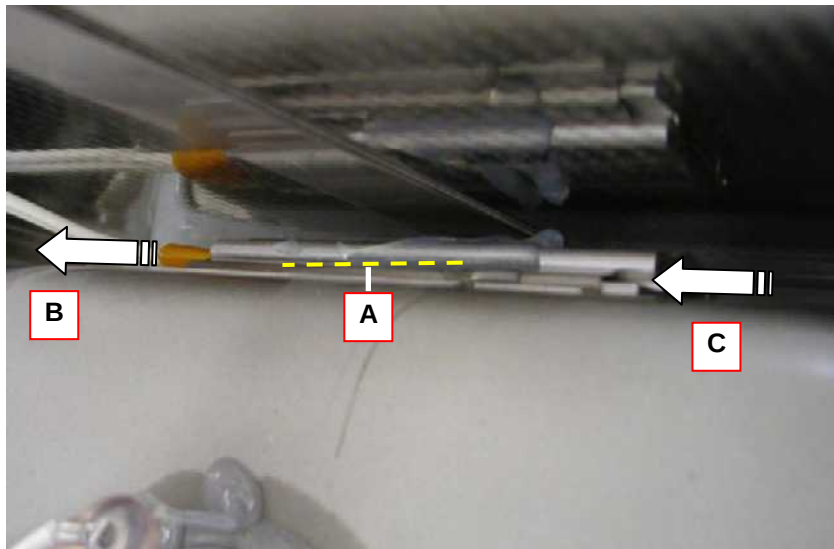


Illustration 13.2. Transducer tank unremoved, with horizontally mounted heating element. Broken line: cut the silicone to remove.

14

Replacement of piezoceramics



The piezoceramics must be replaced if one or more of the disks are torn or damaged by scorching.

The transducer system should be opened only when all other possible causes of a malfunction have been checked and if both the know-how and the required tools are available.

The piezoceramics are selected capacitively in each unit and are mounted in full sets only. This means that all piezoceramics in one transducer system must show the exact electric behaviour in order to guarantee a homogeneous ultrasonic performance of the transducer system. The consequence of an asymmetric charge of the transducer systems would be a higher risk of breakdown and an increased cavitation erosion on one side of the tank. (This does not apply to units with a single transducer system.)

Therefore, all transducer disks should be replaced even if only individual piezoceramics are faulty. Getinge deliver preselected sets of piezoceramics.

Cause of breakdown

Piezoceramics can be damaged for different reasons (mostly tears): e.g. by heavy cleaning items put directly onto the tank floor, excessive bath temperatures with intensive ultrasonic operation (> 85 °C).

High relative humidity of air or liquid inside can cause scorplings on and inside the transducer system.



Illustration 14.1. Torn and broken piezoceramics

Trouble shooting

In some cases torn disks or scorplings can be visible without opening the unit. However, to make sure it is necessary to open and examine the piezoceramics and the insulating duct.

It is possible that torn piezoceramics remain undetected, because output, transducer performance and current diagram are normal.

Tool To carry out this repair work a torque wrench is indispensable!

Electric load **Caution!** Risk of electrocution due to high amount of electricity on the piezoceramics!

The piezoceramic is charged with a high amount of electricity when the transducer system is opened or tightened. This can be branched off by short circuiting between two terminal lugs, e.g. with a screw driver. For the same reason, also short circuit the plug contacts of the electric cables of the transducer system.

The electric charge is also built up by temperature changes, e.g. cooling of a piezoceramic.

Do not touch charged piezoceramics!

How to open the transducer system

Replace faulty piezoceramics as follows:

1. Place the unit upside down on a solid surface and secure it against displacement (e.g. with screw clamps and wood ledges).
2. Open the unit as described in *section 6*.
3. Open the transducer system screw(s) with the torque wrench.
Caution! Do not tear the transducer system by jamming the torque wrench.
The torque wrench must be held vertically to the transducer system during the complete process of unscrewing. The power given to the handle of the tool must be exactly countered by the hand that centers the tool (*see illustration 14.2.*).
4. Check each transducer disk for hair cracks and scorchings, check the insulating sleeves for scorchings. Always exchange the aluminum washers when you open the system.

