



KerryUltrasonicsLimited

Operation & Maintenance Manual

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ofCleaningSystems
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Table of Contents:

Foreword	3
Manual Content Disclaimer	3
1. Introduction	4
2. Safety	5
2.1 Hazards	5
2.2 Precautions	5
2.3 Cleaning Solutions	6
2.3.1 Type	6
2.3.2 Use of Cleaning Solutions	7
2.4 Safe Practices	9
2.5 Noise Emission	9
3. Operating Instructions	10
3.1 Siting and Installation	10
3.2 Filling of Unit	11
3.3 Control System	12
3.3.1 Function Keys	12
3.3.2 LED Status and Fault Indication	13
3.3.3 LCD Display Screens	14
3.4 Start Up	15
3.5 Operation	15
3.6 Setting the Heating Temperature	16
3.7 Setting the Sonics Time	18
3.8 Shutdown	18
4. Maintenance	19
4.1 Safety Precautions	19
4.2 Routine Preventative Maintenance	20
4.2.1 Frequently	20
4.2.2 Daily	20
4.2.3 Monthly	20
4.3 Draining and Cleaning the Plant	20
4.4 Contaminated Liquid Disposal	21
4.5 Trouble Shooting Guide	22
4.6 Overtemperature Cutout	23
4.7 Replacement of Fuses	23
5. Guarantee	24



Foreword

Kerry Ultrasonics Ltd. - The Company:

Kerry Ultrasonics Ltd. was formed in 1954, and has been based in Hitchin since 1964. Kerry Ultrasonics Ltd. has shown consistent growth and is today a world leader in the application and use of power ultrasonics for cleaning and plastic assembly applications.

The Company's Head Office and manufacturing operations are based at Hitchin, Herts, housing our entire production facility including design, development, sales, service and administration functions.

Our cleaning equipment is used worldwide in applications ranging from electronic PCB cleaning, optical glass cleaning, through precision engineering, to simple metal cleaning. Our plastic welding equipment helps companies cut assembly costs and improve their product quality.

In 1993 we were proud to receive the Queen's Award for Environmental Achievement as a result of our world leadership in new, CFC free, cleaning processes.

Kerry Ultrasonics Ltd. is a member of the Halmagroup of companies.

Manual Content Disclaimer

Kerry Ultrasonics Ltd. Operation & Maintenance Manuals are frequently updated and improved.

It is our company policy to make on-going improvements and/or changes in the products and/or the programs described in this information at any time without notice.

Although our intent is to provide complete and accurate information, Kerry Ultrasonics Ltd. does not warrant the accuracy or completeness of the materials and content contained in this manual and reserves the right to correct any errors or omissions to the manual content at any time.

1. Introduction

The key operation associated with this equipment is ultrasonic cleaning, so to give an understanding of the machine's operation, the principles of this technique are now described.

Ultrasonic cleaning depends upon the phenomena associated with acoustic cavitation. This is generated in a liquid medium as a direct result of subjecting it to continuous alternating pressure from piezoelectric transducers. These generate acoustic vibrations in the frequency range 25 to 200 kHz.

Acoustic cavitation exists in two forms, *stable* and *transient*.

Stable cavities are bubbles of more or less uniform size, that are relatively permanent and will continue to oscillate for many cycles of applied pressure.

On the other hand *transient* cavities will generally exist for less than one cycle of pressure. During this cycle they will expand to many times their original size before collapsing violently.

Both cavities will contain either air or, more probably, vapour of the cleaning medium. Cleaning is effected by the gentle scrubbing action of the stable cavitation bubbles as well as the violent collapse of the transient cavitation bubbles.

Transient cavity pressure is dependent upon the frequency of the applied alternating pressure and hence, by selecting the ultrasonic transducer frequency, contamination ranging from the very heavy, as is found for example on engine components, to the very light, as found on semi-conductors or jewellery, can be removed.

