

FERNOX
MAKES WATER WORK



Powerflow flushing Pump

Instruction Manual

Issue 4.2/ 0703

OEEG

Fernox Powerflow flushing pump

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Fernox Powerflow flushing pump

PRODUCT SPECIFICATION

The Fernox Powerflow flushing pump has been designed to enable domestic central heating systems to be effectively and speedily cleaned. Systems over about 200 litres volume (20 single radiators) should be flushed by zoning off sections. The unit is compatible with all Fernox cleaning agents and Protectors. Use of Fernox cleaning agents is vital to the overall effectiveness of flushing with a Powerflow pump.

The Fernox Powerflow flushing pump features quality materials and components from leading manufacturers, including a Grundfos stainless steel pump, which combined with a comprehensive specification means that the Fernox Powerflow offers unparalleled flushing performance and reliability.



Product Features

The Fernox Powerflow flushing pump specification includes:

- 370W multi-stage Grundfos pump in 316 grade stainless steel
- Pump flow rate up to 80 litres/min at a maximum pressure of 2.3 bar.
- 85°C maximum operating temperature
- Reversible flow with unique discharge from return in both directions of flow
- 35 litre translucent tank with max / min level marks
- Fully acid resistant materials (Polypropylene and 316 stainless steel)
- ¾" flow, return, dump and overflow hoses for optimum flow rates
- CE marked pump
- 1 year return to base warranty

Safety information

The Fernox Powerflow unit weighs 21kg empty so it is easily transported. The maximum weight of unit when in use is 56kg. The unit is fitted with casters for mobility with a total load capability of more than twice the maximum operating weight. The total weight of the hoses and elbows is an additional 12kg.

The Fernox Powerflow pump should always be connected to the electrical supply via Residual Current Device (RCD).

The Fernox Powerflow pump is designed to operate safely at full system temperature of 85°C without the operator coming into direct contact with the hot water, thus preventing any risk of scalding. High temperature cleaning has been shown to give significantly enhanced cleaning performance.

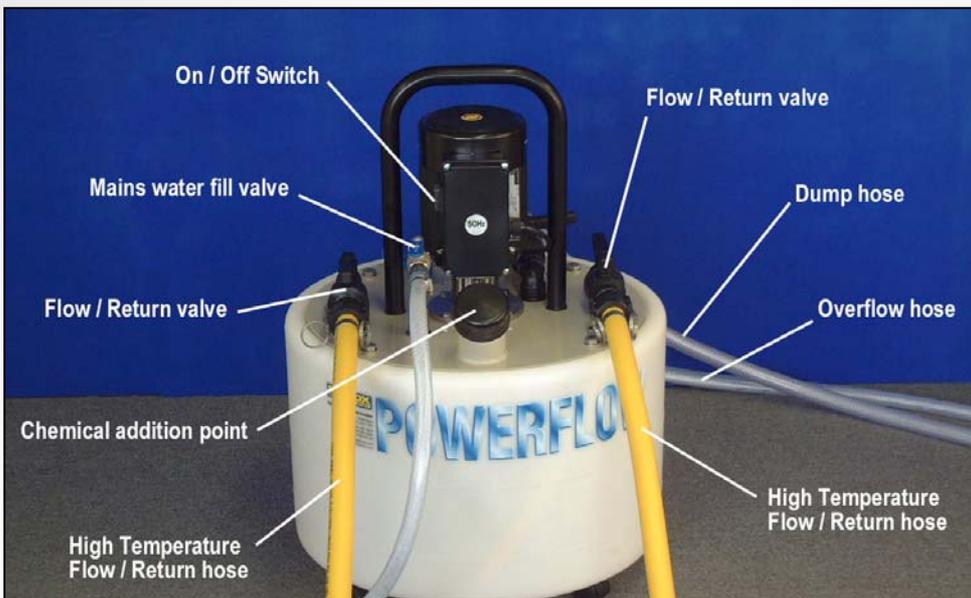
Fernox Powerflow flushing pump

UNPACKING AND ASSEMBLY

The Fernox Powerflow unit is supplied fully assembled and ready to use! Please retain the outer carton, you will need it to return the machine for service or repair.