How to assemble the transducer system

For assembly of the transducer system ensure that all contact surfaces are clean.

The transducer disks must be poled correctly. Observe the markings on the piezoceramics *see illustration 14.3. and 14.4.:* The marking must always point to the plus connection of the transducer system.

1. Put a drop of Loctite or similar onto the thread of the coupling piece (to lock the screw).
2. Assemble the individual parts of the transducer system exactly as shown in the illustration.
3. Important! The black markings must point to the plus terminal lug.
4. Screw in the transducer system screw and fix it with the torque wrench.
Systems with 1 piezoceramic (E35) at **46 Nm**.
Systems with 2 piezoceramics (W35) at **58 Nm**.
Caution: The transducer disk is charged with electricity when the transducer system screw is tightened. Branch off the electric charge by short circuiting between two terminal lugs, e.g. with a screw driver.



Illustration 14.2. Always hold the torque wrench vertically. Do not tilt the tool!

**Structure of
transducer system
with 2 piezoceramics
(W 35)**

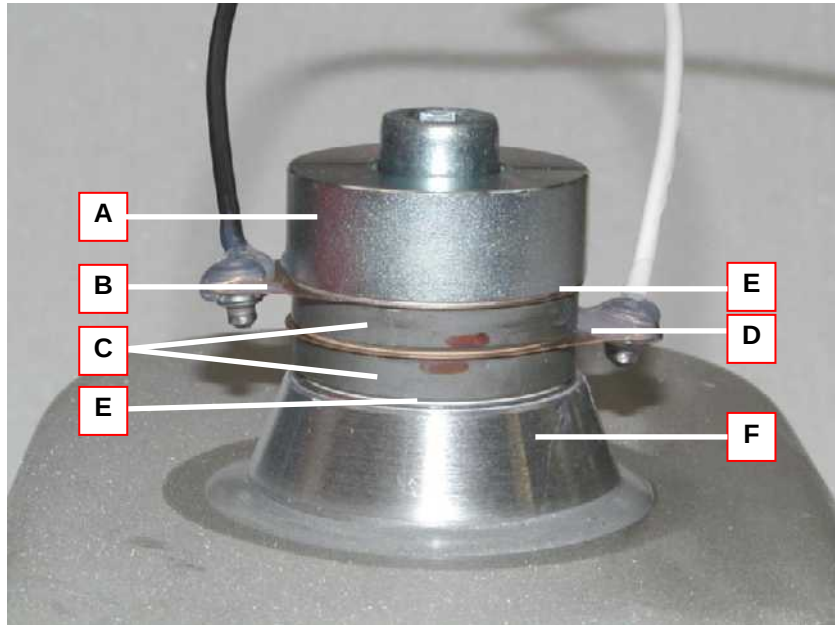


Illustration 14.4. Transducer system with 2 piezoceramics

- A** Pressure piece
- B** Terminal lug minus connection
- C** Piezoceramic
- D** Terminal lug plus connection
- E** Aluminum washer
- F** Aluminum coupling piece
- G** Insulating disk

