

Kamco

OPERATING AND SERVICING GUIDELINES

CLEARFLOW POWER FLUSHING PUMPS

| CF40 | CF90 | CF210 |



FOR DETAILS OF OUR FULL RANGE OF
POWER FLUSHING CHEMICALS & ACCESSORIES PLEASE VISIT

KAMCO.CO.UK



Kamco 'CLEARFLOW' pumps are purpose-built units for 'Power Flushing' central heating systems, designed to cure circulation and boiler noise problems caused by the accumulation of sludge, corrosion deposits and scale.

This manual contains detailed guidelines for the safe use of Kamco pumps, information on how to connect the pump into the heating system, a step-by-step guide to the power flushing process, and information on which chemicals are best suited for each application.

Please take time to carefully read through these guidelines before using your Kamco pump.

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Watch the 'Brief guide to power flushing' video at:

<https://www.youtube.com/watch?v=TJn9LrRfXm8&t=28s>



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SECTION A – INTRODUCTION

TECHNICAL DATA

	<u>'CF40 Evolution'</u>	<u>'CF90 Quantum'</u>	<u>'CF210 Titan'</u>
Pump Type:	Vertical axis centrifugal	Vertical axis centrifugal	Vertical axis centrifugal
Motor nominal rating	0.5HP	0.75HP	0.75HP
kW (max.flow conditions):	0.80 kW	1.1 kW	1.1 kW
Degree of protection:	IP55	IP55	IP55
Motor rating:	Continuous	Continuous	Continuous
Temperature range:	0°C to 75°C	0°C to 75°C	0°C to 75°C
Dimensions (mm):	W 390, D 440, H 690.	W 390, D 590, H 890	W530, D670, H890
Hose connections:	3/4" BSP	3/4" BSP	1" BSP
Tank capacity (to filler cap)	39 litres	57 litres	125 litres
Weight (without hoses):	17kg	23kg	28kg
Wheels (dia):	75mm	200mm	200mm

230v models may be used on a domestic 13 ampere supply. A 5 ampere fuse should be fitted in the plug top. A residual current circuit breaker adapter should be used.

SAFETY PRECAUTIONS

Precautions should be taken to ensure a safe working environment.
 Take care when lifting large or heavy items.
 Regularly check power leads for wear or damage, use with a residual circuit breaker.
 When handling chemicals wear suitable protective clothing, gloves and goggles.
 Use in a well-ventilated area.
 PAT test (Portable Appliance Test) the electrics annually.

CONTENTS OF EACH CLEARFLOW FLUSHING KIT

Each kit comprises the following:

- Clearflow power flushing pump.
- Set of 2 x 5m flow and return hoses.
- 1 x 8m dump hose.
- 1 x 3m overflow hose.
- 1 x 8m water inlet hose.
- 2 x circulation pump adapters.
- 10 part BSP adapter set (With CF40 & CF90 models only).
- Waterproof container for hoses.
- Comprehensive operating guidelines.
- Starter pack of power flushing chemicals and corrosion inhibitor.
- 50 promotional leaflets for advertising.



SECTION B – USING THE CLEARFLOW PUMP FOR POWER FLUSHING

INTRODUCTION

Clearflow pumps are designed to power flush heating systems with minimal dismantling, by circulating water and flushing chemicals at high velocity, and then purging the dirty water from the system with a high flow of fresh, clean, water. Radiators may be individually flushed without removing or disconnecting them from the system.

Pumps with 230 volt motors are single phase, for use on a standard domestic supply. A 5 ampere fuse should be fitted in the plug top. We recommend the use of a residual current circuit breaker plug or adapter for extra protection.

SYSTEM INSPECTION AND PREPARATION

1. Turn on heating system in order to identify problem flow areas, cold radiators, or those with cold spots, etc. Switch off system.
2. Note how many turns are required to shut off radiator and lock shield valves so that settings may be re-instated after flushing to avoid system balancing. Use a copy of the chart provided to record the number of turns.
Open all (both sides of radiator) valves fully.
3. Set any thermostatic radiator valves to the fully open position. Remove the heads and check that the plunger pin moves freely. Check that diverter or zone valves are in the fully open position, setting manually if necessary.
4. If an anti-gravity / check valve is present, this must be by-passed or bridged to allow the flow reversing action to be used. It may be possible to disassemble the anti-gravity valve, and remove internal components.
5. Tie up the ball cock or turn off the mains water supply by another means.
6. Drain enough water from the system to empty the F&E tank. This can be drained into the Clearflow tank if it has already been connected (connection details are in the next section).
7. With vented systems, it is necessary to cap off, or loop together, the expansion and cold feed pipes in order to avoid the flushing pump filling and overflowing the expansion tank.

The F&E pipes may be capped with push fit end caps, such as Speedfit, Prestek, or Hep₂O, or a temporary compression fitting gate valve.

Depending on the configuration of the heating system looping the feed and expansion pipes together may enable these pipes to be flushed during the cleansing process, which can be beneficial when the cold feed pipe contains corrosion deposits.

NOTE 1: This will only be effective when the F&E pipes are not close coupled, or connected via an air separator, and may not remove deposits which have hardened over a long period of time.

NOTE 2: The looping connection may be made with any sturdy flexible tubing, such as Kamco hose, or Hep2O, but should incorporate a valve in the loop to close the circuit when flushing individual radiators.

Capping or looping together the F&E pipes are only temporary measures, which must be removed after the flushing process.

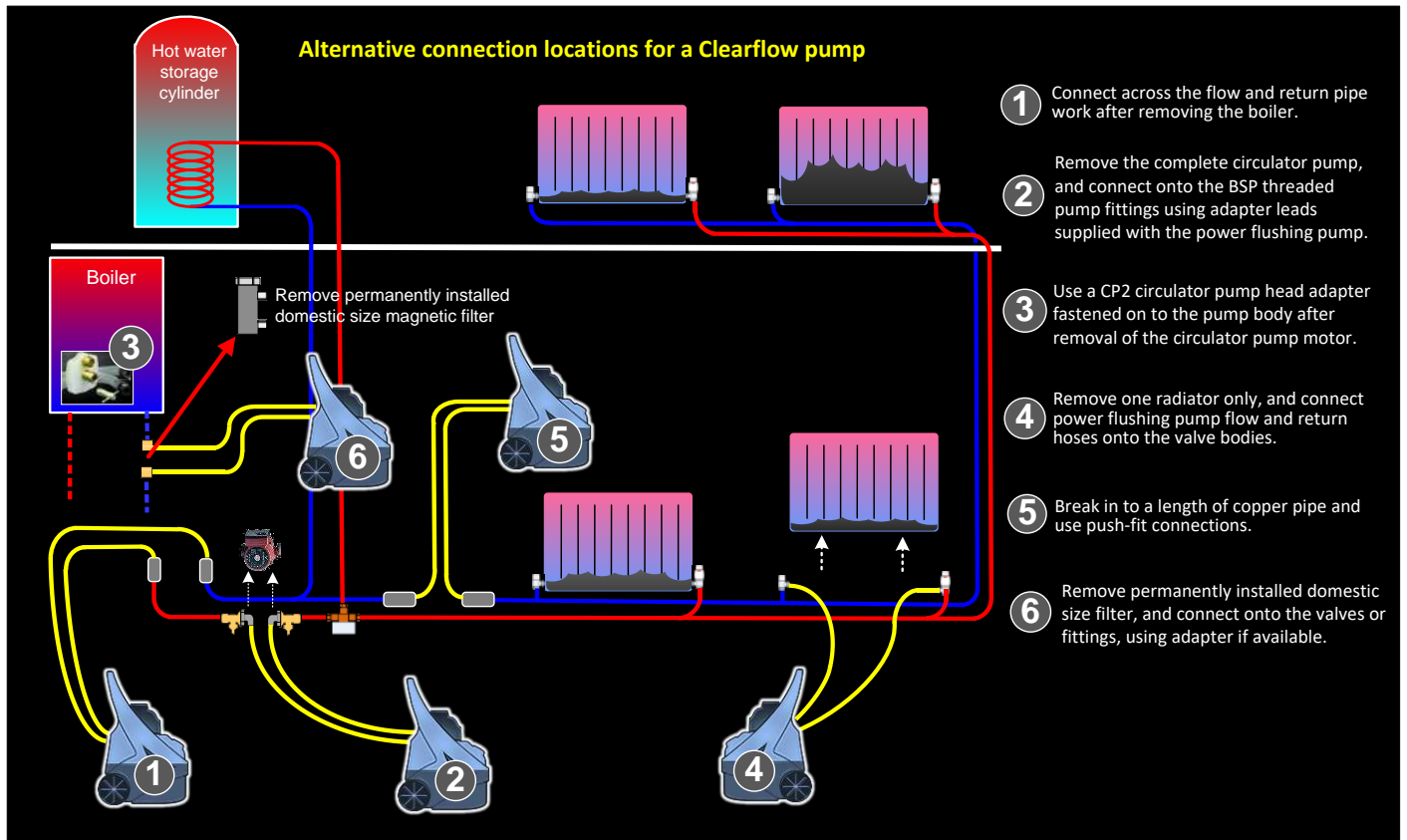
ENGINEER'S TIP: Don't drain water from the system to lower the water level in the F&E tank until after the flushing pump has been connected into the system.

Tie up the f & e tank ballcock or otherwise turn off the cold water feed, and return to the flushing pump. Open both the isolating valves, without switching on the electric motor. The head of water in the house means that heating system water will run down the flow and return hoses and into the tank. Let the water run until the tank is half full, and close both isolating valves.

You should now have emptied the f & e tank sufficiently to carry out the necessary valving or capping off of the cold feed.

NOTE: If there is a large amount of sludge or slime present in the f & e tank it must be cleaned manually and not drained into the system.

LOCATION AND CONNECTION OF THE CLEARFLOW POWER FLUSHING PUMP



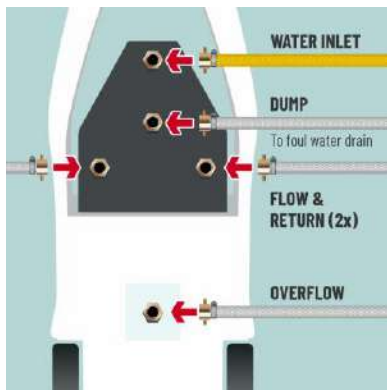
The connection point for the flushing pump may vary depending on the system to be cleaned, and the availability of suitable connection points.

A recommended location is via the central heating circulation pump, using either the special hoses supplied to connect across the pump unions, or using the optional CP2 adaptor connected to the pump body. (see page F.2)

Ideally the unit should be located in a room with a suitable drain point, and near to a convenient mains water supply, such as a bathroom or kitchen. The cold water supply for a washing machine or dish-washing machine is a convenient source when a mixer tap makes connection of a hose difficult.

The normal precautions during work on any heating system should be taken, and it is prudent to place the pump on a waterproof groundsheet or drip tray.

1. Hose connections to the flushing pump



1a. Ensure that both valves are in the closed position (i.e. the valve handles are horizontal).

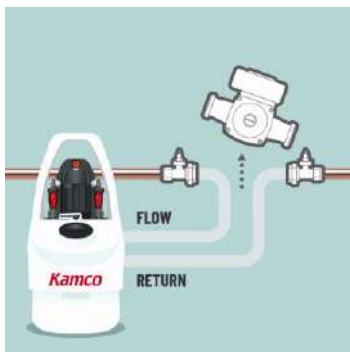
1b. The pump has two 5 metre flow and return hoses, fitted with female brass hose connectors on either end of each hose.

One end of both flow and return hoses should be screwed onto the corresponding brass nipples on rear of the hose support plate. The other ends of these hoses will be connected into the heating system.

- 1c. Connect the overflow hose connector to the BSP male overflow fitting on the rear of the pump tank, and lead to a suitable drain point.
- 1d. Connect the 8m dump hose to the brass nipple on the reverse of the hose support plate, and lead the hose to a toilet pan or drain pipe gully leading to a foul sewer.
- 1e. Connect mains water supply hose BSP female hose connector to the brass nipple on the rear of the hose support plate. Fill the tank with water until above the minimum liquid level, and then close the water inlet valve.
- 1f. Plug in the pump to a suitable 13 ampere supply fitted with an RCD adapter.

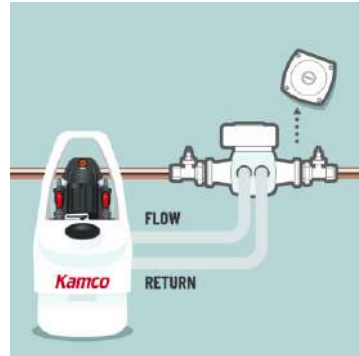
2. Hose connection to the system

Connect the flow and return hoses of the pump to the system at the selected point. This may be either:



2a. Across the 1½" BSP unions left once the system circulating pump has been removed. The circulating pump isolating valves should be closed to isolate the flushing pump from the system until power flushing is commenced.

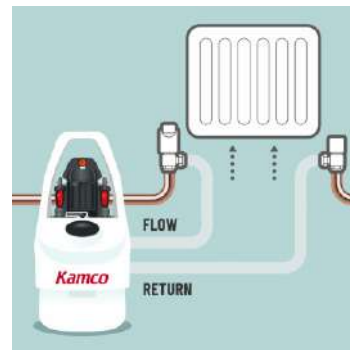
A pair of 0.5 m long adapter hoses, enabling the pump to be connected across the 1½" unions, are supplied as standard. When used, these are screwed directly onto the female brass hose adapters of the flow and return hoses, giving a total hose length of 5.5 m.



2b. Connection via the optional CP2 pump head adapter (see page F.2). Remove the socket head bolts that attach the circulation pump motor to the pump body. Attach the CP2 adapter to the pump body and the flow and return hoses

to the short lead hoses.

2c. Across the "tails" of a radiator (having drained and disconnected the radiator) using appropriate 1/2" or 3/4" BSP adapters to connect to the valves. The radiator valves should be closed to isolate the flushing pump from the system until power flushing is commenced.

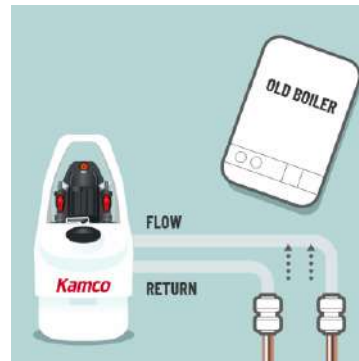


This is likely to be the least effective method due to the restrictive effect that valves (particularly thermostatic) may have on the flow rate.

The above method is generally used on a combination boiler system when a CP2 adapter is not available.

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2d. Across the flow and return connections at the boiler, isolating the boiler itself. This is the preferred method when flushing a heating system prior to installing a new boiler, as corrosion debris may be purged from the heating system before the new boiler is attached. This is important with all modern boilers, particularly so if the new boiler incorporates a plate type heat exchanger with complex and narrow water passages.