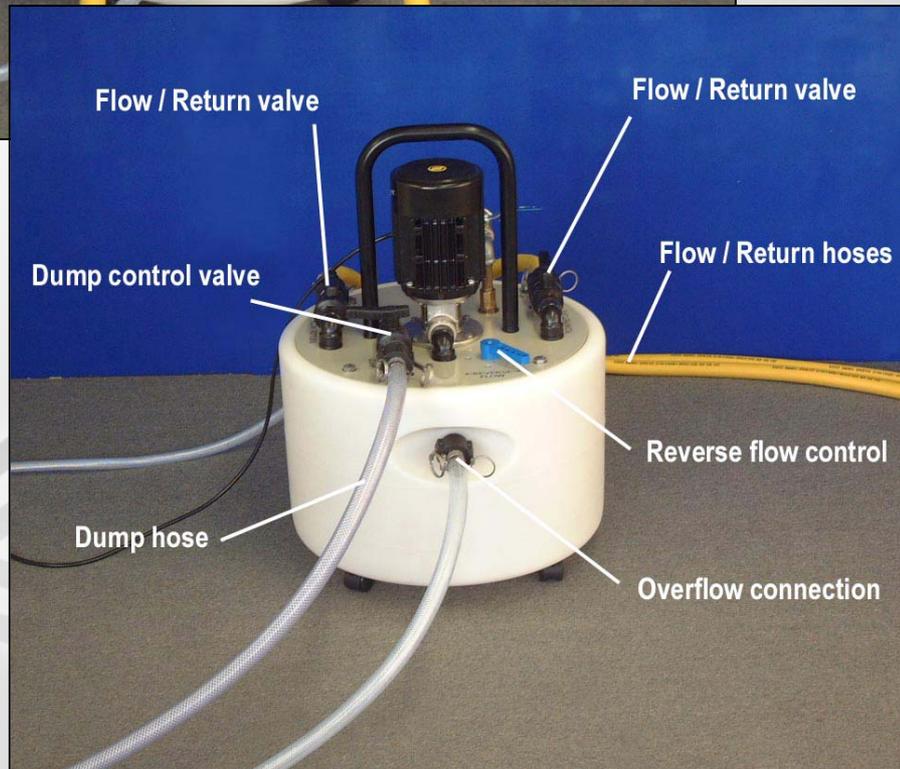
Please read the instructions carefully even if you have used other power flushing machines before. The accompanying photograph shows how the Fernox Powerflow is configured for use.

General arrangement photographs:



1. Flow/return, mains fill and chemical addition point

2. Reverse flow valve, dump valve and overflow connection



Fernox Powerflow flushing pump

Description of items labelled on the general arrangement photographs

- **On/Off switch** - The switch is integral with the pump motor control box. The mains plug is fused to 5 amps. The Fernox Powerflow pump should always be connected to the mains via Residual Current Device (RCD).
- **Mains hose and valve** - A ½" clear hose is provided for the mains water connection. This is supplied with a ¾" connection to fit a ¾" male outside tap thread and a ½" female connection to attach at the Powerflow flushing unit. A ½" quarter turn plated brass ball valve provides fill control and a double check valve is fitted for back flow protection.
- **Flow/Return valves and hoses** - Two ¾" flow and return isolating valves are provided on either side of the machine. Valves open by turning anti-clockwise when viewed from above. The coloured high temperature hoses to ISO 2398 are supplied for flow and return hoses connections between the heating system and the Powerflow flushing pump. System connection is by detachable elbows on the flow and return hoses that are designed to fit onto 1 ½" circulator unions at normal 130mm centres. Connection to the Powerflow unit is by acid resistant ¾" quick-release Camlock connectors.



- **Dump/Overflow Hoses and Dump valve** - Two ¾" clear hoses are provided for dump and overflow connections. The dump and overflow hoses are identical and interchangeable. There is no fitting on the outlet end of the dump/overflow hoses. The discharge must always be put to foul drain. Ensure the overflow discharge point is lower than the maximum water level in the Powerflow tank. Ensure the dump discharge point is not greater than 1 metre above the pump.



Powerflow unit after use.

