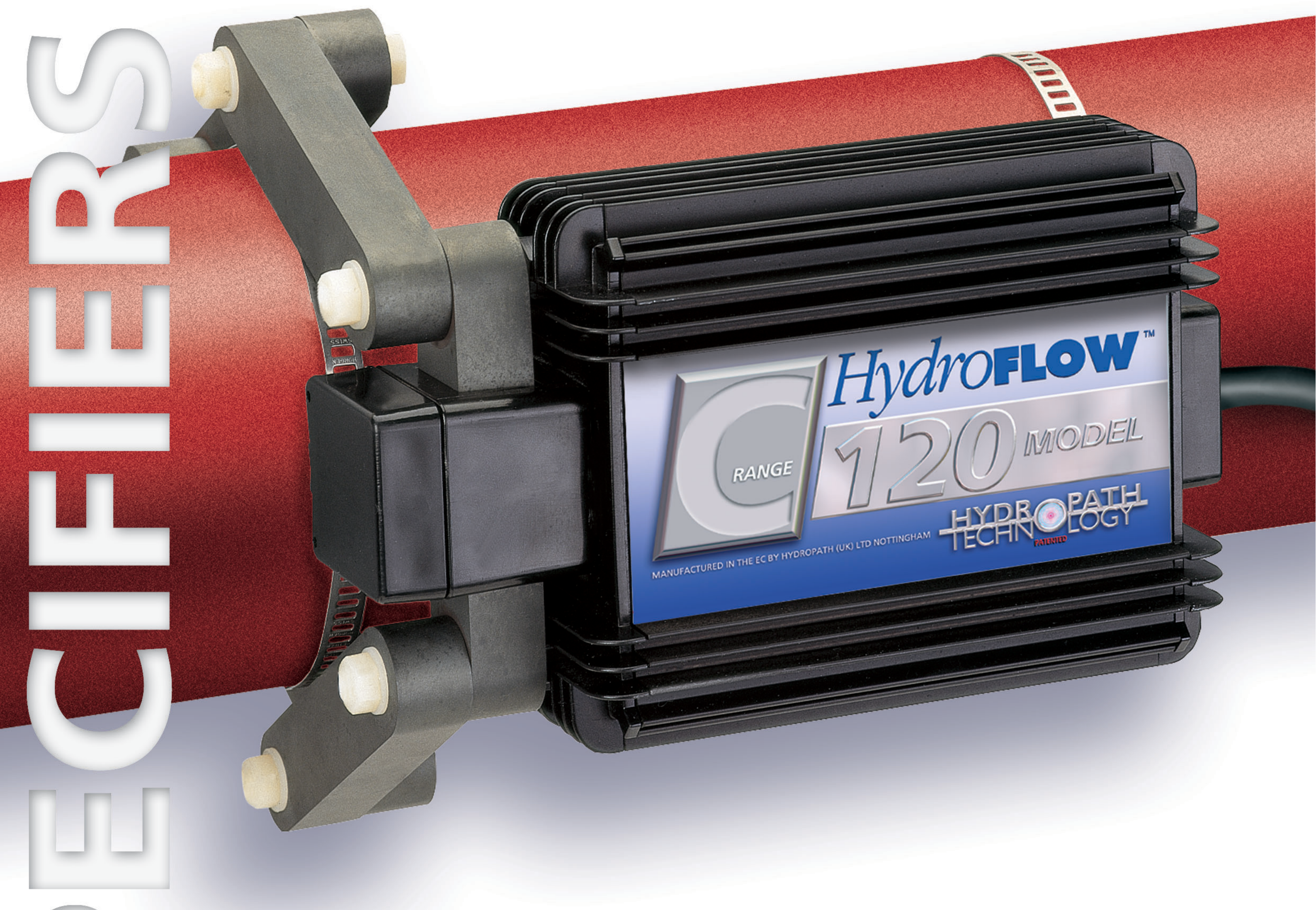
SPECIFIERS GUIDE

HYDROPATH TECHNOLOGY
PATENTED

The Breakthrough in Electronic Water Treatment

ECMI Environmental Controls & Methods Incorporated

SPECIFIER'S GUIDE



MODELS C45 C60 C100 C120 C160

Contents

www.ecmi.us

Unique Technology

A unique and new approach to physical water treatment

The most important feature of the **HYDROPATH TECHNOLOGY** that sets it apart from that of any competing technology, is the efficient manner by which the electric field is directionally generated throughout the entire water system.