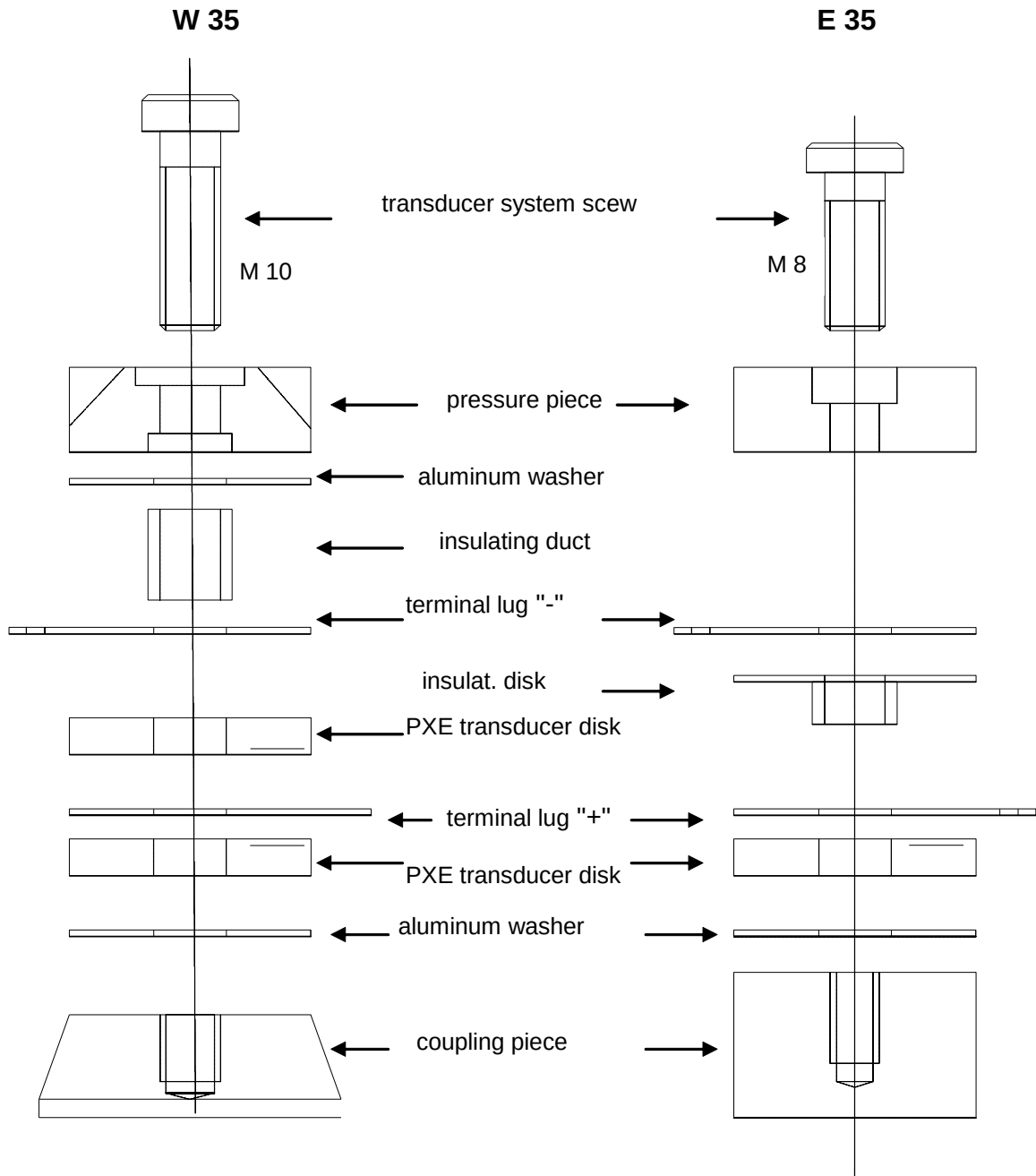


Illustration 14.5.

on the left: structure of transducer system with 2 piezoceramics
on the right: structure of transducer system with 1 piezoceramic

15

Replacement of transducer tank



If the tank floor is heavily damaged by cavitation erosion or due to leaks the tank must be replaced.

The transducer tank is a wear part due to the cavitation erosion around the sound-giving surfaces. This process is increased by improper use (aggressive cleaning media, cleaning items put directly on the tank floor, deposits and remains on the tank floor, etc.).