- When the Dump valve is opened (turn anti-clockwise viewed from above) during circulation, up to 80% of the returning water will be directed to drain. The machine always dumps from the return regardless of the direction of the reverse flow lever.
- A safety overflow is provided to prevent overfilling/spillage. The overflow is also used to empty any residual water from the

Fernox Powerflow flushing pump

- **Reverse Flow Valve** - The direction of circulation around the system can be reversed by means of the reverse flow valve. The position of the valve lever indicates direction of flow, i.e., lever to the right, flow from the right hand flow connection, return to the left hand side. Changing flow direction does not affect dumping as the Powerflow always dumps from the system return (see schematic). Note that reverse flow is not possible on systems fitted with non-return valves in the pipework or boiler, or with some older types of TRV.

NOTE: The reverse flow valve is designed to allow some passage of water across the valve in order to prevent over pressurising the system when a complete blockage is encountered. This means that with both the flow and return valves shut, some water will still be pumped from the dump when open and the pump is running. With the reverse valve mid-feather, the tank can be quickly emptied at the end of a clean.

- **Chemical addition** - This is made via the 2" dia. inlet point with cap.
- **Camlock Hose connectors** - The Fernox Powerflow utilises Camlock connectors for flow, return dump and overflow hoses. These connectors will not normally work loose during use, However, where additional security is required, the Camlock handles may be secured together using standard electrical cable ties for the duration of the clean.

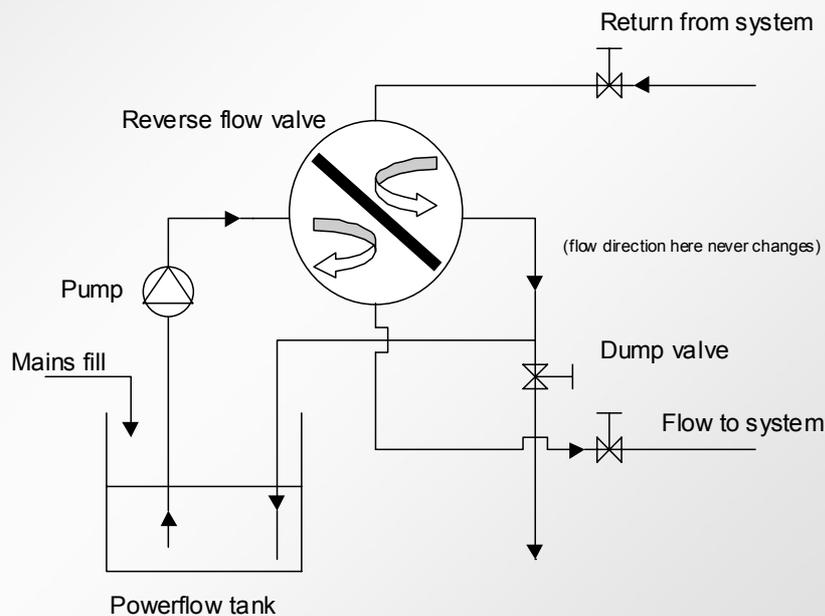


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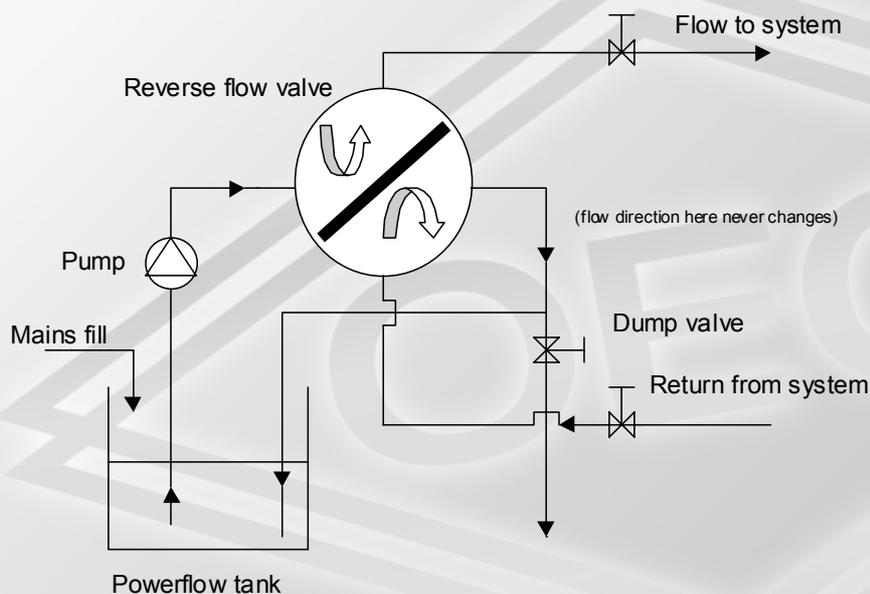
PRINCIPLES OF OPERATION