This unique advantage protected by international patents singularly delivers consistently beneficial results in industrial, commercial, and domestic applications.

Operation Explained

Most plumbing systems must be regarded as an open circuit from the electrical point of view. It would be impractical and expensive to form a reliable circuit from a domestic or industrial plumbing system whereby an electrical current flows through every section of the plumbing system.

To generate a reasonable flow of electrons in an open circuit conductor, it is necessary to provide a source of high frequency to a conductor that is long enough to generate a standing wave voltage over its length. Fig. 1 shows a sign wave of 200KHz. The wave length is 1500m, the 1/4 wave length is 375m. A domestic plumbing system including the feed pipe, central heating, cold water and hot water is about 60m. If the source is 10V then the standing wave voltage will be [sin((60/375)*90)]*10 = 2.49V between one end of the plumbing system and the other. This voltage difference between the extremities of the plumbing system is caused by a substantial flow of electrons from one end to the other of the system. Fig.2 represents the position at T1 on Fig.1 and Fig.3 represents the position at T2 on Fig.1.

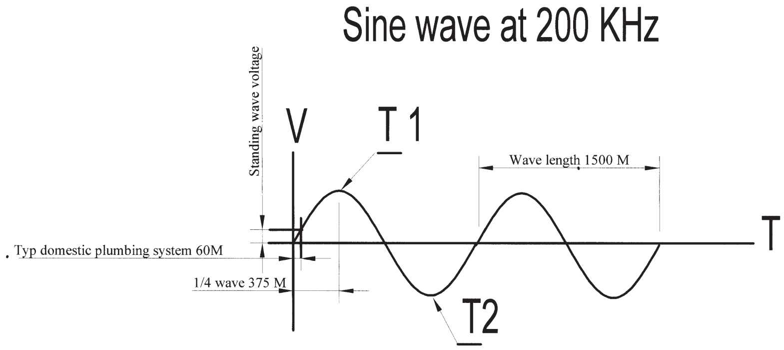


Fig. 1

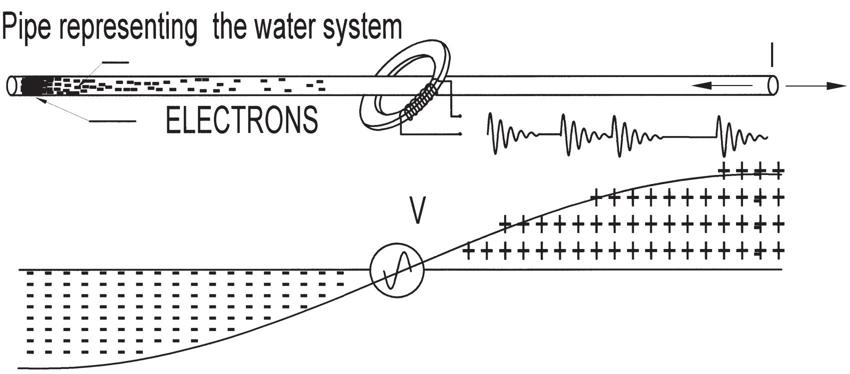


Fig. 2

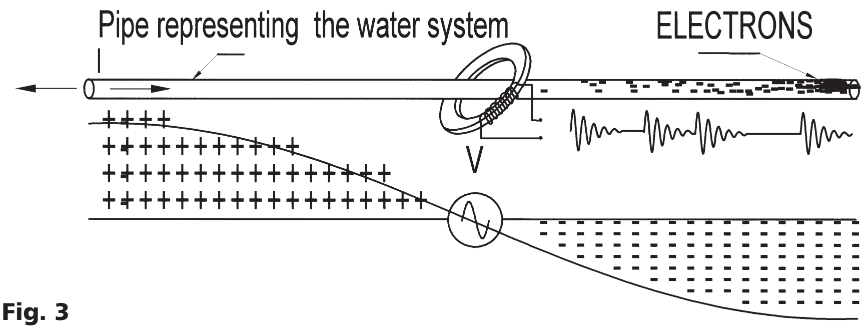


Fig. 3

To achieve this flow of electrons in the plumbing system a voltage must be generated in the water in the direction of the pipe. This is achieved by utilising a high frequency transformer. This transformer consists of a ferrite ring around the water pipe. A primary coil is wound around the ferrite ring. Any conductor, the water and the pipe (if it is a conductive material) will form parallel secondary windings of the transformer. The signal that is fed to the primary coil is a high frequency diminishing wave with random wait periods. This wave is designed to allow the formation of seed crystals for a variety of crystal forming salts that may be present in the water.