Cavitation erosion

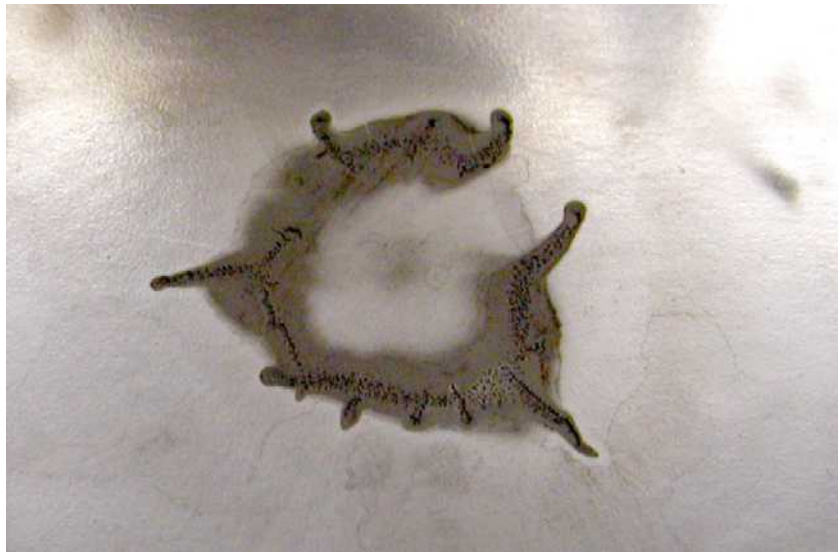


Illustration 15.1. Heavy cavitation erosion at the spot where the transducer system is fixed



Illustration 15.2. Leaking tank floor with traces of liquid

There are two ways to replace the transducer tank:

Tank complete with transducer system

Replacement by a complete transducer tank with mounted transducer system (and heating, if required). We recommend to use a complete tank if the transducer system is damaged and if you do not have the necessary know-how for a replacement of piezoceramics.

Tank without transducer system

Replacement by a preassembled tank with coupling piece(s) and the support for the heating element(s), but without transducer system. We recommend to use the preassembled tank if the transducer system on the old tank is without fault and can be mounted on the new tank. For this you need a torque wrench. We recommend to carry out this repair only if you have the required know-how for replacing piezoceramics.

For instructions on the replacement of the transducer system and / or of the piezoceramics please see *section 14*.

How to proceed

1. Place the unit upside down on a solid workplace.
2. Open the unit as described in *section 6*.
3. On units with heating: Interrupt the electric supply cables to the heating(s) and separate the temperature sensor from the unit.
Caution! Mark all electric cables to avoid interchanging when you assemble the unit: risk of damage.
4. On units with drain duct: Loosen the screw connections of the drain duct. Note: The screw connections are secured with Loctite 586. The screw connections can be loosened more easily after heating the duct in the threaded area with a hot air fan (see *section 16*).
5. Remove the transducer tank from the housing:
Carefully heat the tank edge around the sealing e.g. with a hot air fan to make the sealing material flexible (see *illustration 15.3.A*). **Caution!** The handles can be damaged by hot temperatures.
6. Cut the sealing between the tank edge and the housing with a narrow and flexible knife (see *illustration 15.4.A*).
7. Carefully lever the tank out of the housing; cut the sealing further with the knife if necessary; use the knife to loosen the tank from the housing (see *illustration 15.4.B*).
8. Remove the remains of the sealing at the transducer tank and the housing edge with a knife.
9. Degrease and clean the glueing surfaces of the housing edge of the (new) tank with alcohol.
10. Fill new sealing material (e.g. Teroson) evenly along the edge of the transducer tank.
11. Position the unit housing in the sealing mass. Ensure correct front and backside positioning.

12. Let the sealing mass harden (approx. 12 h / or according to the instructions of the manufacturer).
13. On units with drain duct:
Mount the drain duct: Wipe all duct threads with a wire brush to remove any sealing remains and clean with alcohol. Seal the thread e.g. with Loctite 586 or Teflon tape (see section 16).
14. Reconnect all electric cables.