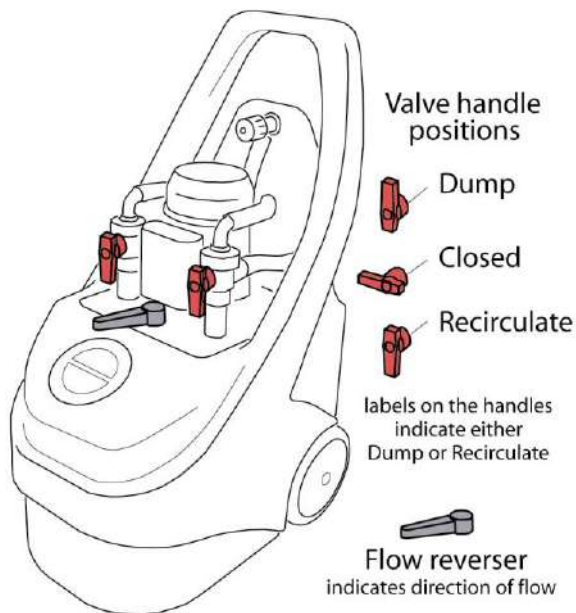


2d. Across the flow and return connections at the boiler, isolating the boiler itself. This is the preferred method when flushing a heating system prior to installing a new boiler, as corrosion debris may be purged from the heating system before the new boiler is attached. This is important with all modern boilers, particularly so if the new boiler incorporates a plate type heat exchanger with complex and narrow water passages.

INITIAL FLUSHING PROCEDURE (WATER ONLY STAGE, BEFORE ADDITION OF CHEMICALS)

Note: In the following procedure, the pump is first used to loosen and mobilise loose silt and debris, before forcibly expelling it together with the existing heavily contaminated system water. This rids the system of as much debris and sludge at an early stage, before establishing full, chemically treated circulation through the flushing pump.

By removing loose corrosion products from the system before addition of any chemical, the full effect of the chemical is available to disturb, loosen, and dissolve more stubborn accumulations of debris.



1. Leave the pump tank cap loose, or on by no more than one turn if water splashes whilst flushing / descaling (to allow gas to escape).
2. Check that both valves are closed (horizontal). Open the isolating valves between flushing pump and heating system and switch on pump immediately. Ensure that liquid level in tank remains above the minimum mark, adding more water if necessary.
3. Allow the flushing pump to run for ten minutes, reversing the direction of flow regularly. If there is sludge and debris in the system, the water returning into the tank will be heavily discoloured as the high flow rate picks up looser debris.

4. Check all hoses and connections for leaks.
5. The pump has the ability to dump dirty water with the flow in either direction.

Change the pump into dumping mode as follows, remembering that the flow reverser is constructed so that the direction in which the lever points also indicates the direction of flow.

- 5a. Operate the flow reverser lever so that the water is flowing through the heating system in the same direction as it is during normal heating operation.
- 5b. Rotate the valve on the return side through 180° so that the dump label is clearly visible.

By doing this, system water is diverted to waste down the dump hose, instead of returning back into the tank. The liquid level in the tank will immediately begin to fall.



- 5c. The mains water inlet supply (orange tap) should now be turned on and adjusted so that the volume of incoming water compensates for that being forced out of the system to waste. Continue dumping until the waste water runs relatively clear. Ensure that the water level in the tank remains above the minimum mark at all times.

Note: If the mains water cannot keep up with the dump speed (i.e. the unit begins to empty) stop dumping until the tank fills up.

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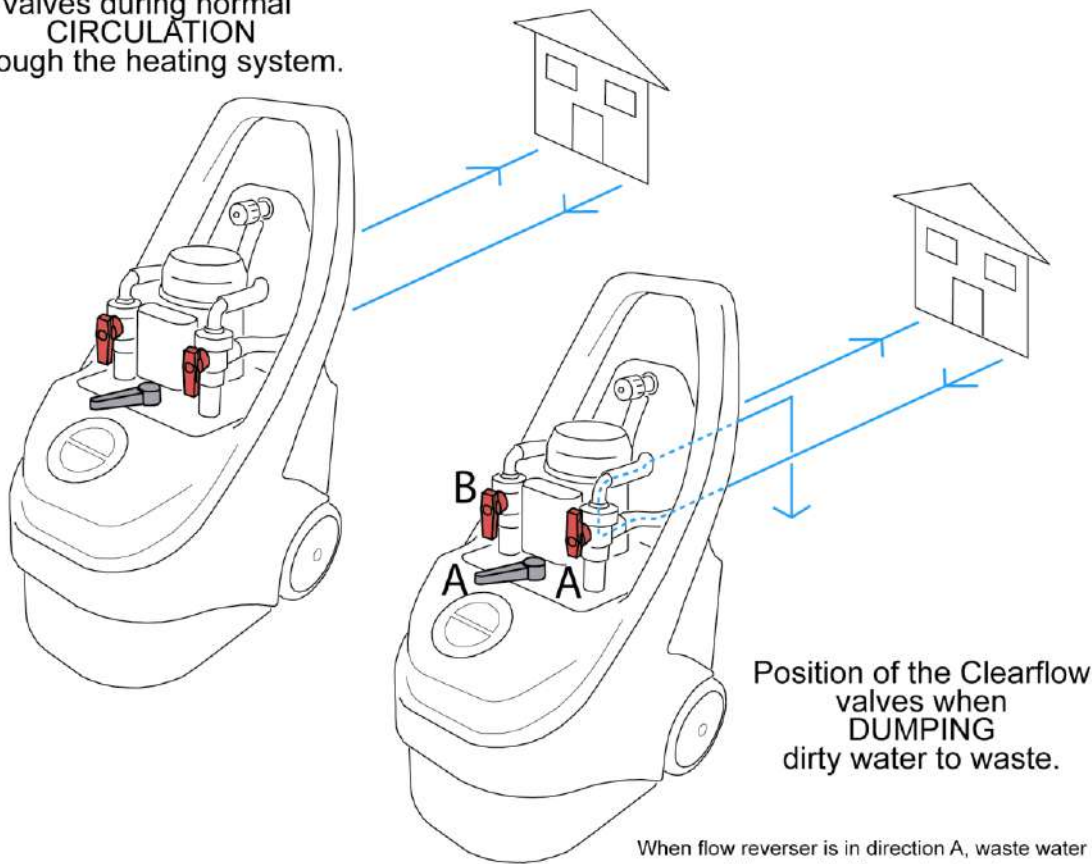
6. Once the water remains reasonably clear, restore circulation by rotating the valve back through 180° into re-circulation mode.

7. Check that the liquid level in the tank remains 10cm above the minimum mark. Add more water if necessary. Vent all radiators to ensure that there are no air pockets. Use a cloth to absorb any liquid expelled, as the system water may be discoloured and likely to stain.

8. The flushing chemical may now be added. See page B.6

Leave the pump tank cap loose, or on by no more than one turn, whilst flushing / descaling.

Position of the Clearflow valves during normal CIRCULATION through the heating system.



Position of the Clearflow valves when DUMPING dirty water to waste.

When flow reverser is in direction A, waste water will be expelled through valve A, with valve A in dump, and valve B in recirculation.

CHEMICAL FLUSHING PROCEDURE – WHICH CHEMICAL TO USE

Which chemical to use? POWERFLUSH FX2, or HYPERFLUSH.

Both of these chemicals will remove sludge, and POWERFLUSH FX2 will also remove scale from the heating system.

POWERFLUSH FX2



Use POWERFLUSH FX2 when:

- ~ You consider the system to be heavily sludged, although basically sound and in reasonable condition.
- ~ There are no aluminium heat exchangers or radiators present in the system.
- ~ The system does not have elderly galvanised steel or stainless steel pipework installed during the 1960s copper shortage crisis.
- ~ You consider that there may be limescale deposits present in the boiler or system.

How much to use?

2.1/2 litres per ten radiators (or a little more if you consider the system to be heavily sludged).

Where and when to add POWERFLUSH FX2?

Into the pump tank whilst power flushing, but not beforehand.

Temperature required?

POWERFLUSH FX2 may be used cold (necessary when changing a boiler), but works faster with temperature. The very high flow rate of the pump means that during power flushing it is not necessary to work at temperatures above 60°C.

NEVER LEAVE POWERFLUSH FX2 IN A SYSTEM

HYPERFLUSH



Use HYPERFLUSH when:

- ~ The system contains aluminium radiators or heat exchangers.
- ~ You consider the system to have suffered severe internal corrosion and metal wastage.
- ~ The system has elderly galvanised steel or stainless steel pipework installed during the 1960s copper shortage crisis.

How much to use?

500ml per ten radiators (or 2 x 500ml if you consider the system to be heavily sludged).

Where and when to add HYPERFLUSH?

Into the system 3-14 days prior to power flushing (via the feed & expansion tank, or a SYSTEMSURE injector unit),

Directly into the pump tank whilst power flushing.

Temperature required?

HYPERFLUSH works best at higher temperatures, and when used to pre-treat a system, it should be operated as hot as possible.

However, the very high flow rate of the pump means that during power flushing it is not necessary to work at temperatures above 60°C.

Use both HYPERFLUSH and POWERFLUSH FX2 if you consider the system to be heavily fouled.

Add HYPERFLUSH on a prior visit up to 14 days before the power flush, and ask the householder to leave the system running as hot as possible.

Use POWERFLUSH FX2 as usual on the day of the power flush, adding directly into the pump tank.

CHEMICAL FLUSHING PROCEDURE USING POWERFLUSH FX2



1. Switch on the Clearflow pump.
2. Whilst re-circulating water through the pump and heating system, slowly add 2½ litres of POWERFLUSH FX2 to the tank (sufficient for a 10-12 radiator system), and ensure thorough distribution around the system.
3. Switch on the boiler, if fitted, and in safe working order. Allow the system water to reach 60°C, and then switch boiler off.
NOTE: Even boiler thermostat setting no.1 could exceed 50°C.
4. Circulate throughout the complete system for 15 minutes, reversing the flow direction regularly, and monitoring the system for leaks.
5. Close off all radiators (one valve per radiator is enough), and allow the full flow to go through the hot water cylinder coil (if present in system).
6. Reverse the flow regularly.
7. Divert the full flow to the radiator circuit, in preparation to putting the full flow of the pump through each radiator in turn.
8. Fully open both valves of the nearest radiator on the ground floor to the flushing pump.
9. Flush this radiator, reversing the flow regularly, until all cold spots have disappeared, and the temperature across the radiator is consistent. Close radiator valves.

Note: If your initial system check identified cold or partially blocked radiators, commence the individual radiator flushing procedure with the worst radiator first, progressing to less problematic radiators. This ensures that the strongest concentration of chemical is directed at the worst areas of the system.
10. Open the valves on the next radiator, and repeat the procedure.
11. Work through the rest of the radiators in turn, so that you have flushed every radiator individually, including upstairs radiators.
12. When you have flushed the last radiator, and obtained an even temperature across the surface, switch the pump into dumping mode, as previously.
13. With only this radiator open, and the pump set to dump, run until the water leaving the dump hose is completely clear. Operate the flow reverser and change the valves to dump in the opposite direction until clear. When water is clear, close radiator valve.
14. Go back to the previous radiator that you had flushed, ensure both valves are open, and repeat the dumping procedure on this one radiator, alternating the direction of flow in each direction as you dump. Close radiator valve.
15. Work your way back around the house in the opposite direction to previously, until you have carried out the dumping process on every radiator individually.
16. Now with the pump still set to dump direct the flow through the cylinder coil until it runs clear. Dump in the other direction until clear.

Note: You have used an acidic cleaner, and therefore a neutralising chemical should be circulated throughout the system to ensure that no traces of POWERFLUSH FX2 remain in the system. Whilst POWERFLUSH FX2 contains specific inhibitors so that its presence during a power flush presents no problems, it is bad practice to leave system water acidic over a long period of time.
17. Return the pump into normal re-circulation mode, re-open all radiator valves, and the cylinder coil.
18. Slowly add 100 gm of NEUTRALISING CRYSTALS to the water in the pump tank whilst circulating throughout the system.
19. Circulate throughout the system for 10 to 15 minutes.



Continued on next page.

20. Switch the pump into dumping mode.

21. After dumping for ten minutes (with coil and all radiators wide open), test the dump water with pH paper. Continue dumping until a pH reading of 7 is reached, or the same reading as the mains water supply in the property is achieved (both samples show the same colour).



Note: As an alternative an electronic pH meter may be used (see page F.13)

22. If you have a TDS meter (Total Dissolved Solids) it is useful to test the water at this stage. The reading should be compared with a mains water sample reading, and the dumping process continued until both readings are within 5-10% of each other.
23. Return to re-circulation mode and move to page B.10.

CHEMICAL FLUSHING PROCEDURE USING HYPERFLUSH



1. Switch on the Clearflow pump.
2. Whilst re-circulating water through the pump and the heating system, slowly add 500ml of HYPERFLUSH to the Clearflow tank, sufficient for 10-12 radiator system, (unless it was added on a prior visit), and ensure thorough distribution around the system.
3. Switch on the boiler, if fitted, and in safe working order. Allow the system water to reach 50°C, and then switch boiler off.
4. Circulate throughout the complete system for half to one hour, reversing the flow direction regularly, and monitoring the system for leaks.
5. Close off all radiators (one valve only), and allow the full flow to go through the coil in the hot water cylinder (if present in the system).
6. Reverse the flow regularly.
7. Divert the full flow to the radiator circuit, in preparation to putting the full flow of the pump through each radiator in turn.
8. Fully open both valves of the nearest radiator, on the ground floor, to the flushing pump.
9. Flush this radiator, reversing the flow regularly, until all cold spots have disappeared, and the temperature across the radiator is consistent. Close the radiator valves.
10. Open the valves on the next radiator, and repeat the procedure.
11. Work through the rest of the radiators in turn, so that you have flushed every radiator individually, including upstairs radiators.
12. When you have flushed the last radiator, and it has an even temperature across the surface, switch the pump into dumping mode, as previously.
13. With only this radiator open, and the pump set to dump, run until the water leaving the dump hose is completely clear. Now operate the flow reverser and change the valves to dump in the opposite direction until clear. When water is clear, close radiator valve.
14. Go back to the previous radiator that you had flushed, ensure both valves are open, and repeat the dumping procedure on this one radiator, alternating the direction of flow in each direction as you dump. Close radiator valve.
15. Work your way back around the house in the opposite direction to previously, until you have dumped on every radiator individually.
16. With the pump still set to dump direct the flow through the cylinder coil until it runs clear. Dump in the other direction until clear.
17. If you have a TDS meter (Total Dissolved Solids) it is useful to test the water at this stage. The reading should be compared with a mains water sample reading, and the dumping process continued until both readings are within 5-10% of each other.
18. Return the flushing pump into normal re-circulation mode, re-open all radiator valves, and the cylinder coil, and move to page B.10.
19. NOTE: When using HYPERFLUSH there is no requirement to neutralise after the flushing process.

Note: If your initial system check identified cold or partially blocked radiators, commence the individual radiator flushing procedure with the worst radiator first, progressing to less problematic radiators. This ensures that the strongest concentration of chemical is directed at the worst areas of the system.

INHIBITION AND CORROSION PROTECTION – SYSTEMSAFE-DM



IMPORTANT

1. The system is now full of fresh, clean water, and in line with Building Regulations Part L: 2006, a good quality corrosion inhibitor, such as SYSTEMSAFE-DM, must be added to the system water to prevent further corrosion and scaling.