- The schematic diagrams below show internal connections within the Powerflow with particular reference to operation of the reverse flow valve. The valve design ensures that water is always dumped from the return, regardless of the direction of flow around the system. Dual dump valves, as supplied on some competitor's machines, are not required.

Powerflow flushing pump - normal direction of circulation



Powerflow flushing pump - reverse direction of circulation



Fernox Powerflow flushing pump

SETTING UP THE SYSTEM

1. Preliminary steps

Identify symptoms that may indicate that the system is contaminated with sludge. i.e., cold radiators, cold spots on radiators or blockages in pipe work. Please refer to the enclosed Fernox technical data sheets, which illustrate how sludge causes circulation problems within systems. A high iron concentration, dirty system water or an acidic pH (see Fernox Water Test Kit) may also indicate that the system needs cleaning.

Cleaning will be enhanced if Fernox Heavy Duty Restorer or Superconcentrate Restorer is added before flushing the system. Alternatively, by using Fernox Superconcentrate System Cleaner & Neutraliser at full system operating temperature in the Fast-Clean™ process will allow rapid cleaning to be carried out within half a day, provided that the system is sound.

The Fernox Powerflow pump has been tested with all Fernox products. The warranty will be invalid if damage results from the use of any product other than those from the Fernox range.

2. Before starting

Turn off all electrical controls and electrically isolate the system.

Ensure that all radiator wheel head and lockshield valves are fully open. Make a note of the position of lockshield valves (number of turns to open) so that the system balance can be reset after cleaning. Check that all thermostatic radiator valve (TRV) heads are either set to maximum, or removed and that all zone valves and three port valves are locked open.

Any anti-gravity valves should be bridged, by-passed or temporarily removed.

Cap off, or temporarily link together, the cold feed supply and open vent of open vented systems. If the system is fitted with a Primatic or similar single feed cylinder, the flow and return to the cylinder must be either capped or temporarily joined together. Thermal store cylinders must also be isolated prior to power flushing. No alterations are required for sealed pressurized systems.

Refer also to later section "Consideration of system design".

3. Connections

Decide on the best position to locate and connect the Fernox Powerflow flushing pump to the system. This will vary depending on the system to be flushed and availability of suitable connection points.

Fernox Powerflow flushing pump

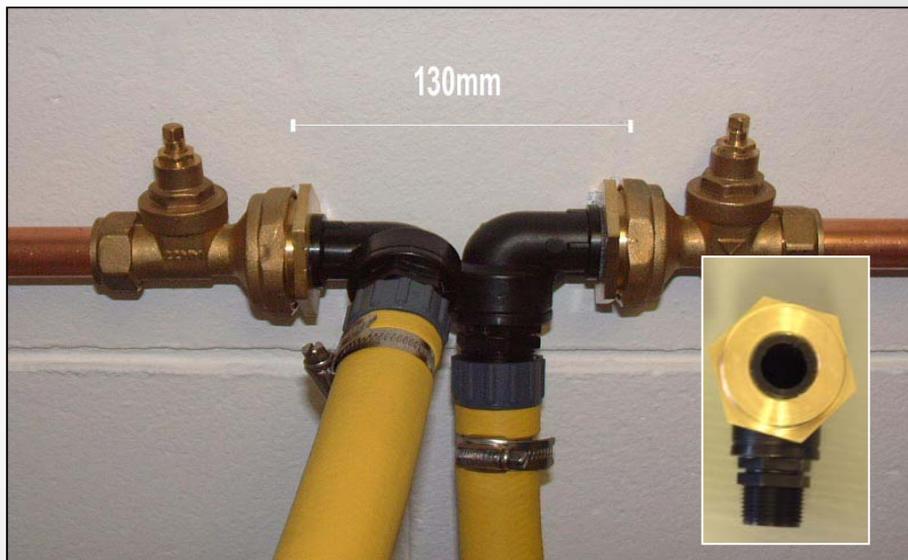
The unit should be located within easy reach of a suitable drain, or waste, and near to a convenient mains cold water supply. The dump discharge must not be more than 1 metre above the pump whilst the overflow discharge hose should be arranged to ensure that there is a continuous fall along its length. Do not site the machine so that dump water has to be pumped upwards, for example out of a cellar. The System flow and return hoses are 4 metres in length. Additional 4m extension flow and return hoses are available.