In this way intricate objects having complex shapes can be cleaned without disassembly. The cavitation cleaning action occurs wherever the immersed parts come into contact with the cleaning medium in an operating ultrasonic tank.

Ultrasonic cleaning systems achieve extremely high standards of cleanliness in a fraction of the time required to obtain the same results by conventional methods such as hand cleaning, spray washing or similar mechanical means. They efficiently remove contaminants including polishing and lapping compounds, grinding abrasives, cutting oils and associated swarf, fluxes and general environmental contaminants from a wider range of components and sub-assemblies. Although the cavitation produced by ultrasonic waves is thorough, it will not damage delicate or intricate mechanisms.

Operation of an ultrasonic cleaning process requires a minimum of supervisory labour, and this may be unskilled. Multi-stage ultrasonic cleaning systems, designed for use with either organic solvents or aqueous solutions, may be readily incorporated into mass production lines. The development of automatic handling facilities for specific cleaning cycles is now well advanced.

2. Safety

2.1 Hazards

There are hazards associated with the handling of some of the more alkaline cleaning products and also from skin contact with hot cleaning liquids.

Further significant hazards exist in respect of electrical failures and maintenance, where there is a risk of contact with live electrical circuits. The equipment is fuse protected, and in failure situations it is important that the cause is established and the malfunction rectified by a competent, qualified electrician. If such personnel are not available, reference must be made to the serviced department of Kerry Ultrasonics Ltd. for assistance.

2.2 Precautions

Observance of the following points is essential for the safe operation of the equipment.

- Ensure that the operating and maintenance instructions (see sections 3 and 4) are thoroughly understood before using the unit.
- The unit must be correctly wired and earthed, preferably using an earth leakage circuit breaker (ELCB). It must be set up for the correct supply voltage at its place of use.
- The cleaning bath must not be operated with liquid levels below the minimum level (see Fig 1 overleaf), and on no account must it be operated without liquid in the system.
- The unit must be disconnected from the mains before refilling and emptying.

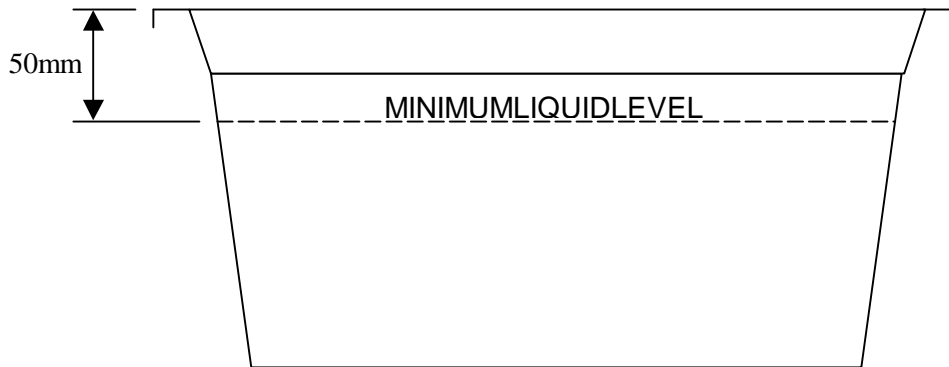


Fig1 Minimum liquid level

WARNING:

Manufacturer's warranty invalidated if tank is operated with liquid level below indicated minimum level. There is a minimum level mark on all MKC tanks.

2.3 Cleaning Solutions

2.3.1 Type

It is to be emphasised that MKC units are only designed for use with alkaline aqueous cleaning solutions. Typical products are at the end of this section, and the technical serviced department of Kerry Ultrasonics Ltd. will readily advise on the cleaning solution to be used for any particular application. The normal types of cleaners do not incorporate any recognised dangerous substances, but some of the more alkaline liquids require careful handling. Users must avail themselves of the manufacturers' technical and safety data sheets and ensure that the necessary precautions are taken in using the products.