Fig.2 and Fig.3 illustrate the diminishing wave and the voltage V over the plumbing system at specific times marked T1 and T2 in Fig.1, as well as the position of the electrons, and the positively charged atoms in the conducting water (and pipe), at maximum voltage position. V is the voltage generated by the ferrite ring and, I is the accelerated charge generated due to the standing wave.

It is this acceleration that forms the electromagnetic field. The electric component is responsible for the generation of nuclear clusters that act as seed crystals to prevent the formation of encrusting scale.

Operational comparison between different water conditioners

	Beneficially treats still water	Treats running water	24 hour system treatment	No plumbing	No maintenance	No corrosion	No chemicals	Environmentally friendly	Consistent	✱ Operates at all temperatures	✷ Whole system treatment
*Hydro*FLOW	●	●	●	●	●	●	●	●	●	●	●
Water softener		●							●	●	
Magnetic		●					●	●			
Electromagnetic		●					●	●			
Single wound wire electronic		●		●	●		●	●			
Double wound wire electronic		●		●	●		●	●			
Electrolytic		●					●	●			
Phosphate dosing		●				●				●	

✱ All normal temperatures 20°C - 98°C in a typical heating system

✷ A voltage of not less than 0.5 volts can be measured throughout the system

The Effect of *Hydro*FLOW on Limescale

Hard Water – the Cause of the Problem

Rainwater is slightly acidic, ie soft. In heavily industrialised regions, emissions make the rainwater more acidic. The hardness in water comes from the calcium and magnesium salts, that are dissolved into the water, from soluble rocks through which the rain water flows. Hard water contains both temporary and permanent hardness. **Temporary** hardness in most cases is associated with calcium and magnesium carbonates and bicarbonates. These crystal forming salts are held in solution and will remain so, unless there is a change in pressure or temperature, which will cause the water to become supersaturated, resulting in the precipitation of encrusting scale on hot or rough surfaces, such as pipes and heat exchangers. **Permanent** hardness is due mainly to calcium and magnesium sulphate and is not effected by heat or pressure change. However if the water is evaporated it will remain and will encrust.

The water hardness problem is sometimes exacerbated by being stored in reservoirs constructed from different materials and is also further exacerbated seasonally as the water table rises and falls resulting in concentrations.

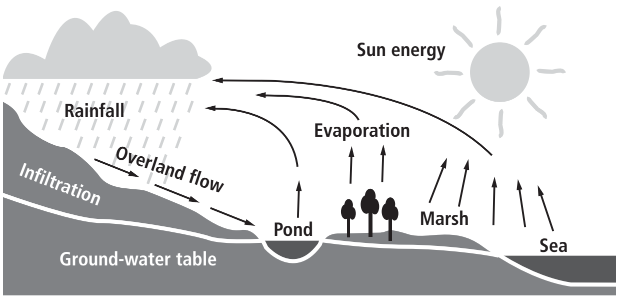


Fig. 1 The Water Cycle

Physical Conditioning

Chemists are concerned with the chemical reaction of elements and compounds that have formed as a result of the reactions. However, to gain an understanding of Physical Conditioners, one has to take into account the physical effects that occur ***before*** the reactions take place. Hence Physical Conditioning.

The Electrochemistry

Stable chemical compounds are normally electrically neutral. When they dissolve in water to form solution, they may separate into oppositely charged particles called ions. This process is known as dissociation and can be partial or complete. Although ions are independent particles, the connection to their opposite is maintained and is re-established following crystallisation. This process of dissociation in water is used widely in industry to separate metals from their compounds, for electroplating and the separating of the elements of water itself, oxygen and hydrogen gases.

Dissolved Solids

The mineral salts found in water can be determined in type and quantity by simple evaporation and weighing the residue. In addition to hardness salts – and by other techniques – sodium chloride, sodium sulphate and silica can be found. These substances do not exist in solution as definite compounds, but as "ions" – charged soluble particles of metal (known as cations) or as acid radicals (know as anions).