Always employ best practice protecting customer's property for wet works. Stand the Powerflow flushing pump on a waterproof sheet or in a bund tray during use.

Check the condition of all hose and connections for damage prior to commencing every job, especially when using the machine at high temperature. The Fernox Powerflow pump is designed to operate safely at full system temperature of 85°C and be used without the operator coming into direct contact with the hot water, thus preventing any risk of scalding.

Connect the Fernox Powerflow flushing pump to the system using one of the following options (in order of preference for efficient cleaning):

1. Across the pump connections after removal of the domestic circulator using the adapters provided (see photograph below).



2. Across the flow and return pipes at the boiler once the boiler has been removed or isolated. Attach temporary earth bonds where required.
3. Across a radiator. (Use only if no alternative connection point is available)

Connect the mains water supply, overflow and dump discharge pipes. Ensure that all isolating valves are closed. Check for leaks before proceeding!

Fernox Powerflow flushing pump

OPERATING PROCEDURE - POWER FLUSHING

1. Basic Operation - FILLING & CIRCULATING

Fill the unit with water to approximately half way between the indicated maximum and minimum fill levels.

Open the pump isolating valves and the flow/return isolating valves on the Powerflow unit, but ensure that the dump valve on the Powerflow is closed! Switch on the pump. Ensure that the liquid level on the tank remains above the minimum mark. Add more water if necessary. Do not run the pump dry. Check all connections for leaks.

NOTE: Although the pump is self-priming, when first starting the unit it is advantageous to turn on the pump whilst the flow valve is still closed. Open the flow valve after about 60 seconds.

NOTE: Occasional noise may be heard from the pump during operation due to the presence of entrained gas or air, especially when circulating cleaner. Air entrapment may very rarely result in a trace of discharge water from the seal on the pump shaft above the top-plate. This is not detrimental to the Powerflow pump and will stop when the system is de-gassed.

Allow the pump to run for ten to fifteen minutes, reversing the direction of flow approximately every three minutes. This will help to loosen sludge prior to flushing.

2. General flushing procedure - prior visit to add cleaner

The following sequence of flushing can be applied to most installations:

- Add Fernox cleaning agent (as per product instructions) before flushing.
- Circulate for the duration indicated in the cleaner instructions.
- Purge system (see next section) to remove cleaner.
- Dynamic flush to remove sludge (see next section).
- Disconnect the Powerflow flushing pump and re-commission the system.
- Add the desired Fernox Protector.

3. Alternative flushing procedure - single visit

Where it has not been possible to add cleaning agent before the flushing visit, the following procedure may be adopted:

- Purge system as per (1) above.
- Clean system by the Fast-Clean™ method (see next section)
- Neutralize and Purge to remove cleaner.
- Dynamic flush to remove sludge.
- Disconnect the Powerflow flushing pump and re-commission the system.
- Add the desired Fernox Protector.

Fernox Powerflow flushing pump

POWER FLUSHING PROCESSES IN DETAIL

There are several methods that can be employed to flush systems. The most appropriate method is often dependent on the characteristics of the system being flushed. A combination of the techniques listed below is usually employed.

1. Purging - used to remove old inhibitors and cleansers

- Purging introduces fresh water and pumps it through the entire system. The system is kept filled during purging and virtually no water is re-circulated back to the Powerflow flushing pump after passing through the radiators.
- Purging is used to rapidly remove old inhibitor and cleaning agents but is not so effective at removing sludge (see Dynamic Flushing).

During the purging procedure all radiators in the system should be fully open and the dump must be discharged to foul drain. Turn on the Powerflow flushing pump and open the mains water inlet valve fully. At the same time, open the dump valve and adjust to maintain a constant level of water in the tank. If the water level cannot be maintained with the mains water full on, reduce the dump rate by partially closing the dump valve. If the water level rises, reduce the mains water inlet rate.