For certain cleaning applications, the use of strong alkalis (containing caustic soda or sodium hydroxide) may be considered. Such cleaning media are compatible with the equipment, but where they are used the hazard to operatives is significantly increased, since caustic soda can cause severe skin burns and eye contact with this chemical can have very serious consequences.

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MKC units must not be used with volatile organic solvents of the fluorocarbon or chlorinated hydrocarbon type, eg trichloroethylene. These solvents volatilise in air to give atmospheric concentrations that are harmful to operators.

2.3.2 Use of Cleaning Solutions

Alwaysfollowtheinstructionsgiveninthemanufac
handlingchemicals.Inaddition,whenfilling,topp
ofthecleaningsolutionwiththeeyesandtheskin
PVC,polytheneorrubber)shouldbewornroutinely.
whenhandlingliquidconcentratesandatalltimes
workingsolution.Suitableprotectiveclothingmus
beremovedimmediatelyandcleanedbefore-re-use.
degreasingeffectontheskinleavingitinadryc

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inguporusinganultrasonicbath,contact
mustbeavoided.Imperviousgloves(egof
Goggles(toBS2092)shouldbeworn
whenthereisariskofsplashingwiththe
tbeworn;ifcontaminated,clothingshould
Thecleaningsolutionstendtohavea
ondition.

Typical Cleaning Solutions	
Name (manufacturer)	Typical Uses
MicroCleaner (International Products)	Broad spectrum ultrasonic cleaner for removing organic/inorganic contaminants from stainless steel, glassware, plastics, rubber, ceramics and most metals
Rapidex Detergent Powder (Rapidex)	As above, especially for blood and protein removal. pH < 11
Castrol ICD119 (Burmah Castrol)	General purpose ultrasonic coupler for use in cleaning china, glassware, catering equipment and laboratory glassware
Quadralene Instrument Cleaner QIC	Removal of tarnish, oils, processing residues and atmospheric soils from tarnished printed circuit boards, all types of electronic parts, watch and instrument components
Questions relating to cleaning chemistries should be referred to the manufacturer of the product in question.	

2.4 Safe Practices

Experience has shown that observance of the following simpler rules will assist in securing the safer operation of cleaning units.

- **DO** refer to the chemical materials safety data sheets before use.
- **DONOT** place unprotected hands in the cleaning solution, since the skin degreasing effect is enhanced by ultrasonic cavitation. Use a suitable component carrier.
- **DONOT** drop heavy objects into a cleaning bath. There is a serious risk from splashing with liquid entering the eyes. Where such a risk is perceived, goggles must be worn. Additionally, objects sitting on the base of the tank will damage the ultrasonics.
- **DO** wear protective clothing, goggles and gloves and ensure that eye wash bottles are readily available.

Users must establish safe operating procedures for the running of ultrasonic baths, so that in their individual routines schedules, operations are conducted safely, without undue risk to personnel.

This can be achieved from a thorough understanding of the equipment and cleaning solvents and a disciplined application of the knowledge by managers, supervisors and operators to the particular cleaning situations. It is to be noted that despite the increasingly stringent standards imposed by safety legislation, there are many hundreds of Kerry Ultrasonics Ltd. cleaning units in safe everyday use.

2.5 Noise Emission

Use of the ultrasonic cleaning system is attended by the emission of characteristic, high pitched noise consisting largely of harmonics and subharmonics of the basic working frequency (38 KHz). Many individual tests have shown that the total noise emitted from Kerry Ultrasonics Ltd. baths is below the first action level of 85 (dBA) (Leq) (reference The Noise at Work Regulations 1989).

MKC cleaning systems are configured such that the noise level from the equipment is below the statutory level under typical operating conditions. Despite this, there is a need for users to ensure that the noise intensity does not increase with time during routine use. In some circumstances, the provision of ear defenders for operators may be necessary. To combat excessive noise, much can be achieved by the use of a tank lid when the equipment is on stand-by, since a good deal of noise is emitted through the liquid surface.