To comply with Benchmark documentation, inhibitors must have passed the NSF (formerly BUILDCERT) product performance standard and can be identified by this logo on the pack.



UPON COMPLETION

1. Restore system to normal, restoring radiator balance valves to original settings, removing any temporary isolating valves or caps on the expansion and cold feed pipes, and restoring non return valves to normal operation if necessary.
2. Before re-connecting the feed & expansion tank, it should be thoroughly cleaned, removing all traces of dirty water and sludge, and then disinfected with Kamchlor chlorine release tablets.

The inhibitor may be added to the system by using the Clearflow pump as follows:

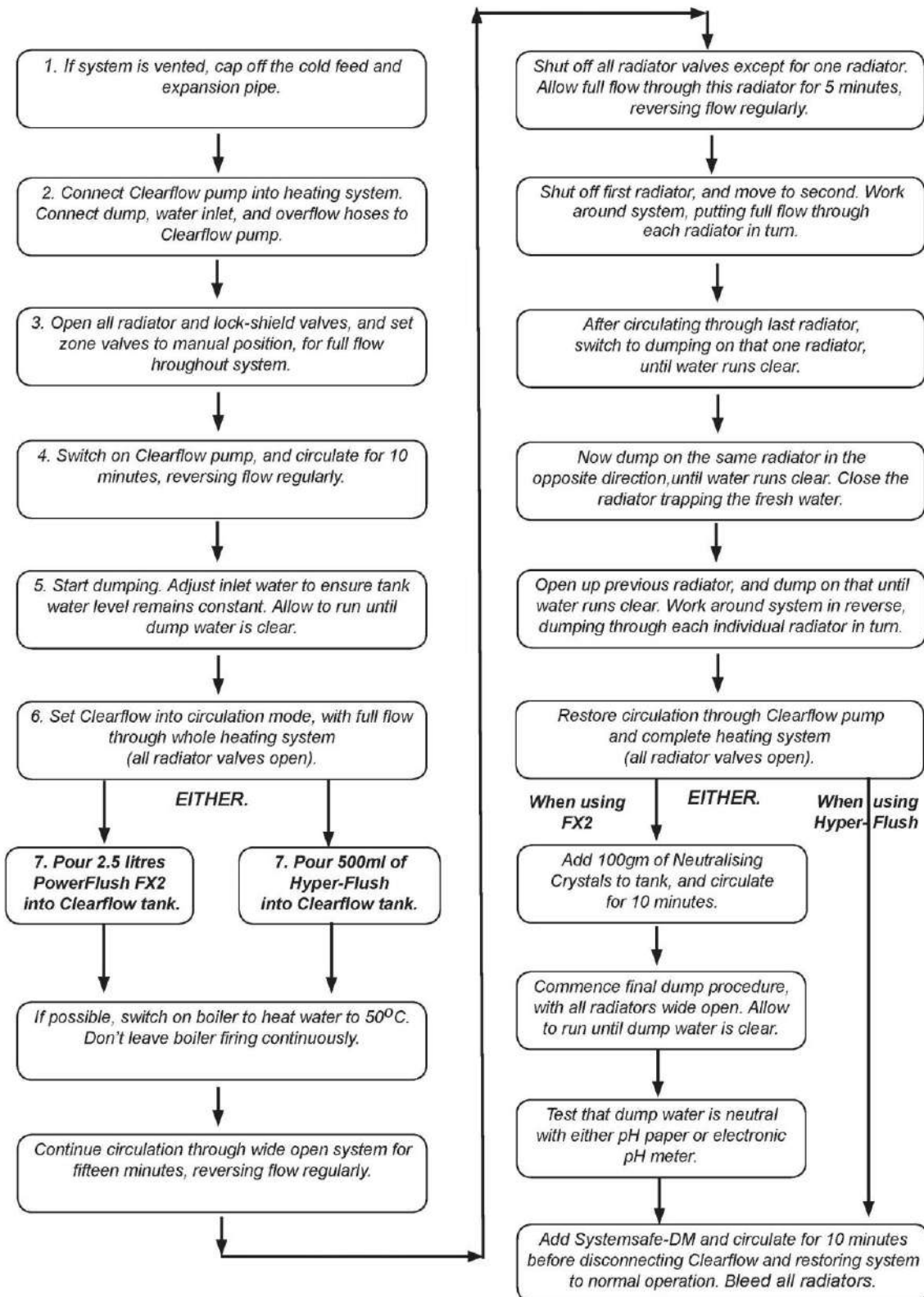
2. Briefly open a dump valve to lower the water level in the tank to just above the minimum level, close the dump valve. Add the SYSTEMSAFE-DM inhibitor into the tank. Allow circulation through the system for ten minutes, isolate the flushing pump from the heating system, and switch off.
3. If the system is vented, the residual water in the Clearflow tank, which will contain a small quantity of inhibitor, may be poured into a bucket and added to the F&E tank after this has been cleaned.

Note: In a pressurised system the inhibitor may be injected into the system using an IK6 injector, which will avoid wasting any inhibitor left in the tank (see page F.4).

NOTE: Clearflow pumps are also very powerful descaling pumps, suitable for use when descaling the primary water side of combination boiler heat exchangers, any conventional domestic boiler, water heaters, direct fired water heaters, thermal store type water heaters, showers, and calorifiers.



QUICK GUIDE TO POWER FLUSHING PROCEDURE



SUMMARY OF CHEMICALS USED WHEN POWER FLUSHING

Product	Application	How much do you need?	How is it packed?
POWERFLUSH FX2 liquid	<p>Power flushing.</p> <p>For all systems except those containing aluminium heat exchangers or radiators.</p> <p>Pour into the tank whilst re-circulating.</p>	<p>2.5 litres</p> <p>(half of a black 5l pack) - up to 12 radiators.</p>	<p>Carton of 4 x 5 litre packs. (sufficient for 8 power flushes).</p> <p>Carton of 4 x 2.5 litre packs, with 4 one-shot tubes of Neutralising Crystals. (sufficient for 4 power flushes).</p>
Neutralising Crystals	<p>To neutralise the system water after dumping.</p> <p>Pour slowly into the Clearflow tank whilst re-circulating clean water.</p>	<p>100 gm per 2.5 litres of FX2.</p>	<p>Carton of 20 x 100gm tubes</p> <p>Carton of 6 x 2.5 kg pails.</p> <p>15kg pail.</p>
pH paper	<p>To check that acidity has been removed.</p> <p>Dip 3cm in dump water and compare colour with chart.</p>	<p>Approx. 10 cm used per flush.</p>	<p>5 metre dispenser pack. (sufficient for at least 50 power flushes).</p>
<p>HYPERFLUSH</p> <p>Non-acid flushing chemical</p>	<p>Power flushing systems containing aluminium or to pre-treat heavily sludged systems.</p> <p>If possible, add to system 3 to 5 days before power flushing. May be added on the day.</p>	<p>500ml (0.5 litre) for up to 12 radiators.</p>	<p>Carton of 12 x 500ml packs. (sufficient for 12 houses)</p> <p>Carton of 4 x 2.5 litre packs</p> <p>10 litre drum</p>
<p>SYSTEMSAFE-DM</p> <p>corrosion & scale inhibitor, for all heating systems.</p>	<p>Protecting system.</p> <p>Add to system via the pump tank when power flushing is complete, or via injector, or into header tank.</p>	<p>500ml (0.5 litre) for up to 12 radiators.</p>	<p>Carton of 12 x 500ml packs. (sufficient for 12 houses)</p> <p>Carton of 4 x 2.5 litre packs</p> <p>10 litre drum</p>

RADIATOR VALVE SETTINGS

Use a photo-copy of this chart to note the radiator valve settings before commencing to power flush the system, so that the heating system can easily be re-instated afterwards, avoiding the need to rebalance the system.

	Number of turns of valve to fully closed position:	
Room	Radiator valve	Balance / lockshield valve
Hall		
Cloakroom		
Kitchen		
Living room		
Dining room		
Downstairs hall		
Upstairs hall		
Bathroom		
Bedroom 1		
Bedroom 2		
Bedroom 3		
Bedroom 4		
Bathroom 2		
Other		
Other		

POWER FLUSHING SURVEY and CHECK LIST

Date:

Address:

.....

.....

Name of householder / property owner:Tel:

Why does system need flushing?

Recommendation by other company British Gas / other?	Previous survey	New boiler installation
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Type of system:

Vented (Need to cap off cold feed and expansion pipes.)	Sealed	Fully pumped	Gravity hot water (Is there a non return valve on return side of radiator circuit?) Can gravity circuit be closed off? Need valve to be fitted?	Thermal store (Need to drain down and loop out cylinder, and flush radiator and boiler circuits separately.)
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Age of system:

Boiler	Radiators	Pipework
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Type of boiler:

Conventional	Combi type	Condensing
Serial number:		If condensing boiler, is secondary heat exchanger aluminium?

Location of boiler:

Type of water cylinder:

None (combi system)	Conventional indirect	Primatic / Fortic (Need to drain down and loop out cylinder.)	Thermal store (Need to drain down, loop out cylinder, and flush radiator & boiler circuits separately.)
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Type of pipework:

Copper 15mm / 22mm	Microbore	Single pipe	Steel pipe work?
If microbore system, are twin entry radiator valves fitted? If so, are all radiators completely warm when boiler fired? (i.e. are the radiator 'injector' tubes still fitted correctly?)			

If single pipe system, is there circulation (heat) to all radiators? Cold radiators will need removal from system and individual flushing.
If elderly steel pipe work, is system sufficiently sound to power flush? (Or would it be better to re-pipe?)

Location of system circulator pump:

In boiler casing	Adjacent to boiler	In airing cupboard	Elsewhere?

Best location to connect Clearflow pump?

On to circulator pump fittings	On to radiator	Elsewhere?

Number of radiators:

Steel	Aluminium	Are they all getting warm?	TRVs fitted?	Any obvious signs of neglect / leaks?
			Yes / No	
Do all thermostatic radiator valves (TRVs) open fully?				

Are there zone valves? Where are they located?

Number of valves	Airing cupboard	Elsewhere

Feed & expansion tank:

Location	Checked?	Condition?

Best place to connect onto for good fresh water supply?

Best place to locate power flushing pump?

Across circulator pump fittings	Across radiator tails	Across flow and return at boiler	Across flow and return pipe work from disconnected cylinder

Need to use a drip tray?

Best place to run dump hose to?

Toilet	Outside drain	Elsewhere?

Colour of heating system water, as run from bottom of a radiator:

Clear	Orange	Dark brown	Black

POWER FLUSH MONITORING FORM

Visual inspection of system water before power flush:

Clear	Orange	Dark brown	Black

Analysis results

Test parameter	Mains water	System water before power flush	System water after power flush
pH			
Soluble iron (ppm)			
Soluble copper (ppm)			
Chloride (ppm)			
Hardness			
Inhibitor (ppm molybdate)			

TDS (Total Dissolved Solids) readings

Mains water (ppm)		System water before flush (ppm)	
When checking dump water TDS from each radiator when dumping, note results below (ppm):			
Radiator 1		Radiator 8	
Radiator 2		Radiator 9	
Radiator 3		Radiator 10	
Radiator 4		Radiator 11	
Radiator 5		Radiator 12	
Radiator 6		Radiator 13	
Radiator 7		Radiator 14	

Flushing chemical used:

POWERFLUSH FX2

HYPERFLUSH

Corrosion inhibitor used:

SYSTEMSAFE-DM

The undersigned has power flushed the system according to best industry practice and following procedures detailed in code of practice BS7593

Name:

Signature:

Date:

SECTION C – FREQUENTLY ASKED QUESTIONS ABOUT POWER FLUSHING

Frequently asked questions about power flushing, and their answers, may now be found online at:
<https://www.kamco.co.uk/kamco-support.html#pf-faqs>

Subjects covered are:

1. General questions regarding power flushing.
2. Common concerns.
3. Types of systems that can be power flushed.
4. Preparing the system prior to power flushing.
5. Questions about things that happen during a power flush.
6. Completing the power flush.

SECTION D – USING THE CLEARFLOW FOR DESCALING BOILERS & HEAT EXCHANGERS

DESCALING PROCEDURE

Safety Precautions

When working with acidic descaling chemicals always wear suitable protective clothing and goggles, and check and observe instructions supplied with descaling chemicals.

PLEASE FOLLOW THESE INSTRUCTIONS TO AVOID OPERATING OR SERVICING PROBLEMS.

Fill the tank with sufficient descaling solution to ensure that the pump rotor housing is submerged during use. The minimum liquid level is shown on the tank.

Screw the outer ends of the flow and return hoses securely to the plant or equipment to be descaled, using BSP threaded adapters & PTFE tape if necessary. Connect the power cable to a suitable earthed power supply (230 or 110 volt [50 Hz], according to model). As the pump will be used in a damp location, we recommend that a residual current circuit breaker plug top be used.



Switch on the pump, and check to ensure that the liquid level does not fall below the level of the rotor housing (see above) as some of the contents of the tank enter the equipment being descaled, particularly when the overall capacity of the system being descaled is greater than the tank capacity of the pump. If necessary, add more descaling solution, or water. Check all connections for leaks.

During use, the tank cap should remain loose and **not be screwed on by more than a quarter turn**, to allow for the passage and elimination of the gas evolved during descaling. Check that the foam level does not exceed the maximum filling level. If necessary, carefully add FOAMBREAKER to the solution.

The built-in flow reverser makes it possible to attack scale from both directions. During descaling periodically move the flow reverser handle from one side to the other. This reduces descaling time considerably, and is more effective in flushing out any solid matter, which may then accumulate on the base of the Clearflow tank. By attacking scale from both directions it is possible to clean piping which is almost totally obstructed.

Scale removal can be considered complete when bubbles no longer form in the return pipe, and the solution is still acidic.

SCALEBREAKER descaling chemicals, with a built-in colour change to allow acid strength to be monitored visually, are available from KAMCO.

Caps should be kept securely on all chemical containers whilst not in use. As a matter of prudence, and to avoid splashes, operators should avoid standing directly over the open neck of either chemical containers or the filling aperture of the descaling pump whilst pouring or adding chemicals.

If the pump is not to be used for a period of time, wash it out after use by circulating clean water through it, to prevent any residues of the descaling process from drying and "gumming up" the rotor.

Please observe these precautions:

1. Always add the acid to the water, never the other way round.
2. Temperature of the descaling / flushing solution must not exceed 50°C.
Monitor temperature closely when descaling plant / equipment which may already have a high temperature, such as the domestic water coil in storage water heaters, or large plastic injection moulding tools.
3. Do not dissolve solid or crystalline descaling chemicals directly in tank, as this may choke the pump inlet and cause abrasion damage. Dissolve solid or crystalline chemicals in a bucket first.
4. Always keep pump upright, particularly in transit, to avoid any liquid penetrating lower electric motor bearing, as this may cause the bearings to wear prematurely.