Note the direction of the reverse flow valve relative to the system flow/return and set to normal flow direction for the system initially. Reverse flow direction every 3-5 minutes during purging if possible.

Monitor the discharge at the drain and continue purging until the water runs clean. Use a Fernox TDS meter to check the cleanliness of the rinse water.

At the end of the process, close the dump and mains valves. Circulate, top up with water and vent as necessary to refill the system.

2. Restorer cleaning - mild and safe cleaning for old systems

- Restorer cleaning uses the Powerflow pump to flush out a Fernox Restorer cleanser that has been added previously and allowed to circulate under normal load conditions, or for mild cleaning on very old systems.
- Use Restorer to chemically clean systems where it is convenient to add a Fernox Restorer cleaning agent at the time the system is surveyed. Circulate for a minimum of one hour hot.

Begin with the system still filled and treated with a Fernox Restorer and the Powerflow flushing pump connected. Open the system flow/ return connections and circulate. The boiler may be switched on, using the Powerflow flushing pump to circulate the system. Ensure that the electrical

Fernox Powerflow flushing pump

connections to the central heating circulator (removed) are made safe before running the boiler.

Circulate the cleaning agent for 5-10 minutes. All radiators and zone valves should be fully open at this stage.

After circulation, purge and then dynamic flush to remove first the cleaner, then the sludge as described in sections 1 (above) and 4 (below).

3. Fast-Clean™ - using Fernox Superconcentrate System Cleaner

The unique Fernox Fast-Clean™ process may be used to clean systems known to be in sound condition with one visit to site in just a few hours. Fast-Clean™ comprises of the following elements:

- The Powerflow pump is used to circulate Fernox Superconcentrate System Cleaner for a short period of about 1 hour, with the boiler running, so that the clean can be completed in just one visit to site. The householder's risk from contact with chemicals is thus reduced as a skilled heating engineer is on site throughout the cleaning process.
- Fernox Superconcentrate System Neutraliser is used to ensure compliance with water Regulations with respect to the pH of the effluent.
- Dynamic flushing removes both sludge and dissolved scale deposits.
- Cleaning at temperatures up to 85°C is used during the Fast-Clean™ process. All cleaners need to be circulated hot, but high temperature is a key element in increasing the speed and efficiency of the power flushing operation - the rate of cleaning doubles for every 10°C rise in temperature!
- Finally, the Fernox TDS meter is used to monitor flushing and reduce time on site whilst ensuring a thorough job is done.

With the system filled and the Powerflow flushing pump connected, add Fernox Superconcentrate System Cleaner via the dosing point on the pump. Open the system flow/ return connections and circulate. The boiler may be switched on, using the Powerflow flushing pump to circulate the system water. Ensure that the electrical connections to the central heating circulator (if removed) are made safe first.

Circulate the cleaning agent for 1-2 hours at up to 85°C temperature throughout the system. Reverse the direction of flow periodically. All radiators and zone valves should be fully open.

After circulation, neutralize the System Cleaner before draining by adding a similar quantity of Fernox Superconcentrate System Neutraliser. When the colour changes from red to green, purge (see 1) the neutralized cleaner from the system and dynamic flush (see 4) to remove sludge as described next.

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4. Dynamic balanced flushing - the prime means of sludge removal

- Dynamic balanced flushing differs from purging only in that it maintains maximum flow through one specific part of the system at a time.
- This is the most effective method for removing corrosion sludge after cleaning as it maintains a high circulation velocity to keep sludge in suspension. The process is best carried out following removal of the bulk of the cleaning agents by purging (see 1).
- Particularly effective on drop feed radiators and microbore systems.

Shut off all except one or two of the radiators on the system. With the system filled and the Powerflow pump running, circulate and reverse flow direction ever 1-2 minutes. Slightly open both the dump valve and the mains inlet valve. The dump must be discharged to foul drain. Gradually open the dump valve further, balancing the water lost by increasing the flow from the mains inlet as for the Purging procedure. Aim for the maximum discharge rate that can be made up by the mains supply available. Continue to circulate with the pump throughout this process. The fill and dump rate may need to be re-balanced when the flow is reversed due to differences in system resistance in each direction of flow.