Particular care should be taken to avoid sitting or standing near ultrasonic cleaning equipment near other noisy machinery, since the combined noise intensity could exceed the required safe limit. Where such a combination is unavoidable, then total noise level measurements must be made.

3. Operating Instructions

Strict compliance with the following operating procedures will ensure that the machine is utilised within its design parameters and will operate efficiently.

3.1 Siting and Installation

In order to ensure efficient operation of the system and to maintain a safe working environment for associated personnel, it is imperative that the following conditions are met:

- The unit must be placed on a level and secure base.
- Ensure that the unit is switched 'OFF'.
- Check that the voltage supply is within the range shown on the serial number plate on the back panel.
- The MKC's are supplied as standard with a British 13A moulded plug. However for some countries this plug may need to be removed and replaced with an appropriate plug for the location (this must only be carried out by qualified electrical personnel). If this is required, connect the input lead to a suitable plug as follows:

The input cables must be connected to the plug as follows:

- Brown lead to the live terminal**
 - Blue lead to the neutral terminal**
 - Green/yellow lead to the earth terminal**
- It is very important that a good earth connection is made to a recognised earthing point.
 - The fuse ratings for the fuses in the rear of the MKC are specified in Section 4.7 of this manual.
 - Plug the power lead into the back of the MKC and plug the mains plug into a mains supply socket.

When all these conditions are satisfied, the unit is ready for filling.

As major suppliers of cleaning systems, Kerry Ultrasonics Ltd. have wide experience in solving problems and will be pleased to give assistance to any purchaser of their equipment and use.

3.2 Filling of Unit

- The appropriate safety precautions must be taken when filling the bath with cleaning solution (See section 2 - Safety).
- As previously stated, MKC Ultrasonic tanks are designed for use with neutral or mildly aqueous solutions. These must be diluted with water to the concentrations recommended by the manufacturer. Occasional topping up is necessary to replace losses due to 'drag-out' of cleaning solution.
- The level of cleaning liquid in the tank should be such that when the objects being cleaned are placed in the liquid, their displacement is not sufficient to cause an overflow.

On no account must the liquid depth be allowed to fall below the minimum level line inside the tank (see Fig. 1 in Section 2.2 of this manual), or serious damage may be caused to the generator, transducers and heaters (where fitted).

To avoid thermal shock to the transducers, never pour hot liquids into a cold tank or vice versa. When filling a hot or cold tank, fill it approximately one quarter full with liquid of a similar temperature to that of the tank and complete the filling using either hot or cold liquid.

3.3 Control System

The control system on the MKC cleaner comprises a digital timer and temperature on the MKC6/MKC14 and MKC22. (There is no heating or timer fitted to the MKC2 or MKC3).

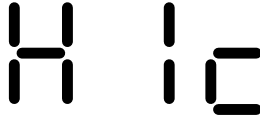
3.3.1 Function Keys

The small membrane panel includes an LCD display and the following keys:

- +and-** For increase/decrease of temperature and time set points
- SELECT** Toggle key to select if time or temperature is displayed
- START** To start and set/reset ultrasonic cycle

3.3.2 LED Status and Fault Indication

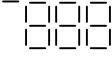
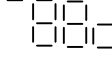
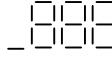
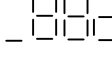
The LED's on the control panel illuminate in different formats to show the status of the unit as follows:

Colour of LED	Type of illumination	Meaning
YELLOW	solid	Main power is applied to the unit.
RED	flashing	The heaters are enabled and the temperature is below the set point.
RED	solid	When the heating set point is reached and the temperature remains within the 1°C hysteresis band.
GREEN	solid	Ultrasonics in operation
RED & GREEN	flashing alternately with  message on LCD display	An over-temperature condition is reached. The +10degC over-temperature function recovers automatically when the condition returns to normality. (The heater and sonics should then be restarted.)
RED & GREEN	flashing alternately with  message on LCD display	The temperature sensor is disconnected or has failed. (Can only be cancelled by turning the unit OFF and correcting the sensor fault.)