Heat up tank edge



Illustration 15.3. Heat up the edge of the transducer tank with a hot air fan

Cut the sealing

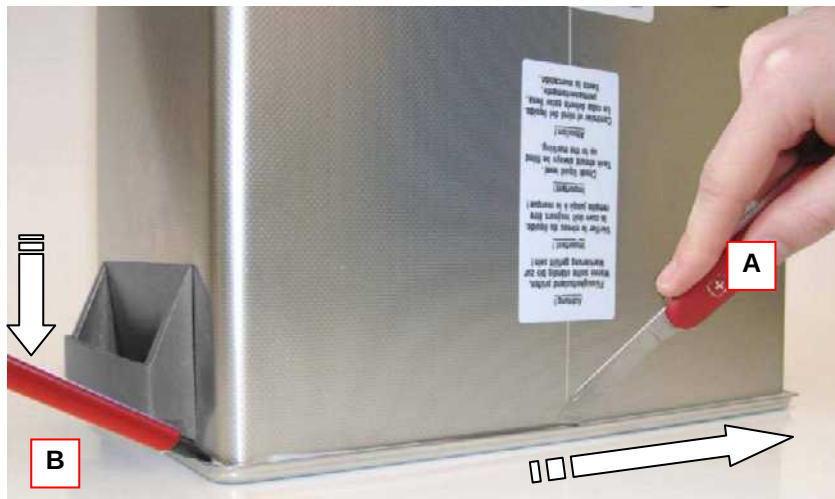


Illustration 15.4. Cut the sealing and lever the housing.

16 Replacement of drain duct

16.1 How to replace the turning knob drain duct

The ball valve for opening and shutting the drain duct is actuated by the turning knob via a plastic extension. Both parts are connected with the ball valve by a hexagon socket screw.

The turning knob can be replaced without opening the unit.

For the removal of the transducer tank or of the ball valve the turning knob drain duct must be dismantled.

How to proceed

1. Open the hexagon socket screw with a hexagon socket screw key (3 mm) anti-clockwise (*illustration 16.1.*).
2. Remove the turning knob with extension (*illustration 16.2.*).
3. To replace the turning knob the extension must be pulled out of the turning knob and then be inserted into the new turning knob.
4. Mounting: Position the new turning knob with inserted extension and fasten with the hexagon socket screw.

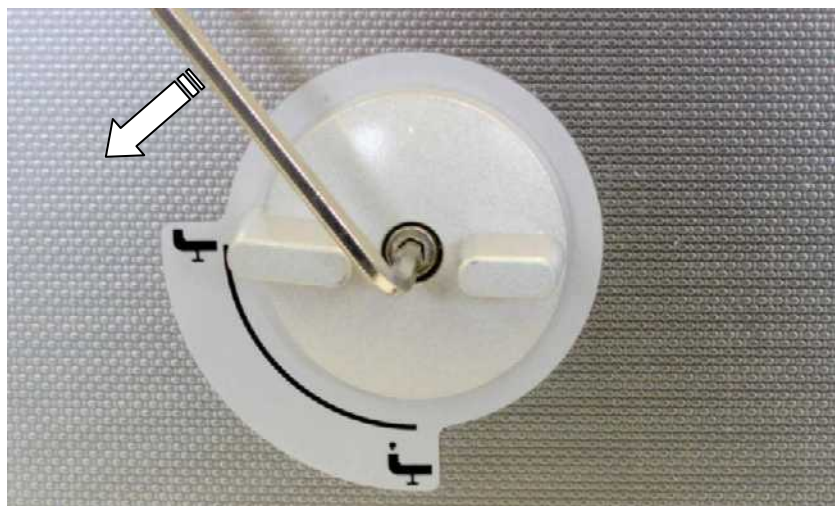


Illustration 16.1. Open the hexagon socket screw anti-clockwise

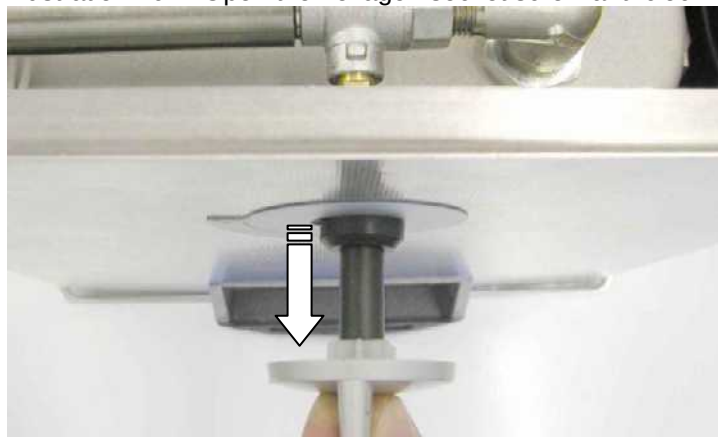


Illustration 16.2. Pull the turning knob with extension out of the unit

16.2

How to replace the ball valve



The ball valve is screwed onto the drain duct and sealed with Loctite. For unscrewing the ball valve the ducting around the thread must be heated, e.g. by means of a hot air fan, to dissolve the sealing material.