Monitor the discharge at the drain and continue flushing until the water runs clean. This will probably take 3-5 minutes. When the discharge appears to be clean, re-open the one or two of the radiators that were previously closed off, then close those that were previously open. Check with a Fernox TDS meter that the water is completely clean.

Repeat the Dynamic flushing process for all radiators, zones and other parts of the system. Radiators further from the boiler on long pipe runs, and radiators on drops will require longer to flush than those close to the boiler. This should result in the total volume of flushing water used for the clean being about 5-10 times the total system volume.

5. Adding inhibitor and leaving the system

After disconnecting the Fernox Powerflow flushing pump and re-commissioning the system, the system may need to be re-balanced. Once satisfactory operation is achieved, the system should be dosed with an appropriate Fernox Protector and/or antifreeze.

Add Protector via a radiator either using the Superconcentrate system or the Fernox Injector bottle. Alternatively introduce via the Feed and Expansion cistern. Circulate the Protector for 15 minutes, this will ensure it is fully dispersed throughout the system. Check the Protector strength using a Fernox Inhibitor Test Kit.

Re-set controls and test run the system.

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POWER FLUSHING - CONSIDERATION OF SYSTEM DESIGN

1. Temperature - safe operation

The Fernox Powerflow flushing pump is designed to work safely at full system temperature of 85°C. For the safety of both you the operator and of by-standers, it is important to ensure that all hoses and connections are in good order prior to operating the pump at full system temperature. Provided these precautions are taken, there will be no risk of scalding from use of the machine. Cold water may be added at any time to reduce the temperature in the tank/ system.

2. Primatic cylinders

Primatic and other forms of single feed indirect cylinder, designed to BS 1566 Part 2, should be disconnected/isolated before flushing as the pressure created by the unit can blow the air bubble in the cylinder. It is contrary to Water Regulations to add chemicals to the primary side of single feed systems.

3. Thermal Store Cylinders

Most types of thermal store cylinder are not designed to operate at pressures over approximately 0.5 bar. This means that they must be isolated before power flushing with the Fernox Powerflow unit - maximum pressure is 2.3 bar.

4. Pipe work and system design

The maximum flow rate through a pipe at a given pressure varies depending on its diameter and resistance due to its length. Where non-return valves have been fitted to systems, these will need to be removed if reverse flushing is to be achieved. Otherwise flush only in the normal flow direction.

Microbore piping reduces overall flow rates significantly so particular care may be needed to ensure that all parts of a microbore system are adequately flushed. Single pipe systems may be flushed using the Fernox Powerflow flushing pump but the results will be much less satisfactory than with two-pipe construction. Greater reliance needs to be placed on the effectiveness of any cleaning agent used to ensure a reasonable end result - use Fast-Clean™. Underfloor heating systems can be cleaned very effectively by dynamic balanced flushing. Use this method on each individual pipe run in turn, isolating the remaining pipe runs at the manifold. Ensure that the underfloor circuit does not exceed the design temperature (usually 40°C) which could distort the floor surface.

Radiators fitted with double entry valves will only be flushed if the insert tube inside the radiator is in place. This may need to be checked.

5. Flushing large systems

Systems with a volume in excess of 200 litres (about 20 single panel radiators) will need to be divided into zones for cleaning. For example, clean the upstairs and downstairs sections separately.

Fernox Powerflow flushing pump

DESCALING

1. Principles of boiler/heat-exchanger descaling with Fernox DS-3:

Scale is deposited by the action of heat. It can be re-dissolved with acid descaling agents giving off gas as a by-product of the reaction. The gas produced during descaling is carbon dioxide and is a non-toxic. Gas is produced in the form of bubbles that may be observed in the Powerflow return hose. When gassing ceases, this is a good indication that either: (1) the descaling agent is exhausted, in which case more descaler will be required, or (2) the boiler is clean and all the limescale has been dissolved!

Fernox DS-3 contains pH indicator that changes colour when the product is exhausted to give a further indication of the progress of the cleaning operation and to aid neutralisation with Fernox System Neutraliser.