3.3.3 LCD Display Screens

The operator can progress through the various LCD screens by pressing these select buttons to go to each next screen as follows:

NOTE: Screen 1 is missed out if the sonics are turned off.

Screen Reference	Example of digits	What is shown?
Screen 1 (press SELECT for next screen)		Sonic cycle time countdown
Screen 2 (press SELECT for next screen)		Actual tank temperature
Screen 3 (press SELECT for next screen)		Sonic cycle time that has been set
Screen 4 (press SELECT to go back to the initial screen)		Tank temperature that has been set

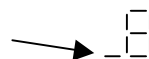
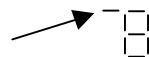
As you can see in the table above, the upper and lower horizontal segments of the left digit of the display, indicates whether the reading is:

runtime/temperature. (upper left segment) i.e.

or

a set time/temperature (lower left segment) i.e.

the upper and lower horizontal segments of the left digit of



Each screen will hold for five seconds before reverting to the initial screen.

If the sonics are ON, the + and - keys are disabled to avoid inadvertent setting.

If the sonics are OFF, the + and - keys are active. This means that the settings cannot be changed in the normal idle mode when the display shows the last set time upon completion of

to the initial screen.

to avoid inadvertent setting.

after the second press of the SELECT button in the normal idle mode when the sonics start of a sonic cycle.

3.4 StartUp

Ensure that all the conditions detailed in sections 3.1 to 3.3 are met.

Switch the power on.

When Mains power is first applied, the sonics and heaters will not be energised. The PWR LED will illuminate. In order to enable the heaters, as a single press of the <START> key is required. At all times, the HEAT LED will flash when the heaters are enabled and the temperature is below the setpoint. The HEAT LED will go solid on when the setpoint is reached and the temperature remains within the 1°C hysteresis band.

When the sonics are off, the heater may be disabled without powering off the machine by depressing the <START> key for three seconds continuously. At this point, the HEAT LED will extinguish.

It should be noted that further heat input will be present during ultrasonic cleaning.

3.5 Operation

Where the items to be cleaned are extremely soiled, they should be pre-washed or sprayed in a separate tank to remove bulk soil. A aqueous cleaning solutions should be used and this may be the same as that used in the ultrasonic cleaning tank.

All parts should be cleaned in baskets. The baskets are available from Kerry Ultrasonics Ltd. A beaker holder is also available for the MKC6 mode 1.

The baskets must have perforated sides to allow the free movement of the cleaning liquid. An excessively deep load of items can cause masking in the ultrasonic tank and result in a slower poor cleaning action. A shallow load will clean more rapidly and effectively.

The cleaning time will depend on the load and degree of soiling etc.

The sonics are initiated by depressing the <START> key momentarily.

The ultrasonic generator will switch off and the sonics will stop when the count-down timer on the LCD display reaches 0 or when the <START> key is pressed a second time.

Ensure parts are correctly oriented to prevent excessive 'drag-out' of liquid. The basket must also be withdrawn slowly to prevent excessive 'drag-out' of liquid.

The baskets supplied by Kerry Ultrasonics Ltd. are specifically designed to prevent 'drag-out' of liquid and any similar work carrier devised by users should achieve the same effect. Failure to allow adequate time for drainage, or removal of the basket at too great a speed, will result in excessive consumption of cleaning liquid.

On no account must the liquid level be allowed to fall all below the minimum level line (see Section 2.2 - Fig 1) or serious damage may be caused to the generator and transducers.

Take care of liquid displacement effects, when moving the workload IN and OUT of the tank.




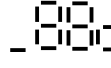
3.6 Setting the Heating Temperature

The temperature may be set in the range 20 °C to 80 °C in 1 degree increments.