SUMMARY OF CHEMICALS USED WHEN DESCALING BOILERS AND HEAT EXCHANGERS

Product	Application	How much do you need?	How is it packed?
<p>Scalebreaker SR</p>	<p>Descaling heat exchangers, boilers or water heaters.</p> <p>Suitable for materials including aluminium.</p> <p>Pour slowly into CLEARFLOW tank whilst re-circulating</p> <p>Works faster with heat.</p>	<p>Dissolves half its own weight of scale.</p> <p>Colour changes from red to yellow when exhausted, so add more.</p>	<p>Carton of 6 x 2.5kg pails.</p> <p># 15kg pail.</p>
<p>Scalebreaker FX</p>	<p>Descaling heat exchangers, boilers or water heaters.</p> <p>NOT suitable for use with aluminium or galvanised steel.</p>	<p>In liquid form, ready to use. Make a solution of 1 part FX to 4 parts of water.</p>	<p>Cartons of 4 x 5 litre.</p>
<p>Scalebreaker HD</p> <p>Note this is an extremely powerful chemical - use with caution.</p>	<p>Descaling heat exchangers, boilers or water heaters.</p> <p>Not for use in central heating systems.</p> <p>NOT suitable for use with aluminium, galvanised or stainless steel.</p>	<p>In liquid form, ready to use. Make a solution of 1 part HD to 10 parts of water.</p>	<p># Cartons of 4 x 5 litre.</p>
<p>Neutralising Crystals</p>	<p>Used to neutralise acidic water to enable safe disposal down a FOUL SEWER</p> <p>Pour slowly into the CLEARFLOW tank whilst re-circulating.</p>	<p>Between 1 and 5% in water.</p>	<p>Cartons of 6 x 2.5 kg pails.</p> <p>15 kg pails.</p>
<p>pH paper</p>	<p>To check that the solution is neutral. pH reading should be 7 (i.e. same as tap water)</p> <p>Dip 3cm in dump water and compare colour with chart.</p>	<p>Approx. 10 cm.</p>	<p>5 metre dispenser pack.</p>
<p>ZnI Booster</p>	<p>To protect galvanised pipes when being descaled with SR Crystals.</p> <p>Add to CLEARFLOW tank whilst re-circulating BEFORE addition of SR Crystals.</p>	<p>3% by weight of SR Crystals.</p>	<p>450g tub.</p> <p>(treats 15kg SR Crystals.)</p>
<p>Foambreaker</p>	<p>Used to control excessive foaming whilst descaling.</p>	<p>10ml per 50 litre of descaling solution.</p>	<p>1 litre dispenser pack.</p>

= Please note carriage restrictions apply with some chemicals / pack sizes. Please call for advice.

SECTION E – TROUBLE SHOOTING, SERVICE + REPAIR

Kamco have a full “Service and Repair” facility at our premises in St Albans, and can either undertake full repairs or supply replacement parts as required.

When your new Clearflow pump was first supplied it was flow and pressure tested after assembly to ensure that it would perform to a high standard. However, over time and use parts may have been physically damaged, worn out, or partially blocked by non-soluble matter.

If you are concerned that your pump may not be producing the same performance as when it left our factory there are a number of steps that you can take to test, and repair, your unit. These are listed below, they are not time consuming, do not require a high level of expertise and will not invalidate the warranty.

Trouble shooting / problem solving.

A flow chart is included on the following page to assist in diagnosing common problems that can be experienced on site. The chart and illustrated test are a useful guide in determining if a problem is related to the Clearflow pump or if it is a problem related to the heating system.

How to check your Clearflow's performance.

We suggest these checks be conducted outside and not within a client's premises.

Test 1 - Pressure test

What you need: Pressure gauge 0-30 psi adapted to the appropriate BSP male thread.

1. Fill the tank ½ full of water.
2. Point the flow reverser lever to the left.
3. Position the left-hand valve to “Circulate”.
4. Position the right-hand valve to “Dump”.
5. Attach one supply/return hose to the BSP nipples. (short-circuiting the flow).
6. Attach the dump hose as normal.
7. Holding the end of the dump hose away from you to a suitable discharge point, switch on the motor for five seconds. You should see a strong jet of water.
8. Attach the pressure gauge into the hose end and turn the motor on for 30 seconds.
While the motor is running you should get a reading of 23-25psi for the CF40 Evolution, 26-28psi for the CF90 Quantum², and 28psi for the CF210 Titan.

Test 2 - Flow rate test

What you need: Empty clean 5 litre container (e.g. an empty POWERFLUSH FX2 container)

1. Repeat steps 1-7 of test above.
2. Hold the dump hose so that it will discharge water into the empty container.
3. When ready, use an assistant to time how long it takes to fill the 5 litre container.
You should get a reading of between 9 - 11 seconds for the CF40 Evolution and 7 - 8 seconds for the CF90 Quantum.
4. When testing the CF210 Titan use a 25 litre container, which should take approx 25 seconds.

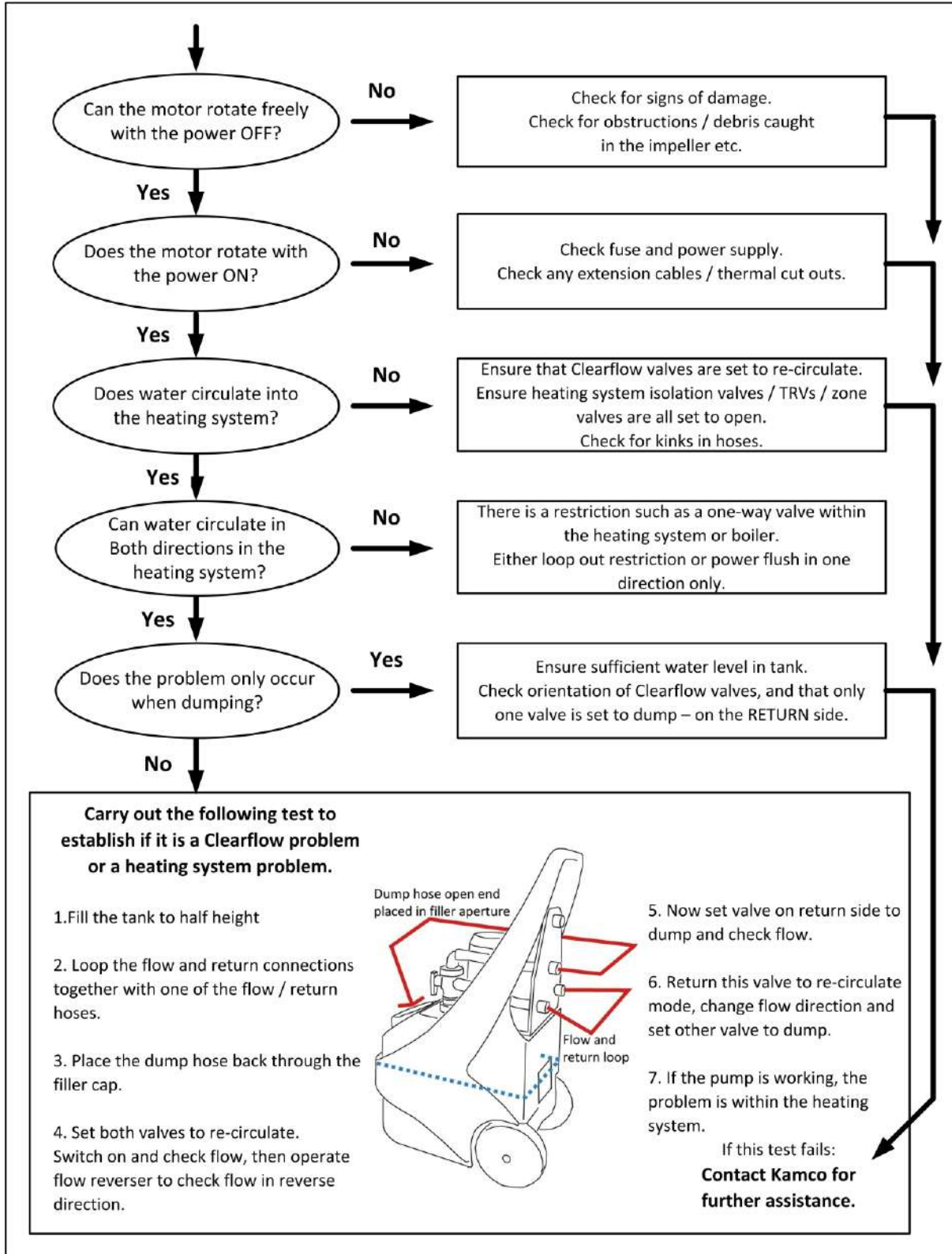
Inspection

1. Remove the 4 bolts that connect the flange to the tank.
2. Lift and withdraw the pump assembly from the tank.
3. Inspect the rotor cover at the bottom of the unit to ensure:
 - a. It is perfectly flat.
 - b. There are no bolts damaged or missing
 - c. The large O-ring is still in place and has not been pushed out.
4. Inspect the inside of the impeller to make sure that there is no debris inside.
5. Check all hose connections to ensure that they are secure.

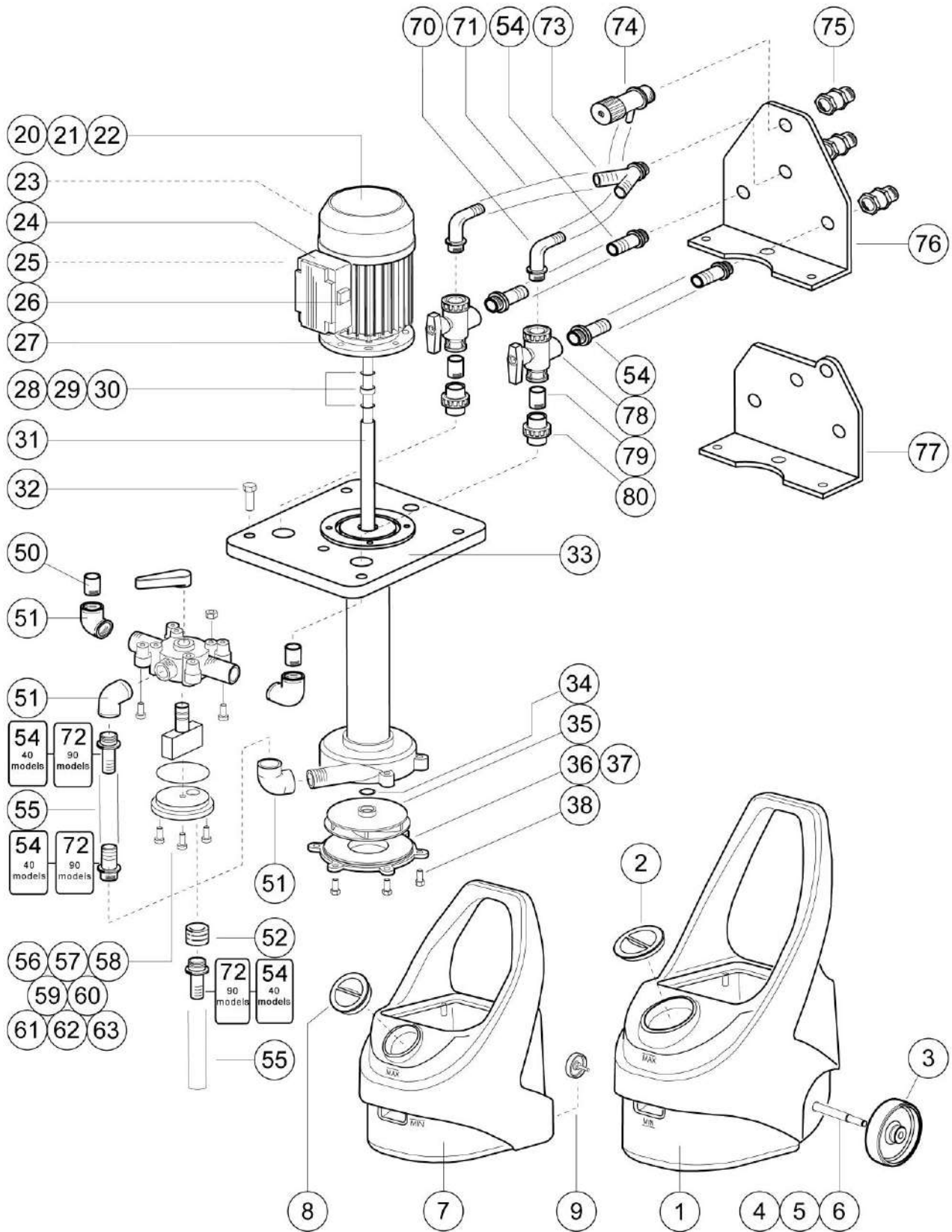
If none of the above faults are apparent please call the Kamco Technical Help line on 01727 875020

TROUBLE SHOOTING / PROBLEM SOLVING

Use the flow chart to determine any likely problem and then if necessary undertake the simple flow test to establish if the Clearflow pump is functioning. If the pump is circulating and dumping with a good flow rate then any problem must be related to the heating system.



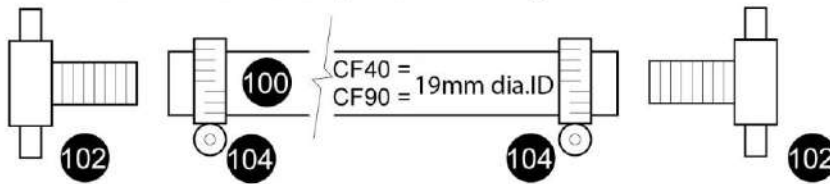
CF40 & CF90 EXPLODED VIEW AND SPARES DIAGRAM



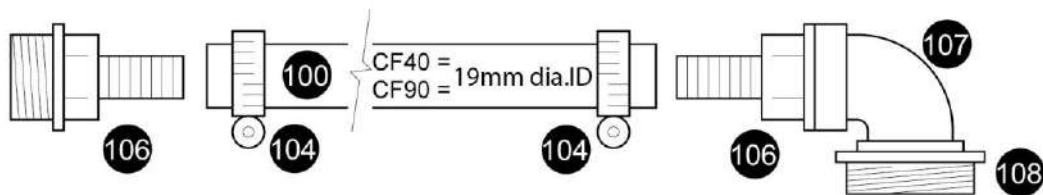
Refer to the following pages for component descriptions and part codes.

CF40 & CF90 EXPLODED VIEW OF HOSE ASSEMBLIES

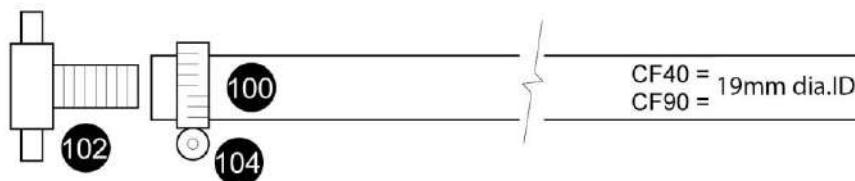
2 x Flow and Return Hoses, each 5m long.