2. Method statement:

1. It is NOT normally necessary to remove the boiler/heat-exchanger in order to carry out descaling.
2. Determine the location of the inlet from the boiler/heat-exchanger. Disconnect the inlet and outlet from the boiler/heat-exchanger. The residual water in the adjacent pipework will need to be drained at this point.
3. Fit up the main flow and return hoses on the Powerflow unit with appropriate size adapter fittings if required. The mains fill and dump assemblies are used only to neutralise and rinse out the appliance after descaling. Test Flow and return for fit to boiler before final assembly.
4. Connect the Powerflow to the boiler. Orientation of the hoses is not important as the direction of flow can be reversed from the Powerflow pump.
5. Fill the Powerflow with water to midway between the Max. and Min. marks, then add 2kg of pre-dissolved Fernox DS-3 descaling agent in accordance with the manufacturer's recommendations.
6. Begin circulating the DS-3 solution. Descaling a boiler/heat-exchanger will take approximately 1-2 hours, depending on the severity of scaling. Reversal of flow at about 10-minute intervals is often beneficial.
7. When satisfied that the boiler is clean, add approximately 1.5kg of Fernox Superconcentrate System Neutraliser, or add until the colour of the solution just turns greenish-blue. Dynamically flush the heat-exchanger/boiler (See previous section) until the water runs clear. Turn off the Powerflow, allowing any residual water in the HE/ boiler to drain into the unit.

Fernox Powerflow flushing pump

8. Then Disconnect the Powerflow and refit boiler/heat-exchanger connections.

SPECIFIC DESCALING APPLICATIONS

1. Secondary hot water heat-exchangers in combination boilers

The method statement described in section (1) should be followed. The heat exchanger can be cleaned with the boiler in situ. Disconnect the cold water inlet and hot water outlet from the combination boiler and connect on the Powerflow.

It is particularly important to rinse the boiler after cleaning.

2. Thermal store cylinders - secondary hot water

The secondary hot water coil of a thermal store cylinder is susceptible to scaling from limescale deposition in hard water areas. The Powerflow is rated to 85°C. This means that it is NOT necessary to allow the primary bulk water in the thermal store to cool, or be drained, before descaling. The method of descaling is similar to that described previously for combination boilers.

3. Primary side of central heating boilers (Boiler only)

The primary central heating side of a domestic boiler is susceptible to fouling both from limescale deposition in hard water areas and from baked on corrosion sludge. Both these deposits form a hard rock like scale that cannot be flushed out by pressure of water alone. Scaling is one of the primary causes of boiler noise and causes fuel wastage.

Sludge (black or red) is formed by the corrosion of steel radiators and cast iron boilers. Corrosion debris will either be dissolved directly by the descaling agent or released as loose sludge that can be flushed out when any limescale that is present is dissolved.

Limescale is deposited by the action of heat. It can be re-dissolved with acid descaling agents giving off gas as a by-product of the reaction.

Again, the method statement described can be used to descale boilers and remove the contaminants that lead to noise.

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WARRANTY - Return to base

Cookson Electronics warrants to you that the Product will be free from defects in material or workmanship for the period of 1 year from the date of delivery.

During the warranty period Cookson Electronics will correct any defects in material or workmanship at no charge for in-house labour and materials. Any replacement parts used will be new or serviceably used, and are warranted for the remainder of the original warranty, or thirty days from the date of shipment of such parts, whichever is the longer.

You are responsible for returning the parts/products to Cookson Electronics for warranty service and for insuring the shipment.

Terms of warranty

1. Maximum water temperature that can safely be used with this equipment is 85°C.
2. Chemicals that have been tested and approved for use in this unit are those from the Fernox range. Use of any other products will invalidate the warranty.
3. Voltage range is 220-240 volts at 50 Hz.
4. In the event of failure no attempt must be made by the user to dismantle the Powerflow. There are no users serviceable parts.

The warranty is not transferable.

SPARES PARTS

There are no user serviceable parts in the Fernox Powerflow pump. A full repair service is available. Extension and replacement hose sets and pump elbows may be purchased separately.

OTHER FERNOX PRODUCTS

Use of the Fernox Water Test Kit plus the Fernox TDS meter is recommended in conjunction with power flushing. Fernox supply a wide range of chemicals for the heating and plumbing trade, all of which are available through builder's merchants. Please telephone our technical office on 0870 870 0362 for full details.