An over-temperature condition for shutdown in the event of any failure is maintained at the current set point plus 10 °C.

The tank temperature may be set while the sonics are off by using Screen 4 of the LCD display (see below table).

NOTE: Screen 1 is missed out if the sonics are returned off.

Screen Reference	Example of digits	What is shown?
Screen 1 (press SELECT for next screen)		Sonics cycle time countdown
Screen 2 (press SELECT for next screen)		Actual tank temperature
Screen 3 (press SELECT for next screen)		Sonics cycle time that has been set
Screen 4 (press SELECT to go back to the initial screen)		Tank temperature that has been set

When the display shows the set temperature, pressing the temperature up or down respectively. When a setting is changed in this way, no extra key presses are required to store the new value.

Pressing the '+' or '-' key will adjust the set temperature in this way, no extra key presses are required to store the new value.

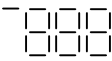
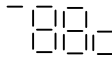

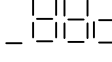
The set temperature variable is stored in non-volatile memory so that, on the application of power, the last used setting will return.

The set temperature variable is stored in non-volatile memory so that, on the application of power, the last used setting will return.

3.7 Setting the Sonics Time

The sonic cycle time may be set while the sonics are off by using Screen 3 of the LCD display (see below table).

NOTE: Screen 1 is missed out if the sonics are turned off.

Screen Reference	Example of digits	What is shown?
Screen 1 (press SELECT for next screen)		Sonic cycle time countdown
Screen 2 (press SELECT for next screen)		Actual tank temperature
Screen 3 (press SELECT for next screen)		Sonic cycle time that has been set
Screen 4 (press SELECT to go back to the initial screen)		Tank temperature that has been set

When the display shows the set time, pressing <+> or <-> respectively. When a setting is changed in this way the new value.

r<-> will adjust the set time up or down, no extra key presses are required to store

The set time is stored in non-volatile memory so that, on the application of power, the last used setting will return.

at, on the application of power, the last

The time may be set in the range 0.1 minute to 99.9 minutes. If the set time is increased beyond 99.9 minutes, the sonics will then run continuously under control of the <START> key.

minutes in 0.1 minute increments. If the

3.8 Shutdown

On completion of a work period (e.g. at the end of the cleaning cycle), the unit must be shut down. Switch off the power and remove the plug from the mains socket. Where a lid is supplied it should be left in position.

eday or shift), or when no further

4. Maintenance

Maintenance is essential to keep the equipment operating efficiently. Basically it falls into two categories:

- routine, preventative operations that are performed by operators, and
- one-off operations to correct plant failures; these are usually beyond the scope of the normal operators and require the services of a qualified electrician or technician from Kerry Ultrasonics.

In all cases where the cause of failure is uncertain, reference should be made to Kerry Ultrasonics Ltd.

The following schedules list the tasks that must be carried out, but the frequency of their implementation will be determined by the working environment of the machine, e.g. the type of components being cleaned, the nature of the cleaning liquid, the amount and type of contamination etc. As suggested initial maintenance frequency is annotated by each item.

Experience gained during operation of the machine will quickly establish a programme of maintenance that suits the particular working practice.

4.1 Safety Precautions

When any maintenance work is carried out on the machine, strict compliance with the following safety precautions must be enforced.

- Only qualified electrical personnel are permitted to remove any panels from the machine that will expose live terminals.
- Before any electrical connections are disturbed, the supply must be removed from the machine by removing the mains plug from the supply socket.
- Whenever the ultrasonic bath contains cleaning liquid, care must be taken to prevent contact with the skin and eyes. The wearing of impervious gloves and eye protection is necessary.

4.2 Routine Preventative Maintenance

In addition to the tasks listed, the operator should be constantly aware of the running condition of the machine. Any deterioration in performance should be investigated immediately and, where possible, the cause identified and the fault rectified.