Cause of breakdown

Deposits of dirt particles in the drain system can damage the Teflon sealing in the ball valve. Damage can also be caused by aggressive cleaning media.

How to proceed

1. Open the unit (*see section 6.*).
2. Remove the turning knob drain duct (*see section 16.1.*).
3. Heat up the barrel nipple around the screw connections (*illustration 16.3.B*) by means of a hot air fan to dissolve the Loctite sealing.
4. Unscrew the barrel nipple (*illustration 16.3.C*) with a pipe wrench anti-clockwise. Arrest the ball valve (*illustration 16.3.A*) with a fork wrench (21 mm) during the process in order to avoid bending the tank floor.
5. Heat up the ball valve around the screw connections (*illustration 16.4.E*) by means of a hot air fan to dissolve the Loctite sealing.
6. Unscrew the ball valve with a fork wrench (21 mm) anti-clockwise. Arrest the 90° duct bow (*illustration 16.4.D*) with a pipe wrench in order to avoid bending the tank floor.
7. Remove any remains of Loctite from the thread of the drain duct and clean the thread e.g. with alcohol.
8. Clean the inner thread of the new ball valve and the ductings e.g. with alcohol.
9. Prepare the thread of the ball valve and of the drain duct with Teflon tape or Loctite. Observe hardening period of sealing material (before filling the transducer tank with water).
10. Mount the ball valve, screw on the barrel nipple and fasten the turning knob drain duct.

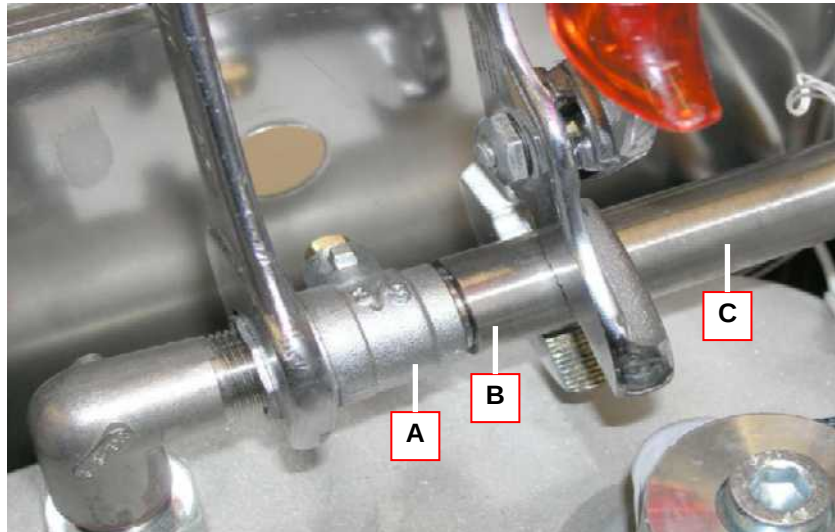


Illustration 16.3. Open the barrel nipple with a pipe wrench. Arrest the ball valve with a fork wrench during the process.