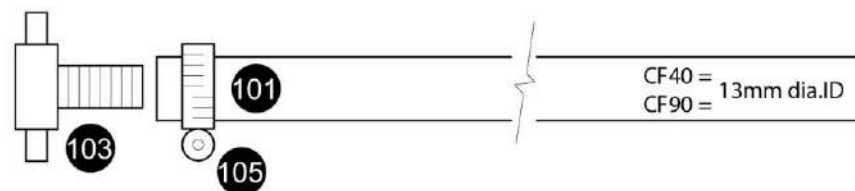
2 x Circulation Pump Hoses, each 0.5m long.



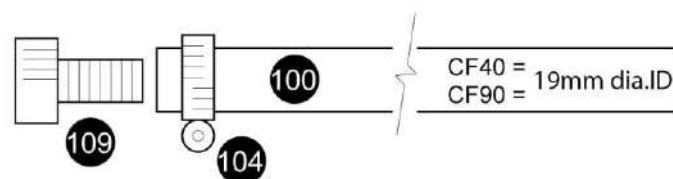
1 x Dump Hose, 8m long.



1 x Water Inlet Hose, 8m long.



1 x Overflow Hose, 3m long.



Refer to the following pages for component descriptions and part codes.

CF40 & CF90 SPARES LIST

No. on Diagram	Pump Type	Product Code	Description	Unit Price
1	90	H09006K	CF90 moulded tank	
2	90	H04005	CF90 tank cap	
3	90	H09008K	CF90 wheel (each)	
4	90	H09007K	CF90 axle	
5	90	H09009K	CF90 axle circlip, inner 22.2mm	
6	90	H09010K	CF90 axle circlip, outer 20.0mm	
7	40	H04020K	CF40 moulded tank	
8	40	H04021K	CF40 tank cap	
9	40	H04022K	CF40 wheel (each)	
9	40	H04022KA	CF40 wheel axle (each)	
20	40	H04002L22K	CF40 motor 230v	
20	40	H04002L11K	CF40 motor 110v	
20	90	H09002L22K	CF90 motor 230v	
20	90	H09002L11K	CF90 motor 110v	
21	40 & 90	H04012KA	Fan cover	
22	40 & 90	H04012KB	Motor fan	
23	40 & 90	H03002B	Motor bearings	
24	40 & 90	H03002F	Motor switch box	
25	40	H04007	CF40 capacitor 230v	
25	40	H04008	CF40 capacitor 110v	
25	90	H09001	CF90 capacitor 230v	
25	90	H04008	CF90 capacitor 110v	
26	40 & 90	H01502C	On/off switch for motor	
27	40 & 90	H030HJ08	M8 x 35mm brass bolt	
27	40 & 90	H030HJ07	M8 brass nut	
27	40 & 90	H030HJ09	M8 brass washer	
28	40 & 90	H03002A	Motor shaft circlip	
29	40 & 90	H03006	White 'Arnite' bush	
30	40 & 90	H03007	Drive shaft 'O' ring	
31	40	H04014K	CF40 drive shaft sleeve	
31	90	H09005K	CF90 drive shaft sleeve	
32	40 & 90	H01507K	M12 PP bolt	
33	40	H04013K	CF40 flange and body	
33	90	H09001K	CF90 flange and body	
34	40 & 90	H0150211A	Impeller 'O' ring	
35	40	H04015K	CF40 impeller	
35	90	H09004K	CF90 impeller	
36	40 & 90	H04017K	Rotor cover	
37	40 & 90	H04016K	Rotor cover 'O' ring	
38	40 & 90	H03012K	M10 PP bolt	

continued on next page.

CF40 & CF90 SPARES LIST (continued)

No. on Diagram	Pump Type	Product Code	Description	Unit Price
50	40 & 90	H04018KF	3/4" BSP threaded nipple - 45mm long	
51	40 & 90	H03023	3/4" BSP female/female elbow	
52	40 & 90	H030F46	3/4" BSP threaded socket	
53	40 & 90	H030F11	3/4" BSP male/female elbow	
54	40	H090F04	3/4" BSP male x 19mm PP hose adapter	
72	90	H190F15	3/4" BSP male x 25mm PP hose adapter	
55	40	HH019X30	Clear hose 19mm ID (per m)	
55	90	HH2229	Clear hose 22mm ID (per m)	
56	40 & 90	H04018KAA	Flow reverser handle	
57	40 & 90	H04018KBB	Flow reverser paddle	
58	40 & 90	H04018KCC	Flow reverser body	
59	40 & 90	H04018KDD	Flow reverser top plate	
60	40 & 90	H04018KE	'O' ring for reverser top plate	
61	40 & 90	H03007	'O' ring for flow reverser paddle	
62	40 & 90	MI022	M6 x 30mm socket cap head screw	
70	40 & 90	H090F03	3/4" BSP male x 20mm 90° hose adapter	
71	40 & 90	HH019X30	Clear hose 19mm ID (per m)	
54	40 & 90	H090F04	3/4" BSP male x 19mm PP hose adapter	
73	40 & 90	H030HJ06	3/4" BSP male x 20mm 'Y' piece hose adapter	
74	40 & 90	H190F16	3/4" BSP x 19mm water inlet tap	
75	40 & 90	H090F06	3/4" BSP female x 3/4" BSP male brass adapter	
76	90	H09011K	CF90 hose support bracket	
77	40	H04024K	CF40 hose support bracket	
78	40 & 90	H090F01	3/4" BSP single union L port valve	
79	40 & 90	H04023K	3/4" BSP threaded nipple - 35mm long	
80	40 & 90	H04019K	3/4" BSP union	

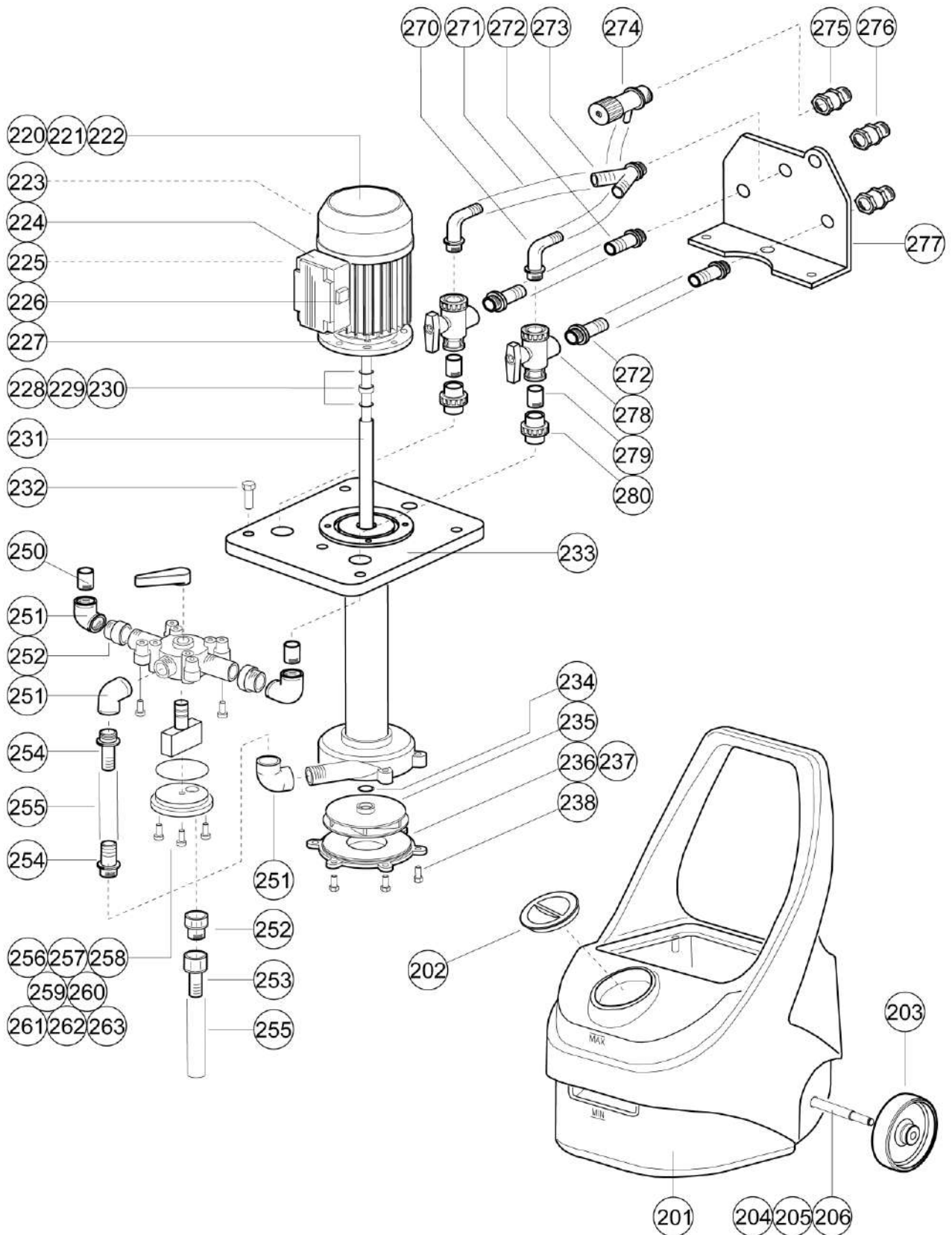
CF40 & CF90 HOSE COMPONENTS

No. on Diagram	Pump Type	Product Code	Description	Unit Price
100	40 & 90	HH019X30	Clear hose 19mm ID per metre (state length)	
101	40 & 90	HH013X30	Yellow hose 13mm ID per metre (state length)	
102	40 & 90	H090F07	3/4" BSP female x 19mm brass hose adapter	
103	40 & 90	H090F10	3/4" BSP female x 13mm brass hose adapter	
104	40 & 90	H030F13A#	Worm drive clip, 16-25mm	
105	40 & 90	H030F13	Worm drive clip, 12-22mm	
106	40 & 90	H090F04	3/4" BSP male x 20mm PP hose adapter	
107	40 & 90	H030F11	3/4" BSP male/female elbow	
108	40 & 90	H030F19	1 1/2" BSP male x 3/4" BSP female brass bush (each)	
109	40 & 90	H030F69	3/4" BSP female x 19mm PP hose adapter	
	40 & 90	H030F06A	CF40/CF90 complete hose washer kit	
	40 & 90	H030F06	Pack 10 x 3/4" seals	
	40 & 90	H030F38	1 1/2" washer (each)	
	40 & 90	H030F23	Hose container (52lt black/red plastic crate)	

CF40 & CF90 HOSE ASSEMBLIES

No. on Diagram	Pump Type	Product Code	Description	Unit Price
	40 & 90	HHCF9SET	Full hose set for CF40/CF90 (7 hoses with fittings)	
	40 & 90	HHCF9DH	8m dump hose	
	40 & 90	HHCF9FR	5m supply and return hoses (pair)	
	40 & 90	HHCF9OH	3m overflow hose	
	40 & 90	HHCF9WI	8m water inlet hose	
	40 & 90	HHCF9CP	0.5m 1 1/2" BSP circulation pump adapter hoses (pair)	

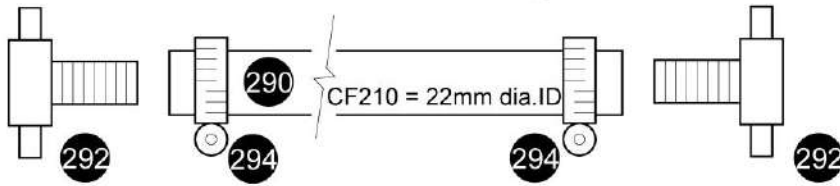
CF210 EXPLODED VIEW AND SPARES DIAGRAM



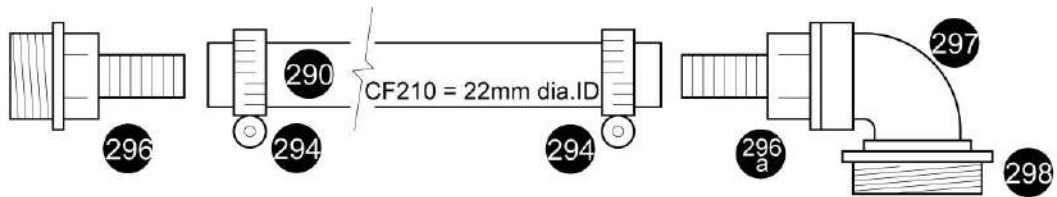
Refer to the following pages for component descriptions and part codes.

CF210 EXPLODED VIEW OF HOSE ASSEMBLIES

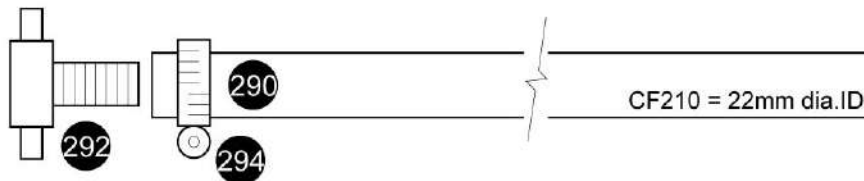
2 x Flow and Return Hoses, each 5 m long.



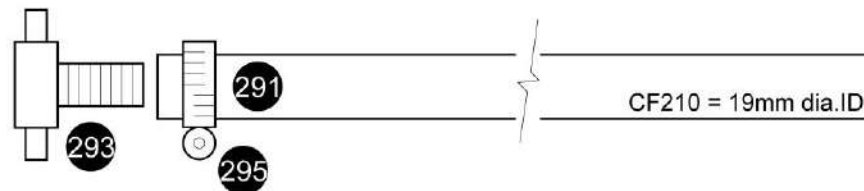
2 x Circulation Pump Hoses, each 0.5 m long.



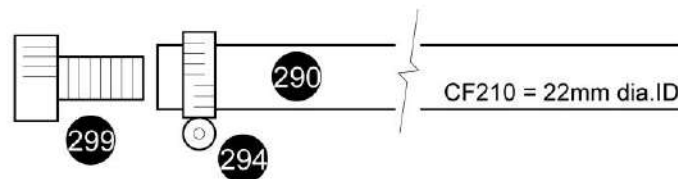
1 x Dump Hose, 8 m long.



1 x Water Inlet Hose, 8 m long.



1 x Overflow Hose, 3 m long.



Refer to the following pages for component descriptions and part codes.

CF210 SPARES LIST

No. on Diagram	Pump Type	Product Code	Description	Unit Price
201	210	H21004K	CF210 moulded tank	
202	210	H04005	CF210 tank cap	
203	210	H09008K	CF210 wheel (each)	
204	210	H21005K	CF210 axle	
205	210	H09009K	CF210 axle circlip, inner 22.2mm	
206	210	H09010K	CF210 axle circlip, outer 20.0mm	
220	210	H21001S22	CF210 motor 230v (exc. fan cover)	
220	210	H21001S11	CF210 motor 110v (exc. fan cover)	
221	210	H04012KA	Fan cover	
222	210	H04012KB	Motor fan	
223	210	H03002B	Motor bearings	
224	210	H03002F	Motor switch box	
225	210	H09001	CF210 capacitor 230v	
225	210	H04008	CF210 capacitor 110v	
226	210	H01502C	On/off switch for motor	
227	210	H030HJ08	M8 x 40mm brass bolt	
227	210	H030HJ07	M8 brass nut	
227	210	H030HJ09	M8 brass washer	
228	210	H03002A	Motor shaft circlip	
229	210	H03006	White 'Arnite' bush	
230	210	H03007	Drive shaft 'O' ring	
231	210	H21003K	CF210 drive shaft sleeve	
232	210	H01507K	M12 PP bolt	
233	210	H21001KCOMP	CF210 flange and body	
234	210	H0150211A	Impeller 'O' ring	
235	210	H09004K	CF210 impeller	
236	210	H04017K	Rotor cover	
237	210	H04016K	Rotor cover 'O' ring	
238	210	H03012K	M10 PP bolt	

continued on next page.