4.2.1 Frequently

Check liquid level is above the minimum level (see manual) and, if required, add further cleaning solution. Fig 1 in Section 2.2 of this

4.2.2 Daily

Check condition of the cleaning fluid. As a general rule, evidence of unacceptable solution contamination is manifested by the visible presence of solid debris in the liquid and/or discoloration. Contaminated solution must be drained and replaced.

4.2.3 Monthly

- a) Check the security of the earth connection.
- b) Ensure that the mains plug is correctly mated in its socket.
- c) Visually examine electrical connections and supply leads particularly for looseness, fraying or signs of damage.

4.3 Draining and Cleaning the Plant

As work is being processed, cleaning results may be progressive build up of solid contamination: see Section 4.2.1 - Daily maintenance (item b). Once this stage is reached the plant will need to be drained and cleaned. The frequency of cleaning will depend upon the work throughput and with the experience can become a routine in particular applications.

As with filling the unit, great care should be taken when draining the plant to avoid eye and skin contact with liquid through splashing, spillage etc. During draining observe all safety features described in Section 2.

To drain the equipment proceed as follows:

- a) Switch off the power and remove the plug from the mains socket. Allow the cleaning solution to cool.
- b) Drain the tank. The contaminated cleaning solution should be disposed of to drain, diluting with copious volumes of water (subject to Local Water Company Regulations as required) - (see Section 4.4 overleaf).
- c) Thoroughly rinse the tank with water and empty the washings.
- d) Clean out the tank, paying particular attention to the base and corners. Any deposit or surface dullness will appreciably decrease the ultrasonic activity. If a cleaning agent is used, ensure that all traces are removed.



-
- e) The unit may now be refilled and brought back in to operation. Ensure that the liquid level is above the minimum level (see Fig. 1 in Section 2.2 of this manual).

4.4 Contaminated Liquid Disposal

Always refer to Local Water Authority regulations when disposing of liquids. Some of the neutral and alkaline cleaners used in MKC tanks are readily biodegradable and may be disposed of with simultaneous dilution to the public sewer. However, strongly alkaline (caustic soda) or strongly acidic solutions should be disposed of through an approved waste disposal contractor to a licensed site. These liquids should be stored in accordance with chemical manufacturers instructions.

4.5 Troubleshooting Guide

This section is intended to be an aid in dealing with the problem that can arise when using this equipment.

Effect	Cause	Action
High cleaning liquid consumption	Excessive liquid loss (drag-out)	a) Use alternative basket design b) Realign components in basket c) Withdraw basket more slowly
Overheating	Low liquid level	Replenish tank with cleaning liquid to maintain suitable liquid level. If the temperature is in the range of 40-80°C, contact Kerry Ultrasonics Ltd. Service Dept.
Unit will not heat MKC6/MKC14/MKC22	Overtemperature cutout has switched due to low liquid level or temperature control failure. Heater failure.	Remove cutout cover on back panel and press button to reset after liquid has cooled. In case of temperature control failure or heater failure, return to Kerry Ultrasonics Ltd. for repair
Unsatisfactory cleaning	Solution very contaminated	Change cleaning liquid
	Masking by too many components	Reduce number of components in the basket
Unit not working	Power failure	Check main supply and all associated fuses
Sonics do not come on	Generator board failure Failure of relay for membrane panel	Return unit to Kerry Ultrasonics Ltd. for repair.

