

### 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 cm<sup>2</sup>

Max. iron oxide capacity: 2.1 kg dry magnetite

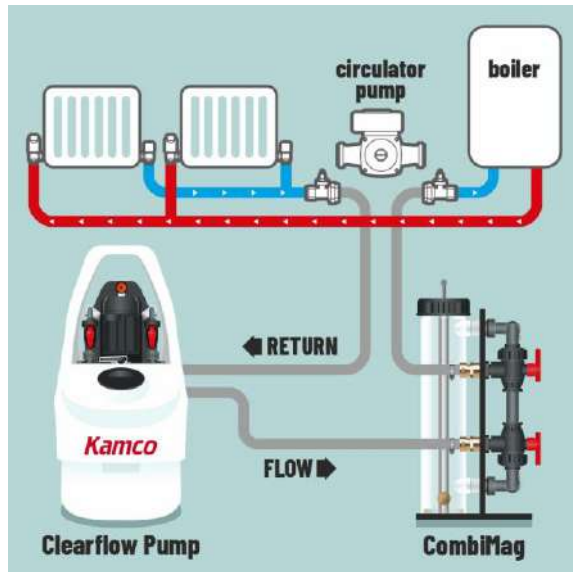
Weight of unit: 4.95 kg

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 <sup>2</sup>
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  $-32^{\circ}\text{C}$ .

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  $-12^{\circ}\text{C}$ .

33% solution provides protection down to  $-17^{\circ}\text{C}$ .

50% solution provides protection down to  $-32^{\circ}\text{C}$ .

**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).