The most commonly occurring cations are:

Calcium	Ca^{2+}
Magnesium	Mg^{2+}
Sodium	Na^{+}

The most commonly occurring anions are:

Chloride	Cl^{-}
Sulphate	SO_4^{2-}
Bicarbonate	HCO^{3-}

The negative and positive signs indicate polarity of electron charge. The negative sign indicates electron gain, positive sign electron loss. Contaminants can be grouped according to polarity and magnitude of charge.

Neutrality of Water pH Value

Pure water in its liquid state is also slightly dissociated into its constituent ions.

$$H_2O \longrightarrow \underset{\text{hydrogen ion}}{H^+} + \underset{\text{hydroxyl ion}}{OH^-}$$

This equation suggests that water contains hydrogen ions moving freely within the liquid however a hydrogen atom with one electron removed is simply a proton. It is now recognised that the protons attach themselves to water molecules to form a hydronium ion H_3O^+. For simplicity, H^+ ions will be referred to below, although the physical reality is, that such species do not have an independent existence in water.

Both hydrogen and hydroxyl ions are present in exactly the same quantity, so that pure water is "neutral". In a unit weight of pure water there will be 0.0000001 unit weights of hydrogen ion and of hydroxyl iron, or 10^{-7} parts of each. The pH value – the index of acidity, alkalinity or purity – uses the figure 7 as a neutral or purity point of the scale. Natural pure water is said to have a pH value of 7. $pH = - \log_{10} (H^+)$. (where H^+ is the hydrogen ion concentration).

As hydrogen ion concentration is increased the pH value decreases. As hydroxyl concentration increases the pH value increases.

Acidity is due to hydrogen ions so the more acid the water becomes the lower its pH value, Alkalinity is due to hydroxyl ions so the more alkaline the water becomes, the higher its pH value. This is because acids give hydrogen ions in solution, while alkalines give hydroxyl ions:

$H_2SO_4 \rightarrow 2H^+ + SO_4^{2-}$
sulphuric acid

$NaOH \rightarrow Na^+ + OH^-$
caustic soda

The pH scale covers the range of 0-14, from strongly acid to strongly alkaline.

Crystallisation

Crystallisation normally occurs when a solution becomes supersaturated. A supersaturated solution is one that contains a higher concentration of solute than its equilibrium concentration (saturation). However supersaturation alone is not sufficient for a system to begin to crystallise. It is generally accepted that two steps are involved in the formation of microscopic crystals from supersaturated solutions: First, nuclei, minute crystalline entities of definite size, must be formed (nucleation); and second, these nuclei must grow (crystal growth). There are many other variables which influence the nucleation and growth of crystals such as: the presence of the impurities; turbulence within the system; the nature and state of the surfaces in contact with the solution, etc.

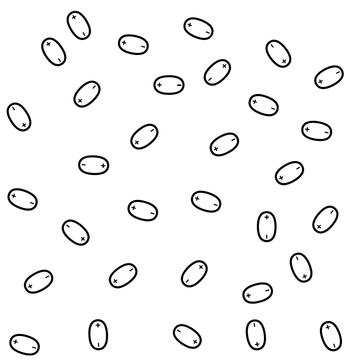


Fig. 2

There are two basic nucleation mechanisms:

- Homogeneous nucleation – where the nucleus is formed spontaneously from the mother solution; and
- Heterogeneous nucleation – where a foreign substance, such as a metal surface or another nucleus, acts as a seed for precipitation.

Any charged species (ions) can be regarded as a dipole and will be attracted to each others opposite pole. Ions are completely dissociated and distributed randomly throughout a solution (see Fig. 2). Ions become associated due to diffusion and electrostatic attraction. This attraction is increased by orientation of the dipoles in an electric field. An electric field is the force field that exists between any concentration of charges. *Hydro***FLOW** can create such concentration of charges throughout the system by creating the **electric field**, as will be described below.

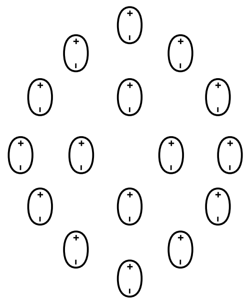


Fig. 3 Nuclear Cluster

*Hydro***FLOW** produces an electric field which is switched on and off. The length of the **off** sequence is randomly controlled. By switching the electric field **off**, adjacent species move together to form clusters (see Fig. 3). These clusters, themselves representing larger dipoles, are affected by the electric field during the **on** sequence, and are joined together to form localised areas of high concentration. The internal forces generated by these larger clusters result in a contraction and concentration of the attraction forces, this causes the collapse of the clusters into nuclei which are the seed crystals.