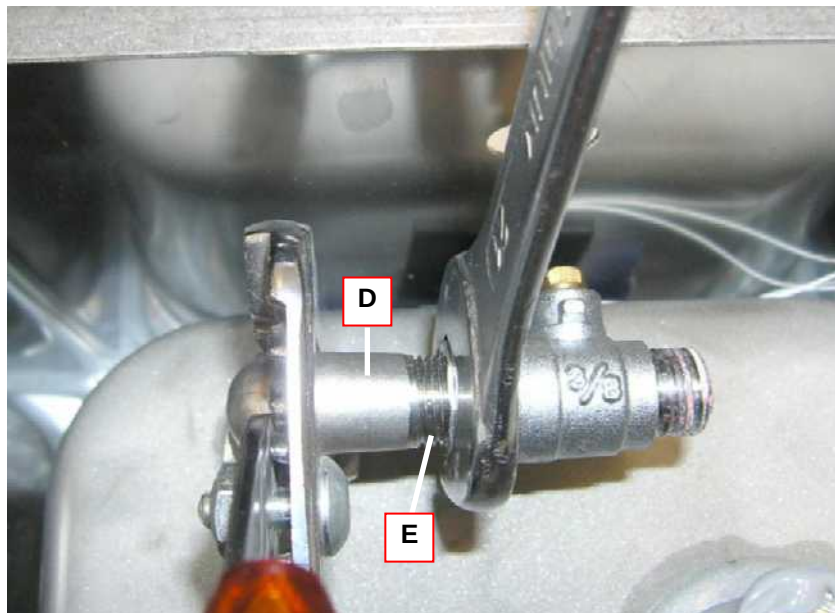


Illustration 16.4. Open the ball valve with a pipe wrench. Arrest the ball valve with a fork wrench during the process.

17

Replace the handle

The handles are fixed with 2 split pins.

How to proceed

1. Open the unit as described in section 6.
2. Press the 2 split pins with a suitable tool (for example a screwdriver and a hammer) downwards out of the handle. Direction see illustration 1.
3. Remove the old handle outwards the housing.

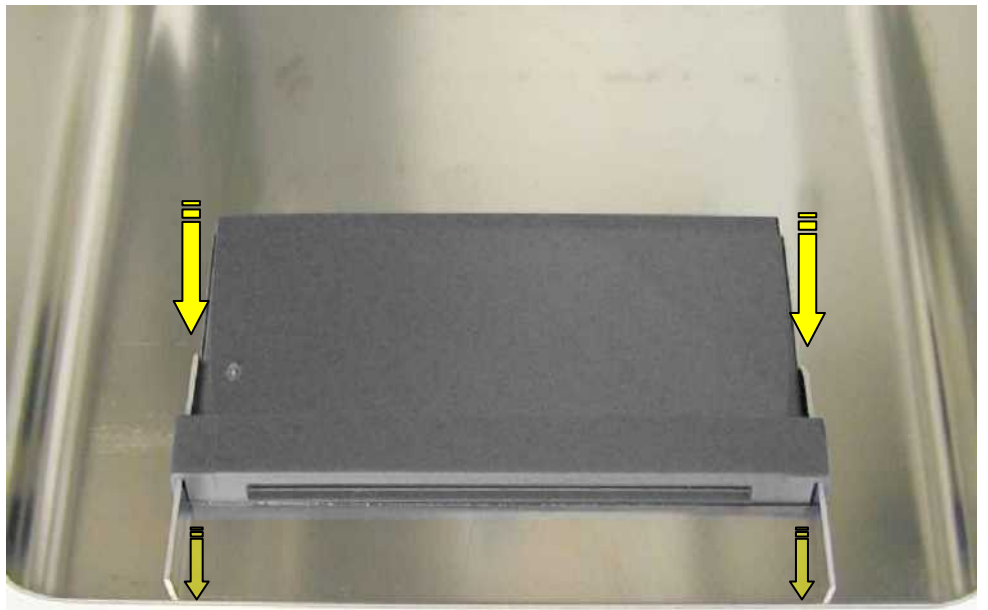


Illustration 1. Remove the split pins

4. Place the new handle in correct installation position.
5. Fix the handle with the 2 new split pins:
push the 2 new split pins, e.g. with a long tweezers, into the handle.
6. Fix the 2 new split pins and the handle, e.g. with silicone.

18

Putting into operation / Trial run

For checking and trial operation of the unit after repair please observe the instructions given in this section. We recommend a trial run over several hours (approx. 3 - 4 h).

Place the unit on a dry and solid workplace. Ensure that the workplace is sufficiently ventilated!