CF210 SPARES LIST (continued)

No. on Diagram	Pump Type	Product Code	Description	Unit Price
250	210	H21010K	1" BSP threaded nipple - 45mm long	
251	210	H030F26	1" BSP female/female elbow	
252	210	MI036	1" BSP male x 3/4" BSP female reducing bush	
253	210	H190F20	1" BSP female x 25mm hose adaptor	
254	210	H190F15	3/4" BSP male x 25mm PP hose adapter	
255	210	HH2229	Clear hose 22mm ID (per m)	
256	210	H04018KAA	Flow reverser handle	
257	210	H04018KBB	Flow reverser paddle	
258	210	H04018KCC	Flow reverser body	
259	210	H04018KDD	Flow reverser top plate	
260	210	H04018KE	'O' ring for reverser top plate	
261	210	H03007	'O' ring for flow reverser paddle	
262	210	H04018KH	M6 x 50mm socket cap head screw	
263	210	H030F54	M6 nut	
270	210	H190F10	1" BSP male x 25mm 90° hose adapter	
271	210	HH2229	Clear hose 22mm ID (per metre)	
272	210	H190F05	1" BSP male x 25mm PP hose adapter	
273	210	H190F07	1" BSP male x 25mm 'Y' piece hose adapter	
274	210	H190F16	3/4" BSP male x 19mm water inlet tap	
275	210	H090F06	3/4" BSP male/female brass adapter (water inlet)	
276	210	H21007K	1" BSP male/female brass adapter (flow, return, dump)	
277	210	H21006K	CF210 hose support bracket	
278	210	H21008K	1" BSP single union L port valve	
279	210	H21009K	1" BSP threaded nipple - 40mm long	
280	210	H21011K	1" BSP threaded union	

CF210 HOSE COMPONENTS

No. on Diagram	Pump Type	Product Code	Description	Unit Price
290	210	HH022X30	Clear hose 22mm ID per metre (state length)	
291	210	HH019X30	Clear hose 19mm ID per metre (state length)	
292	210	H190F03	1" BSP female x 25mm brass hose adapter	
293	210	H090F07	3/4" BSP female x 19mm brass hose adapter	
294	210	H030F13B	Worm drive clip, 20-32mm	
295	210	H030F13A#	Worm drive clip, 16-27mm	
296	210	H190F05	1" BSP male x 25mm PP hose adapter	
296a	210	H190F04	3/4" BSP male x 22mm PP hose adapter	
297	210	H030F11	3/4" BSP male/female elbow	
298	210	H030F19	1 1/2" BSP male x 3/4" female brass bush (each)	
299	210	H190F20	1" BSP female x 25mm PP hose adapter	
	210	H190F06A	CF210 complete hose washer kit	
	210	H190F06	Pack 10 x 1" seals	
	210	H030F38	1 1/2" washer (each)	
	210	H030F23A	Hose container (80lt black/red plastic crate)	

CF210 HOSE ASSEMBLIES

No. on Diagram	Pump Type	Product Code	Description	Unit Price
	210	HHCF210SET	Full hose set for CF210 (7 hoses with fittings)	
	210	HHCF210DH	8m dump hose	
	210	HHCF210FR	5m supply and return hoses (pair)	
	210	HHCF190OH	3m overflow hose	
	210	HHCF210WI	8m water inlet hose	
	210	HHCF190CP	0.5m 1½" BSP circulation pump adapter hoses (pair)	

SECTION F – POWER FLUSHING ACCESSORIES

The following accessories are available for use with a Clearflow pump to either assist with the connection onto the heating system, to assist the process, or to improve the accuracy of system testing.

CP2 circulator pump body adapter ###

The adaptor connects directly onto the body of a standard heating system circulator pump after the removal of the motor head, eliminating the need to physically disconnect the whole unit at the 1½" unions which are often seized and difficult to remove.

IK6 Systemsure injector / sprayer

The injector enables corrosion inhibitors and flushing chemicals to be injected directly into the main flow of a heating system via a radiator bleed screw or combination boiler filling loop.

CombiMag power flushing filter ###

An in-line magnetic filter to collect black iron oxides circulating during flushing. Thoroughly cleans the water, safeguards the boiler, reduces dumping time and water, and demonstrates the sludge removed from the system.

CombiMag Split Twin power flushing filter ###

A twin cylinder in-line magnetic filter with twice the magnetic capture capacity. Can be configured to filter both the flow and return from the power flushing pump independently.

CombiMag Dual Digital power flushing filter and heater combined ###

A combined dual cylinder unit offering both magnetic filter and heater.
An economical heat source for occasions when the boiler is non-functional.

Plate heat exchange adapter

The adaptor enables the flushing of boiler heat exchangers after removal from the boiler.

Radhammer radiator vibration tool

Vibration tool to assist with the loosening of stubborn deposits within radiators.

Electronic testing equipment

Individual hand held infra red thermometer, pH meter, and TDS meters.

Turbidity Tube

For accurate visual inspection of water clarity.

Water Analysis Test Kit

To determine the quality of the water within a heating system. Tests for pH, dissolved iron, dissolved copper, total hardness, chloride level, and inhibitor concentration.

Instructions for the use of all the above equipment are detailed within the following pages.

= Special Note:

Please note that the 'CP2 adapter', 'CombiMag filter' and the 'CombiMag Dual Digital filter' are all supplied with 3/4" BSP fittings to suit the standard CF40 Evolution and CF90 Quantum pumps.

If purchasing either of these units for use with your CF210 Titan pump, please notify us at time of purchase as we can supply the necessary adapters for use with your 1" BSP connections.

The 'CombiMag Dual Digital' is not intended for use with the commercial size CF210 Titan.

CP2 CIRCULATOR PUMP BODY ADAPTER



The CP2 adapter has been developed for use with heating system power flushing pumps, to enable them to be connected directly onto the body of standard heating system circulator pumps, after removal of the motor head.

The compact dimensions of the CP2 allow for easy connection of a power flushing pump even in boilers which contain the circulator pump within the casing, such as combination and system boilers, where access is often difficult, or which have non-standard connections.

When using the CP2, there is no need to physically disconnect the circulator pump 1.1/2" unions, which are often seized and difficult to remove.

During power flushing, the circulator pump body (volute), which may often contain considerable corrosion debris, is included in the cleaning process.

All radiators may be power flushed, as there is no need to remove one to connect the power flushing pump onto the radiator tails.

The central heating (primary) water side of the secondary heat exchanger of combination boilers can be efficiently flushed with the heat exchanger in place in the boiler casing, giving useful time savings.



Instructions for use

Before you start:

Switch off or electrically isolate the existing circulation pump and make safe the cable and connectors. Protect the area around the pump from water leakage.

Close the circulator pump isolation valves (where fitted), remembering that it is common for valves not to seal completely even though they are apparently fully closed.

Procedure:

1. Remove the four hexagon head screws and then carefully remove the circulator pump head and motor assembly, leaving the circulator pump body installed as normal.

2. As you withdraw the pump head, a small volume of water (the capacity of the pump itself and a short length of pipe work) should be collected in a drip tray, and disposed of safely.

3. Clean the loose rust off the inside of the pump body with a cloth and make sure that there is a clean surface area for both of the supplied O rings to seat on. Use a flat bladed screwdriver if necessary.

4. A small quantity of silicon grease can be used to hold the central 'O' ring in place on the brass centre boss whilst securing the CP2.



5. Offer up the adapter and attach with the hexagon socket cap screws provided. Using a hexagon key tighten the bolts evenly, using strong finger pressure but no extra mechanical leverage.

6. Using the supplied large hexagonal centre boss key, gently tighten the brass centre boss until you feel it seal on the inner 'O' ring. Only medium finger pressure is necessary.



NOTE: Do not overtighten, as this may damage the large 'O' ring, or the main body of the CP2 adapter.

7. Connect the hoses to the adapter and to the supply and return hoses of your power flushing pump.

8. Open the isolation valves on the Clearflow power flushing pump

9. Slowly open the circulator pump isolation valves, and check the CP2 adapter and all hoses for leaks.

10. Switch on the power flushing pump for approx. 5 seconds, and recheck the system for leaks. Carry out the power flushing procedure as normal.

Particular care must be taken to avoid water leaks and splashes when using the CP2 within the casing of a combination boiler, because of the close proximity of sensitive electronics and PCBs. Use only chemical resistant O-rings. Never add chemicals until you have checked the entire system for leaks.

Procedure when flushing a combination boiler system:

When the radiator circuit power flush is complete, turn on a hot tap, so that the boiler directs all of the flow through the plate heat exchanger, and the boiler fires up.

If the liquid in the tank of the Clearflow reaches 50°C, turn the boiler off until it cools.

Note: Some boilers will only allow flow in one direction when in hot water mode.

Add a further 1/2 litre of PowerFlush FX2 to the Clearflow tank, and flush for 15 to 20 minutes, reversing the flow regularly.

Set the Clearflow into dump mode, and dump (and then in reverse direction if possible) until the dump water is clear.

Whilst this procedure of power flushing only the plate heat exchanger may be carried out as a stand-alone procedure, without power flushing the rest of the heating system, we would always recommend a total system power flush when a heat exchanger has been blocked.

If this is not carried out, there is a high probability that the heat exchanger will again block in future, as system debris is carried into the heat exchanger with the normal flow and operation of the boiler.

Note 1: To achieve the maximum flow rate around a system when power flushing, the number of bends and restrictions should be kept to a minimum, and the pipe sizes should be as large a diameter as possible.

Note 2: Take care when using on combination boilers such as the Worcester Bosch Heatslave and others which have valves allowing flow in one direction only.

Always refer to manufacturer instructions before use.

Engineers tip

On certain pumps it can be difficult to get a seal on the large outer 'O' ring. In such cases the addition of a standard Grundfos flat 'O' ring* attached to the CP2 body can enable a seal to be made.

The flat 'O' rings can easily be removed from any new or used Grundfos pump head.



The CP2 adapter was primarily designed for the Grundfos Selectric and combination boiler pumps, but will also fit a number of other units, including some Circulating Pumps/Myson, Terrier, Wilo Gold and DAB.

As an option a special large 72mm dia x 7mm thick 'O' ring is also available for use on Vaillant Ecotec boilers.

IK6 SYSTEMSURE INJECTOR / SPRAYER



The SYSTEMSURE IK6 injector enables corrosion inhibitors, flushing chemicals, and boiler noise suppressants to be injected directly into the main flow of heating systems.

It is used to inject liquid chemicals through the air bleed screw of just one radiator, with no need to drain off any water, or even to locate the feed and expansion tank.

With no need to enter the loft space, the whole process can be carried out in less than five minutes.

The SYSTEMSURE IK6 injector is equally as effective when injecting chemicals into sealed systems, removing the need to re-pressurize a system after injection of chemicals.



It is supplied complete with two special nickel-plated steel air bleed valve adapters for the most common radiator bleed valve sizes.

An additional adapter allows connection to the filling loop on combination boilers.



The IK6 has a 4 litre capacity tank, enabling it to be used to add chemicals to even the largest domestic systems in one operation.

Spray applications

The Systemsure IK6 may also be used for spray application of chemicals. It is constructed of thermoplastic materials suited for use with a wide range of industrial chemicals, including acids, and may be used for cleaning, disinfecting and degreasing.

The IK6 sprayer/injector includes an adjustable nozzle, a spray lance incorporating easy action on / off valve and integral filter. The see-through tank has a visible filling level scale, an external safety valve with red over-pressure indicator, and clip for the lance.

Operating Instructions

To inject chemicals into central heating systems through the radiator air bleed valve:

Ensure that the heating system is switched off, and that the circulator pump is not still running. Assemble the IK6 unit with the two supplied flexible hoses connected each end of the combined handle and on / off valve.

Unscrew the pump unit from the top of the tank, add to the tank the liquid to be injected, and screw the pump unit firmly back onto the tank.

Select the Systemsure air bleed screw adapter suited to the radiator into which chemical is to be injected.

Close both radiator valves on the selected radiator. Unscrew the air bleed nipple, taking care to catch any liquid with an absorbent cloth. Screw in the chosen air bleed screw adapter, using PTFE tape if necessary to obtain seal. Fasten the end of the flexible tube onto the adapter, and reopen the radiator valves.

Pressurise the unit by pumping the handle 20 times. When the red indicator on the safety valve appears, stop pumping, Air will be expelled through the valve, and no more pressure will be raised within the tank.

Squeeze the metal handle on the injector lance, and hold until contents of tank have been injected into radiator. Release handle, and pull out external safety valve until pressurised air in IK6 is released. Close radiator valves. Unscrew air bleed screw adapter, replace radiator bleed screw, and reopen radiator valves.

The normal circulation of the heating system will now distribute the chemical throughout the system.

Operating Instructions

As a means to clear an individual radiator blocked with sludge or corrosion debris:

Assemble the IK6 as previously, and select the air bleed screw adapter suited to the radiator.

Close both valves on the radiator. Unscrew the radiator air bleed nipple, taking care to catch any liquid with an absorbent cloth. Screw in the air bleed screw adapter, using PTFE tape if necessary to obtain seal. Fasten the end of the flexible tube onto the adapter, and pressurise the IK6 by pumping the handle 20 times. When the red indicator on the safety valve appears, stop pumping.

Squeeze the metal handle on the injector lance in order to pressurise the radiator, and then open ONE radiator valve only. Wait for two minutes, close the open radiator valve, and pump the IK6 twenty times to restore pressure.

Squeeze the metal handle on the IK6 injector to re-pressurise the radiator, open the other radiator valve, and wait for two minutes. Open both radiator valves and put the full flow of a power flushing pump on that radiator alone, by shutting off all other radiators. There should now be water flow to that radiator.



Operation of the trigger unit.

The Systemsure injector unit is connected to the rear mounted air bleed screw of a round top radiator.

Operating Instructions

As a spray applicator for cleaning, degreasing, and descaling chemicals:

Assemble the IK6 with one flexible hose running from the connector near the base of the unit to the combined handle / on/off valve. Screw the rigid spray lance, with appropriate spray nozzle, on the other end.

Unscrew the pump unit from the top of the tank, and fill the tank to the required level with the liquid to be sprayed. Screw pump unit firmly back onto the tank.

To spray, squeeze the metal handle on the spray lance, and adjust the nozzle to obtain the desired spray. Pressure, and therefore spray intensity, drop with use. Pump more to regain pressure.

Technical characteristics:

Maximum pressure 3 bar / 42 psi

Flow rate at 3 bar 0.50 l/m

Usable capacity 4 litres

Flexible hose length 2 x 1.3 metre

Seal material Viton

Weight 1.75 kg

Maintenance

Most frequent malfunctions and their solutions.