The presence of the *Hydro***FLOW** electric field throughout the solute will enhance the formation of these large clusters by orientating them, in both the saturated and unsaturated solutions. This process attracts more charged species and stable nuclei are formed (see Fig. 4). The attraction forces of such nuclei become much greater and as ions diffuse to the nuclei surface, a diffusion layer is formed and the ions become incorporated into the crystal lattice. Crystals are formed and grow, again helped by the effect of orientation of the ions by the applied field, and aggregate to form larger crystals. When *Hydro***FLOW** is used, the diffusion is enhanced because the ions are orientated by the electric field being applied. For this process to occur throughout the system, the field has to be present throughout the solution, especially closer to the area where the solution will experience changes in temperature or pressure which are responsible for the precipitation of the salts from solution. When *Hydro***FLOW** is present crystals are formed and grow helped by the orientation of the ions in the applied field. Small crystals aggregate to form larger crystals that grow at the expense of smaller crystals.

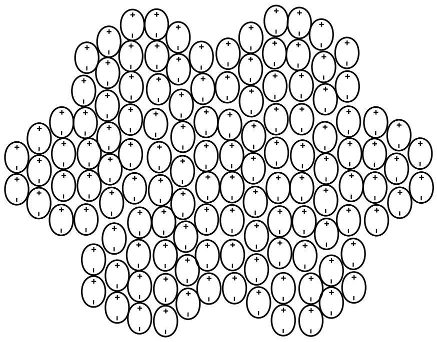


Fig. 4 Crystal Nuclei (Seed)

The energy and time necessary to orientate and move the charged species together, will vary for different species. Any crystallising system is characterised by the generation of a spectrum of differently sized particles. The electric field applied by *Hydro***FLOW** allows for these differences.

Scale Prevention

If hard scale deposits are to be avoided, heterogeneous nucleation has to be minimised and homogeneous nucleation under supersaturation conditions has to be prevented. This can be achieved by the installation of *Hydro***FLOW** that will start the generation of large numbers of nuclear clusters. These clusters will grow and then collapse into nuclei that will act as seed crystals. In the presence of a large quantity of seeds, homogeneous crystallisation can occur in the solution. This will cause the formation of large crystals as soon as the solution approaches super-saturation. Large crystals then grow at the expense of smaller crystals. The bulk of crystallisation will occur in suspension, and heterogeneous crystallisation on the surfaces is thereby minimised.

Any heterogeneous crystallisation that does form on the surfaces, will be such a thin layer that it will be returned to solution, as soon as the solution becomes unsaturated.

To be effective, a physical conditioner has to cause total precipitation of scale for the temperature at which the water is being heated in a heat exchanger. This will prevent the formation of supersaturated water.

If supersaturated water is allowed to form and then flows to other parts of the plumbing system, scaling will occur on surfaces that will be in contact with the supersaturated water. This will continue until normal saturation is achieved.

To prevent supersaturation conditions, a physical conditioner has to produce sufficient seed crystals in the heat exchanger, to ensure that all the crystal forming salts that can precipitate will do so, and form stable crystals in suspension. As the clusters that form the seed crystals are unstable and continually return to solution, the conditioning field has to be present close to and inside the heat exchanger to ensure the formation of the clusters.

HYDROPATH TECHNOLOGY achieves this by efficiently generating large numbers of seed crystals in the saturated and unsaturated water. This process continues all over the plumbing system all the time, and is due entirely to the omnipresent propagating field replacing any seeds that are continuously dissolving back into solution.

Scale Removal

In a scaling system there are three processes that are at work: Heterogeneous crystallisation, homogeneous crystallisation, and scale returning to solution once the solute has become unsaturated.

Heterogeneous crystallisation occurs primarily, on surfaces that are subject to increasing temperatures. As not all the solute is in contact with the heating surface, supersaturated liquid will be carried away by convection and circulating currents to other surfaces. Scaling on other surfaces will continue until saturation point is achieved. Homogeneous crystallisation occurs in large vessels containing high volumes of solute, with a relatively small surface area. As the solute is being heated, the solution becomes supersaturated. The surface area is not sufficient to provide all the nucleation necessary. The solute reaches a critical condition. At this point any source of energy, such as turbulence in the solute, will cause homogeneous nucleation. All the material that can precipitate does so at once. A large number of small crystals are formed. These crystals have a high surface charge that cause them to adhere to all the surfaces, including cold surfaces. The fine crystals which have adhered to the surfaces will then become the nuclei for heterogeneous crystallisation in subsequent heating cycles.