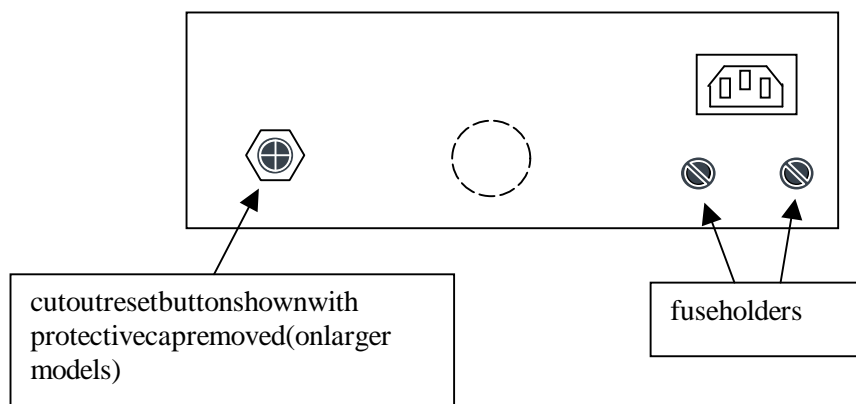
Also refer to Section 3.3.2 LED Status and Fault Indication which shows how the LED's on the control panel illuminate in different formats to show the status of the MKC unit.

4.6 Overtemperature Cutout

There is an overtemperature cutout on MKC6, MKC14 and MKC22 models which is located under the black screw cap on the back panel.

The cutout is used to protect against operation with a low liquid level and as a thermal cutout in case of primary thermostat failure. If this trip reset button after checking the liquid is cool and the level is correct. Replace black cover.

4.7 Replacement of Fuses



1. Disconnect unit from power supply socket.
2. Remove IEC power plug from rear of unit.
3. Place medium flat-blade screwdriver into fuse holders slot then push in barrel and turn, then release and holder will spring outwards.
4. Replace with correct fuses: 20mm ceramic quick acting fuses -
(rating 220-240V) as follows:-

MKC6	-	3.15A
MKC14	-	5A
MKC22	-	10A
5. Push barrel back in and turn to lock in place, replace IEC plug.

5. Guarantee

- A) Kerry Ultrasonics Ltd. guarantees that the equipment has been tested individually or by means of a controlled batch sampling procedure at its premises, using its own sample materials, and:
- 1) The vapour levels found, when using the solvent specified in the quotation, did not exceed the Maximum Exposure Limits specified in the Health and Safety Executive's "The Control of Substances Hazardous to Health Regulations 1988".
 - 2) The noise levels did not exceed the limits specified in the "Noise at Work Regulations" 1989.
- B) Kerry Ultrasonics Ltd. further guarantees to repair or replace any component manufactured by it and which on inspection by it is proved to be defective in material or workmanship, provided that written notice of any such defect is given within 24 months of the date of sale by it to the original purchaser and the equipment or components alleged to be defective are returned carriage paid as soon as may be possible after such notice, and subject to the following further conditions:
- 1) Equipment or components repaired or replaced will carry a further 3 months' guarantee or will be guaranteed to the end of the initial 24 months warranty period, whichever is the later, limited to those items repaired and/or replaced.
 - 2) Carriage and packing charges for the return of a piece of equipment and components shall be for the account of the owner.
 - 3) Where equipment or components are required to be repaired in situ or where the forwarding of replacement parts is involved, Kerry Ultrasonics Ltd. reserves the right to levy such charges to cover service, labour, or incurred travelling expenses as may be appropriate.
 - 4) This guarantee does not include or apply to components that are already subject to a separate agreement. In the case of goods not manufactured by Kerry Ultrasonics Ltd. the guarantee given is limited to that guarantee (if any) received by Kerry Ultrasonics Ltd. from its own supplier.
 - 5) This guarantee does not apply to any equipment which shall have been repaired or altered other than by Kerry Ultrasonics Ltd. or which has been the subject of misuse, negligence or an accident.
 - 6) This guarantee forms part of and is subject to the terms and conditions of sale of Kerry Ultrasonics Ltd..
 - 7) This guarantee is restricted to equipment supplied as new. Where equipment is supplied as ex-demonstration then the guarantee will be subject to separate terms as agreed between Kerry Ultrasonics Ltd. and the customer.
- We reserve the right to alter specifications without notice, where improvements can be effected or where substitute materials can be incorporated.