1. Avoid seals becoming dry by washing the unit after use, and applying a few drops of oil at the points shown in the instruction leaflet
2. If the filter becomes blocked, unscrew the handle, remove the filter from inside the handle, and clean.

COMBIMAG SOLO POWER FLUSHING FILTER



The CombiMag filter increases power flushing efficiency by removing circulating black iron oxide contamination from the system water. The filter is simply installed in line between the heating system and the power flushing pump.

The CombiMag controls the flow of water to give a high residence time within the cylinder, to ensure that the maximum amount of black iron oxide is extracted from the water by the powerful magnet.

The design is such that even at maximum capacity, there is always a clear passage for the circulating water.

The transparent cylinder enables progress of a power flush to be visually monitored, and enables the engineer to quickly check if the magnet requires cleaning.

The built-in bypass enables the magnet to be cleaned without the need to temporarily stop the power flushing process.

Benefits

Reduces dumping time by removing solids from the water whilst circulating.

Collects circulating deposits that could lead to blockages in restricted areas, and prevents them re-entering the system.

Protects the boiler during power flush.

By-pass enables the magnet to be inspected without the need to interrupt the power flush.

Reduces environmental contamination by collecting the iron oxide and reducing the amount of water consumed.

Provides an impressive visual aid to both the householder and the engineer by showing the quantity of sludge removed from the system, and confirming the need for a power flush.



Demonstrates why a permanently installed magnetic filter will be beneficial.

Wipe clean magnetic surface to minimise cleaning time and effort.

Specification

Magnet: 11,000 gauss neodymium rare earth magnet, sleeved in stainless steel.

Length of magnet: 400mm

Magnet surface area: 201 cm²

Max. iron oxide capacity: 2.1 kg dry magnetite

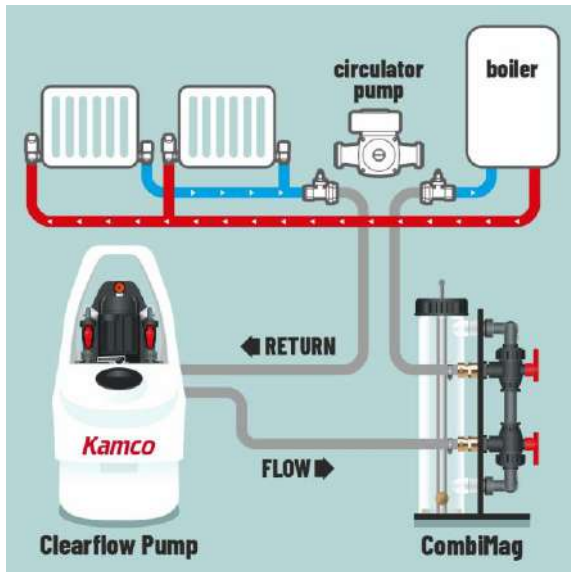
Weight of unit: 4.95 kg

Overall height: 475mm

Overall width: 215mm

Overall depth: 245mm

COMBIMAG SOLO POWER FLUSHING FILTER (CONTINUED)



Connecting the Filter

The power flushing pump can circulate the system water in either direction by operation of the flow reversing level. However, we suggest that the initial set-up is such that the CombiMag filter is installed before the boiler to offer the boiler a higher level of protection in the early stages of the flushing process.

1. Place the CombiMag power flushing filter adjacent to the power flushing pump on a suitable drip tray.
2. Select the required direction of flow and position the flow reverser lever in that direction.
3. Connect the filter to the flushing pump, using the short (1½ m) hose supplied, ensuring the flow enters the bottom of the cylinder and leaves at the top.
4. Using the power flushing pump standard flow and return hoses connect both the pump and filter to the heating system.
5. The CombiMag isolation valves should be open with the by-pass closed.

Operating Instructions

1. Turn on the power flushing pump and immediately check all connections and the top of the CombiMag canister for leaks.
2. Proceed with the power flush in the normal manner.
3. After initial circulation for approximately 10 minutes, visually check the magnet, cleaning if necessary.
4. Remove the securing ring from the top of the canister and, gripping the handle firmly, carefully lift out the magnet.

Note: the magnet is very powerful and is strongly attracted to steel surfaces. Take care not to trap fingers and avoid contact with sensitive equipment.

5. Inspect the magnet for collected deposits and, if necessary, clean as follows:



6. Grip the canister lid and handle with one hand. Whilst wearing disposable gloves, grip and slide the magnetite sludge down and off the magnet.
Note: Only remove a proportion of the deposits with each stroke, starting at the lower end of the magnet. Clean the end of the magnet.
7. Collect the sludge in a suitable container for later disposal.



8. Re-assemble the unit ensuring the magnet locates within the central recess at the base of the cylinder, re-open the isolating valves closing the by-pass, checking the canister lid for any leakage.
9. Repeat the inspection and cleaning procedure at regular intervals during the flushing process.

Cleaning the Magnet

It is not necessary to remove all deposits during the intermediate cleans whilst power flushing, however to ensure a long life the magnet should be thoroughly cleaned and dried at the end of each job.

Caution

The CombiMag contains a very strong magnet. When removed from the canister the magnet is easily attracted to metal surfaces. Take care not to trap fingers and avoid contact with sensitive equipment such as watches, mobile phones, credit cards etc.

COMBIMAG SPLIT TWIN POWER FLUSHING FILTER

The CombiMag Split Twin filter increases power flushing efficiency by removing circulating black iron oxide contamination from the system water.

The Split Twin filter consists of two separate CombiMag magnetic filters mounted on one stand.

It is installed between the power flushing pump and the heating system and connected so that each cylinder is in one flow or return hose to give the boiler the highest level of protection during a power flush.

Magnetic debris is removed from both flow and return at the same time, irrespective of the flow reverser direction setting.

Cylinders each contain 400mm 11,000 gauss magnets, and are designed to give circulating water a high residence time within the cylinder, to ensure that the maximum amount of black iron oxide is extracted from the water by the powerful magnet.

The transparent cylinders enable progress of a power flush to be visually monitored, and enable the engineer to quickly check if the magnet requires cleaning.

The by-pass assemblies have been designed to enable the magnets to be cleaned, either individually or together, without the need to interrupt the power flushing process.

General operating instructions

Follow the operating instructions for the CombiMag filter detailed on Page F7.

Two connection hoses are supplied with the CombiMag Split Twin. If the operator prefers, one of the two connector hoses can be used to loop the two cylinders in series, so that it is possible to clean one cylinder whilst the other is still cleansing the water flow, so that the flow of water to the boiler is always protected.

**Technical data**

Strength of each magnet:	11,000 gauss
Length of magnets:	400mm
Magnet surface area:	2 x 201 cm ²
Weight of unit:	9.6 kg
Overall height:	475mm
Overall width:	350mm
Overall depth:	265mm

COMBIMAG DUAL DIGITAL POWER FLUSHING FILTER AND HEATER



General operating instructions

For the magnetic filter section, follow the operating instructions for the CombiMag filter detailed on Page F7.

The by-pass assembly has been designed to allow the magnet cylinder to be isolated, whilst keeping the heater cylinder constantly in the flushing circuit. This allows the removal of the magnet for cleaning without having to interrupt the flushing process.



Rather than having a single cylinder as per the standard CombiMag, where the engineer only has the option to use either the magnet or the heater, the dual unit has two cylinders. This enables both the magnet and heater to be used at the same time.

Specification

A dual stand with two cylinders:

First containing: Magnet: 11,000 gauss neodymium rare earth magnet, sleeved in stainless steel.

Second containing: 3kw 240v digitally controlled industrial immersion heater element complete with IP55 protective casing.

Supplied in a protective toolbox with hinged lid.

It is important to always replace and use the magnet and heater elements in the correct cylinder as labelled, for safety and correct operation.



PLATE HEAT EXCHANGE ADAPTER



Plate heat exchangers, as fitted to most modern combination boilers, are extremely efficient and compact, allowing ever smaller boilers to be produced.

However, relatively small quantities of iron oxide (rust) can block the waterways, causing the boiler to cut out when in hot water mode. As little as 12 gm of rust can cause a heat exchanger to fail. A central heating system may contain several kg of loose rust, and therefore failures are common.

If it is not practical to use a CP2 adapter, a power flushing pump can still be used to remove rust and sludge from the primary water side of a plate heat exchanger, after removing it from the boiler.

If a plate heat exchanger has BSP threaded connections, it is easy to attach the flow and return hoses of a power flushing pump directly onto the heat exchanger.



However, many plate heat exchangers have plain punched hole water inlet / outlets, without BSP threaded connections. In these cases the adapter can be used to



make the connection to the power flushing pump. ***

*** There are many different proprietary designs of plate heat exchanger. It is not possible for Kamco to be aware of every variation currently on the market, hence the adapters supplied by Kamco will fit most plate heat exchangers, but cannot be guaranteed to fit all.

Plate heat exchanger adapters - instructions

Many combination boiler plate heat exchangers without BSP threaded water inlet / outlet connections conform to a general pattern whereby they have four holes 15 to 18mm diameter, located at 155 x 40 mm centres.

There is generally a 5mm female threaded pillar at each end so that the boiler connection manifolds may be located and secured with a 5mm bolt when in normal use. One pillar is usually centralised between the holes at one end, and that at the other end is offset.

Kamco plate heat exchanger adapters (each kit consists of two adaptor blocks) should be attached as shown in the picture, using the M5 allen bolts supplied.

In some cases a further 8mm hole may need to be drilled in the body of one adapter block, when the connection threaded pillar is further offset than usual.

In this situation, 'G' type clamps may be used to ensure a tight connection of the adapter blocks onto the heat exchanger.

Each adapter block has two 3/4" BSP male threaded hose connections, and the power flushing pump hoses should be connected onto these fittings, one at either end.

Both will always be fitted on the same side of the heat exchanger (see picture), but the choice of side will depend on whether the primary water side, or the domestic water side is to be flushed. ###

Whilst the plate heat exchanger adapters are generally water tight, always place the heat exchanger in a water proof tray or open container prior to switching on the pump.

Circulate water only at first, and check for leaks prior to adding any chemical to the power flushing pump.

In cases where the heat exchanger is heavily fouled, neat HyperFlush can be poured into the exchanger and left to soak for 24 hours before flushing with the pump.

Note: The domestic water side of these heat exchangers may generally be descaled without removing the heat exchanger from the boiler casing.

Access to the domestic water circuit may be gained by breaking into the cold water inlet pipe, and the hot water pipe leading to the taps, underneath the boiler, and connecting the flow and return hoses onto suitable BSP fittings / threads.

RADHAMMER RADIATOR VIBRATION TOOL



Over time corrosion and sludge can build up in heating systems and this often accumulates within the radiators creating cold spots.

These deposits can, especially on older systems, become quite solid and stubborn to shift. To speed up the chemical flushing process and improve the cleansing efficiency it is recommended to vibrate the radiator surface to loosen the deposits within.

The Radhammer has been developed for that purpose. Designed to fit into a standard SDS chuck, it has a replaceable flat-faced head.

Caution

Always refer to the SDS drill manufacturers' safety instructions before use, and wear ear defenders.

Never use the Radhammer on any radiator that is connected to other than standard copper pipework.

The vibration and removal of stubborn deposits may uncover hidden corrosion that is already present within the heating system leading to potential leaks.

Loose paint may be damaged or removed.

Always indemnify yourself from damage the use of the product may cause.

Operating Instructions

Monitor each radiator for cold spots, noting their locations. An infra-red thermometer is ideal for this.

During flushing, check these locations to ascertain any stubborn areas where deposits still remain.

Attach the Radhammer to your SDS drill, and set the drill to "hammer only" mode (non-rotational).

Clean any debris or dirt from the face of the Radhammer and the surface of the radiator.

Hold the drill so that the face of the Radhammer makes flat contact with the surface of the radiator at the problem area. Turn on the drill for 3 seconds whilst holding the Radhammer against the radiator, applying moderate pressure.

Check the radiator temperature and repeat the operation in other stubborn areas, if required.

Note

Only use the Radhammer on an individual radiator that is receiving the full flow of the Clearflow pump, to ensure loosened debris is carried away.

Do not use excessive force.

The more pressure applied to the SDS drill, the more powerful the vibrational force on the radiator will be, and you may damage the paint surface. Apply pressure in accordance with your assessment of the overall condition of the radiator.

The Radhammer is not intended for continuous use, or for use over the whole radiator area. Excessive use could result in damage to either the radiator or the Radhammer head.

The Radhammer is an impact instrument and the replaceable head will wear with time. The life of the head will be considerably reduced if the Radhammer is applied to radiators at an angle.

Replacement heads are available from Kamco: please quote part No MI040B.



ELECTRONIC TESTING EQUIPMENT – INFRA-RED THERMOMETER



Simply aim the infra-red thermometer at the target area and depress the trigger to measure the surface temperature.

The “SCAN” icon will appear in the LCD display. When the trigger is released the reading is automatically held for 15seconds and “HOLD” is displayed on the LCD, after which the thermometer will shut down.

Specification

Range	-50 to +330°C
Resolution	0.1°C
Accuracy	+/- 2%
Battery life	80 hrs continuous
Auto off	after 10 seconds

Measurement Zone

The measurement zone is proportional to the distance the thermometer is away from the target. The thermometer is equipped with a 12:1 lens. If the target is 60cm (24”) away, the measurement zone will be 5cm (2”) across.

Laser Pointer

The centre of the measurement zone is 16mm below the laser dot when held horizontally.

For safety reasons the laser pointer will only activate when the trigger button is depressed.

Prolonged, continuous exposure such as staring at the beam can be harmful and should be avoided. Do not look at the beam with any optical instruments.

Unit of measurement

The instrument default is to measure in °C.

Batteries

The low battery icon indicates that the batteries need replacing as soon as possible. The instrument will continue to function but to maintain accuracy new batteries are required.

Storage and cleaning

The sensor lens is the most delicate part of the thermometer and the lens should be kept clean at all times.

Care should be taken when cleaning the lens using only a soft cloth or cotton swab with water or medical alcohol, allowing the lens to fully dry before use.

Do not submerge any part of the thermometer.

The unit should be stored at room temperature between +10 to +40°C.

ELECTRONIC TESTING EQUIPMENT – PH METER

- A fast and accurate check that heating system water is neutral after a power flush.
- Large 3 digit display.
- Waterproof, dustproof, and rugged for use in damp conditions.
- Battery life, ready and calibration indicators.
- Automatic temperature compensation.
- Auto 'power off' prolongs battery life.
- Push button calibration.



Taking a reading with the electronic pH meter

1. Take a sample of at least 100ml of the water to be tested in a suitable clean beaker / vessel, to a depth of approx. 5cm.
2. Remove protective cap from the pH meter.
3. Turn the pH1 meter on by depressing the ON/OFF button located on the front of the meter.
4. Immerse the pH meter into the sample of water, without touching the bottom of the sample container.
5. Stir gently and wait for the display reading to stabilise. The pH meter automatically compensates for temperature variations, and variations on the meter display can be due to the temperature sensor adjusting to the sample temperature.
6. Read the figure from the display.