CAUTION

Risk of electrocution due to entering humidity!
Keep the unit dry.

The unit inside is splash-proof. To prevent electrical accidents and damage keep the workplace and the unit housing dry.

Ambient conditions

- Allowed ambient temperature during operation: +5°C to +40°C
- Allowed relative humidity of air during operation: 80 %
- No condensation allowed

Mains connections

The unit must be connected to a shockproof socket only.

18.1

How to fill cleaning liquid

Observe filling level

Fill the cleaning tank of the unit with a sufficient quantity of a suitable liquid before switch-on.



NOTE

Dry running of the transducer tank can damage the unit.

Ensure that the cleaning tank is correctly filled during operation (marking on the tank wall).

Suitable cleaning media

Make sure that the selected cleaning chemical is perfectly suitable for the use in an ultrasonic bath and follow the instructions on dosage and material compatibility.

Prohibited cleaning media

In general, flammable products are not allowed for use in an ultrasonic bath. Observe the safety warnings in *section 17.2*.

Limitations concerning other cleaning media are also listed in the warnings in *section 17.2*.

Degassing of the liquid

Fresh cleaning liquid is saturated with air which impairs the cleaning effect of the ultrasonic activity. Sounding the liquid over a period of several minutes before the actual cleaning process is started will eliminate the microscopic air bubbles from the liquid.

18.2

Cleaning media

When choosing the cleaning chemical ensure that it is suitable for the use in an ultrasonic bath, as wrong cleaning media can damage the transducer tank.



Risk of fire and explosion!

Do not use flammable liquids, e.g. solvents, directly in the ultrasonic cleaning tank.



Ultrasonic activity increases the vapourization of liquids and creates fine vapours which can catch fire on any ignition source.



Risk of damage to the transducer tank!

Do not use acid cleaners directly in the stainless-steel tank (pH value below 7), if at the same time halogenides (fluorides, chlorides or bromides) will be removed from the cleaning items or entrained through the cleaning liquid.

The same applies to solvents containing NaCl solutions.



The stainless-steel tank can be damaged by crevice corrosion within a short period. These substances can be contained in household cleaners.

If in doubt please contact your distributor or the manufacturer.

18.3

Heating of the cleaning liquid

**Setting of
temperature at
turning knob
temperature**

Choose the required cleaning temperature. The tank must be filled half (minimum). The optimum filling level is marked on the tank wall.

For a description of the function please see *section 4.5. Operating and Display functions*.

18.4

Check ultrasound

After switch-on the liquid must be degassed to remove the oxygen. With the ultrasound switched on, this takes approx. 5 – 10 minutes depending on the size of the unit.

For a description of the function please see *section 4.5. Operating and Display functions*.

Visual check	After degassing there should be waves visible on the surface of the cleaning bath. There must not be any streamers on the floor of the cleaning tank (floor cavitation).
Power consumption	The power consumption of the ultrasound can be measured with a standard wattmeter (observe measuring range). Compare the measured values with the values given in the table in <i>section 4.4 Technical Details</i>. For this test the heating remains switched off.
Aluminum sheet test	There is a simple method to check the ultrasonic effect in the cleaning liquid: cavitation check with an aluminum sheet. Cut a piece of the size and shape of the transducer tank from a roll of a standard aluminum foil. Put this sheet vertically into the liquid for 1 minute with the ultrasound switched on. The ultrasound will tear pieces out of the sheet. The size of the torn holes indicates the zones of different cleaning intensity in the cleaning tank. It is normal that the number of holes is bigger around the transducer elements.

19 Putting out of operation and disposal

The components can be given to electronic and metal recycling stations or returned to the manufacturer for the same purpose.

20 Contact address

Getinge Infecction Control AB

Box 69

30505 Getinge

Phone +46 (0) 10 335 00 00

e-mail: info@getinge.com

Please visit our homepage. You will find helpful information and descriptions on our large product range:

www.getinge.com

21 Conclusion

If you have problems in finding or repairing a fault we recommend to return the unit to the supplier or manufacturer for inspection and repair.

Please include a short note describing the original cause of the malfunction and which repair works you have carried out.