To hold the display for easier reading, press 'HOLD' key. Press 'HOLD' key again to release.
7. Press the ON/OFF button to shut the pH tester off.
Note: The Eco pH meter automatically shuts off after 8.5 minutes of non-use to conserve batteries.
8. After taking the reading, remove the meter from the sample, and flush with clean water before storing.

Specification

pH range:	0.0 to 14.
Resolution:	0.1 pH
Auto temp.	Yes.
Auto power off:	Yes.
Auto-buffer	pH 4, 7, & 10.
Batteries:	4 x LR44.
Battery life:	>60 hours.

ELECTRONIC TESTING EQUIPMENT – TDS METER

'Total Dissolved Solids' meter to ascertain cleanliness of system water and correct chemical treatment level.

- Rapidly demonstrates the cleanliness of heating system water after a power flush.
- Simultaneous display of TDS and temperature.
- Large 4 digit display.
- Waterproof, dustproof, and rugged for use in damp conditions.
- Battery life, ready and calibration indicators.
- Auto 'power off' prolongs battery life.
- Stainless steel electrodes for resistance and durability.
- Push button calibration.

Note

TDS is usually expressed as parts per million (p.p.m.), or as mg/ litre. Before adding any chemical to system water, the TDS level of the existing water should be checked with the TDS meter, to ascertain a baseline level.



Taking a reading with the electronic TDS meter

1. Take a sample of at least 100ml of the water to be tested in a suitable clean beaker / vessel, to a depth of approx. 5cm.
2. Remove protective cap from the TDS meter.
3. Turn the TDS meter on by depressing the ON/OFF button located on the front of the meter.
4. Immerse the TDS meter into the sample of water, without touching the bottom of the sample container.
5. Stir gently and wait for the display reading to stabilise. The TDS meter automatically compensates for temperature variations, and variations on the meter display can be due to the temperature sensor adjusting to the sample temperature.
6. Read the figure from the display, which is in parts per million of total dissolved solids (= mg/ litre).

To hold the display for easier reading, press 'HOLD' key. Press 'HOLD' key again to release.

7. After taking the reading, remove the meter from the sample, and flush with clean water before storing.

TURBIDITY TUBE



The Turbidity Tube is designed to gauge the level of suspended solids present within the heating system water.

It is useful not only to demonstrate the level of clarity and contamination to you and your client, but also as a comparative tool to monitor that the discharge (dump) water is successfully clearing during the power flushing process.

Equipment required

Kamco Turbidity Tube
White card
Jug or beaker (circa 1 litre)
(Use the container cap as a measuring jug)

Test procedure

Hold the cylinder vertically over a white surface and view downwards.

Use the jug to collect a free-flowing water sample from the dump hose.

Without delay (to avoid settlement of particulate matter) slowly pour the contents of the jug into the turbidity cylinder whilst looking down the column of water from above. Stop as soon as the black rings cannot be seen and take a reading at the top of the water column.

Continue dumping until the reading is above the "Kamco pass mark", and the black "O" rings can still be seen.

Important

Always use in a well-lit room.

Wash thoroughly before and after use.

Do not hold the cylinder whilst taking readings as this affects the amount of light entering the cylinder.

Note

Although a turbidity test is a useful means of checking the clarity, it is essential to also test the pH of the system water prior to disconnecting the power flushing pump.

This equipment measures only 'suspended solids' Accurate comparative 'total dissolved solids' (TDS) readings can be taken with an electronic TDS meter.

SYSTEMSURE WATER ANALYSIS TEST KIT

The test kit enables engineers to make an immediate determination of the quality of water in a heating system, enabling them to understand the causes of problems, and to select the appropriate treatment to prevent future system failures and call backs.

The tests will indicate whether a system has been properly pre-commission cleaned, if corrosion is either taking place or is likely to occur, if the system should be power flushed, and whether it has been treated with the correct level of inhibitor.

The kit comprises six tests:

pH (acidity / alkalinity)

The pH of the water is an indication of how acid or alkaline it is. The scale runs from 0 (acid) through 7 (neutral) to 14 (alkaline).

Corrosion rates in ferrous metals and copper increase rapidly with pH below 6, or above 9.5.

Aluminium heat exchangers and radiators are affected if the pH is below 6, or above 8.5.

Dissolved iron

A test reading of just 1 mg/l above that of the mains water is an indication that corrosion is already taking place (even though water drawn from the top of a radiator may appear clear).

After flushing a dissolved iron level check can ensure that all flushing chemical has been removed. If chemical is still present the level will be higher than the mains water.

Dissolved copper

A level of 1 mg/l or more indicates corrosion problems, and is associated with excessive use of flux when installing or repairing the system, indicating an inadequate pre-commission cleanse.

Only low levels are usually recorded as the copper in solution tends to plate out onto steel and aluminium surfaces, causing localised wasting (at ca 0.5 to 1 mg/l), and pinholing at higher levels (above 1.0 mg/l).

Total hardness

More than 60% of Britain, by area, has water classified as hard, expressed as more than 200mg/l calcium carbonate.

The harder the water, the more prone heat exchangers are to scaling up. Whilst soft water (less than 100mg/l calcium carbonate) tends to be more corrosive to metals used in heating systems.

If the hardness in the system water is less than that in the main water it is probable that scaling has already occurred. Even if hardness levels are apparently similar scaling may have occurred if the system has been frequently drained and refilled, or if a leak has led to the ingress of fresh water.

Soft water (less than 2 mg/l) produced by a water softener should not be used in central heating as it is more aggressive than natural soft water, particularly to aluminium.

Chloride level

Most mains water supplies contain some chlorides varying from 20 up to 100 mg/l. Chloride levels significantly above the mains level (more than 25 mg/l or 50%) can cause pitting and corrosion of mild steel, particularly in areas of high stress such as bends and welds, and will reduce the performance of corrosion inhibitors. High chloride levels are indicative of flux contamination and the lack of pre-commission cleaning.

Inhibitor concentration

It is important to check the correct level of corrosion inhibitor in a system to ensure long term protection against internal corrosion, sludge formation, scale deposition, and boiler noise.

The Systemsafe-DM test kit is used to check the correct level of Kamco inhibitor. The test measures the molybdate content within the system.

The optimum molybdate level for Systemsafe-DM (0.5% dose) is 100ppm.

If an existing system still contains the original Kamco Systemsafe-DM at 1% dose then it is 330ppm.

A higher value is not detrimental, but if the test indicates under-dosing then the level should be brought up to the optimum by the further addition of Systemsafe-DM (concentrate).

All tests come complete with full instructions.

ADDITIONAL WATER TREATMENT CHEMICALS

The following chemicals have specialist applications for cleansing or protection.

SYSTEM PRE-CLEAN Pre-commissioning cleaner.

Essential treatment for new and modified heating systems, to eliminate and neutralise installation debris, corrosive flux residues, oil and grease.

Add to the system and operate the system for at least one hour, with all the radiator valves open. Heat will improve the efficiency.

Drain the system thoroughly prior to refilling, adding Kamco SystemSafe-DM inhibitor for long term protection.

Application: 500ml per 100 litre heating system capacity (typical 10 radiators).

SYSTEMHUSH The solution for 'kettling' and boiler noises.

Added to the system water to stop boiler noises and 'kettling'. SystemHush removes baked on corrosion and light scale from boilers and heat exchangers during normal operation, and may be left in the system.

System-Hush commences working immediately, but may take 2-3 weeks for full effect. It may be left in the system with the addition of Systemsafe-DM inhibitor.

Application: 500ml per 100 litre heating system capacity (typical 10 radiators).

SYSTEMSEAL Leak sealer for heating systems.

A simple and economical solution for curing minor leaks in heating systems.

SystemSeal finds and penetrates leaks. The presence of air causes the polymer to set into a flexible seal, preventing further loss of water. Most leaks will be cured within 24 hours. It may be left in the system but must be used in association with SystemSafe-DM inhibitor to prevent further scaling or corrosion.

Application: 500ml per 100 litre heating system capacity (typical 10/12 radiators).

FREEZBREAKER-LT Non-toxic antifreeze for heating systems.

Antifreeze additive to protect heating and cooling systems down to -32°C .

Compatible with all Kamco water treatment products, and suitable for all materials commonly used in heating systems, including aluminium.

Use in association with SystemSafe-DM inhibitor.

25% solution provides protection down to -12°C .

33% solution provides protection down to -17°C .

50% solution provides protection down to -32°C .

SYSTEMSAFE-BIO Biocide and fungicide for heating systems

A stabilised blend containing a broad-spectrum biocide for the removal and elimination of bacteria and fungal matter in hot water and chilled water systems.

Ideal for cleaning and treating under-floor and low temperature heating systems which are prone to bacterial contamination.

Application: 250ml per 100 litre heating system capacity (typical 10/12 radiators).

SECTION G – HOW TO CONTACT KAMCO

HELP LINE Contact our help line on 01727 875020. Monday to Friday 8.30am to 4.30pm.

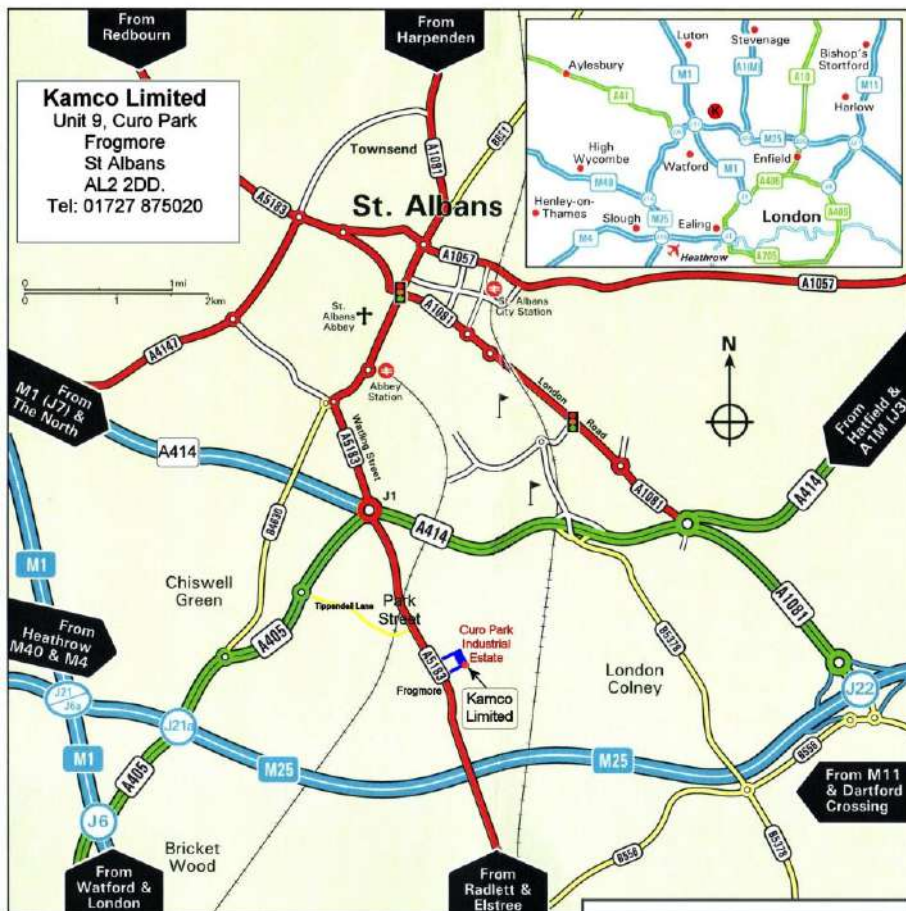
E - MAIL info@kamco.co.uk

TWITTER @KamcoPF

WEBSITE www.kamco.co.uk

Log on to our web site for complete details of our full product range, latest product developments, operational instructions, chemical information, stockists etc.

ROAD Kamco Ltd
Curo Park, Frogmore (the A5183), St. Albans, Herts, AL2 2DD.



Location: Curo Park, Frogmore is located 1 mile south of the “Park Street” roundabout on the A5183 from St Albans to Radlett.

From the North: Curo Park is located on the left-hand side of the A5183. The main access road is shared with the entrance to Park Industrial Estate. Drive along the approach road for 250 metres, bear right, and look for our building on the right at the end.

From the South: Curo Park is located on the right-hand side of the A5183. There is a secondary access road 50 metres after Trinity church, between the new houses. Drive along the approach road for 200 metres. We are the last building on the left.

SECTION H – WARRANTY

All pumps are tested at point of manufacture in Kamco's own works in St Albans, to ensure each unit performs to expected standards.

All pumps are guaranteed against faulty materials or workmanship for **24 months** from the date of purchase, and the guarantee will be validated by the completion and return of the 'guarantee card' supplied with the pump. Should defects due to faulty material or workmanship develop within 24 months the Company will repair, or at its own option replace, any defective mechanical or electrical part thereof, if the pump is returned, carriage paid to the Company. Any replacement parts used will be new and warranted for the remainder of the original warranty, or thirty days from the date of shipment of such parts, whichever is the longer.

This is a UK warranty. Separate conditions apply to exported pumps.

Warranties are not transferable**In the event of a breakdown**

If it is thought that a pump is not working it is important to test it disconnected from the heating system to ensure that any problem experienced is a pump issue rather than an issue with the heating system.

Before contacting Kamco please undertake the test detailed on 'page E.2' of this manual to eliminate potential problems.

When contacting Kamco please have available:

1. Model type, and serial number (on switch box).
2. Clear and concise details of the fault.

Warranty Claims

Any warranty claim must be reported direct to Kamco, and can not be authorised by anyone other than Kamco.

Inclusions

When a warranty claim is valid Kamco will at its discretion either repair or replace the defective parts, including labour required to complete the work. This will include shipping the unit back to the client.

Warranty validation

The warranty remains valid providing the unit has not been serviced, repaired, taken apart or tampered with by any person not authorised by Kamco.

Exclusions

1. Faults caused by misuse, neglect, careless handling or incorrect use.
2. Physical damage.
3. Defects arising from incorrect application, use with water containing debris or material not normally found within heating systems, or with chemicals other than water-based ones.
4. Faults caused by connection to an unsuitable electricity supply.
5. Failure as a result of fair wear and tear.
6. Damage caused by running the pump at sustained temperatures above 75°C.
7. Damage caused by freezing.
8. The cost of removing, returning, and refitting the pump, or any secondary losses arising from the failure.

In the event a pump is returned to Kamco during the warranty period, and no fault or performance problem is found, or the problem is found not to be valid under the terms of the warranty, then all work and transportation costs will be chargeable.

In this instance the client will be informed, and approvals sought, before any repairs are carried out.

Safeguarding your warranty

We strongly advise all users to familiarise themselves with the operating instructions on the correct and safe use of the equipment.

Flush the unit through with clean water after use, and empty the tank and hoses of water.

Store the unit in a dry frost-free location.

Safeguard against bottle caps, security seals, and other objects falling into the tank when pouring chemicals through the filler cap.



Kamco Ltd

Curo Park, Frogmore, Park Street,
St. Albans, Hertfordshire, AL2 2DD

Tel: 01727 875020

E-mail: info@kamco.co.uk

Additional information may be obtained from our website:
www.kamco.co.uk