The third process is the return to solution of the scale deposits. After the solute has become unsaturated due to cooling or pressure change, a quantity of the deposits will be returned to solution. The surface scale that had been formed is not as stable as the crystals that have been formed in suspension, due to the uneven way that nucleation has occurred on the surfaces (see Fig. 5).

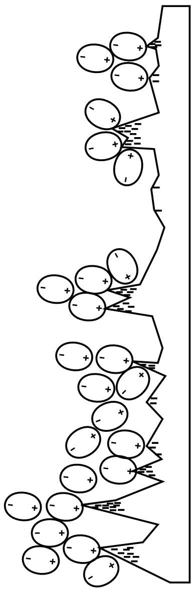


Fig. 5 Heterogeneous Nucleation

Descaling can only occur if the water in contact with the scaled surface is unsaturated, and is able to dissolve the carbonates to form bicarbonates. The presence of CO_2 is necessary for the formation of bicarbonates. The CO_2 which is present in solution in the water, comes from two sources, one from the air in contact with the water and the other, from the decomposition of bicarbonates due to the heating process.

$H_2O + CO_2$
unsaturated water

$\updownarrow$

$H_2CO_3 + CaCO_3 \longleftrightarrow Ca(HCO_3)_2$

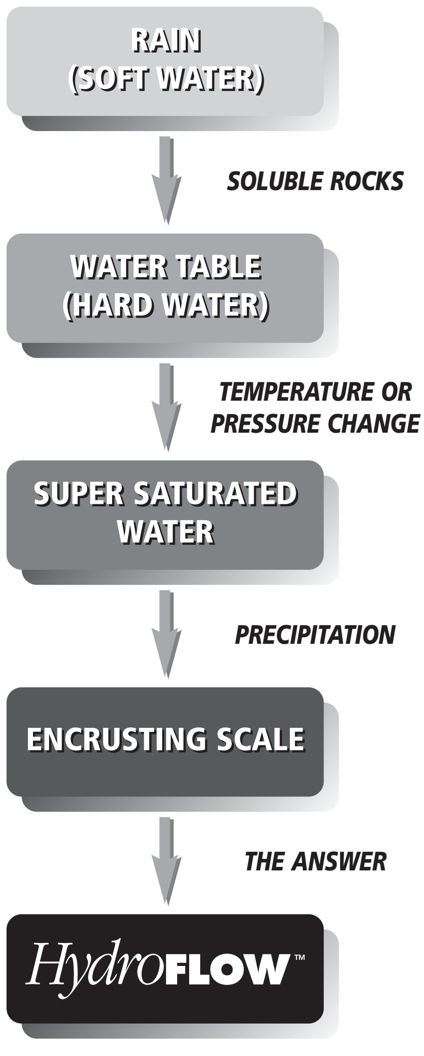
Descaling of the heat exchanger using *Hydro***FLOW** relies totally on turbulence. This is because the temperature of the water is increasing and would normally only deposit scale. If turbulence is present, the water experiences pressure changes that cause the water to change rapidly from supersaturated to an unsaturated condition. While unsaturated the water will dissolve the scale on the surfaces, and in the supersaturated condition the deposits will grow in suspension due to the presence of the clusters generated by the *Hydro***FLOW** applied field.

In every system containing solute, there is a balance of scale-formation and scale-solution. In a system where the balance is in favour of scale-formation, the system will experience scaling. In a system where the balance is in favour of scale-solution, the system will remain free of scale.

$Ca(HCO_3)_2$ + Heat + *Hydro***FLOW** $\rightarrow$ $CaCO_3 + H_2O + CO_2$
calcium bicarbonate in solution → calcium carbonate in suspension

$CaCO_3$ + turbulence + *Hydro***FLOW** + $H_2O + CO_2 \rightarrow Ca(HCO_3)_2$
calcium carbonate on the surfaces → calcium bicarbonate

*Hydro***FLOW** simply tips the balance in favour of the scale-solution, by providing a large quantity of unsaturated solution that dissolves the existing surface scale. This process is repeated, dissolving surface scale and forming suspended stable crystals. The heterogeneous crystallisation is replaced by homogeneous crystallisation. However in this case homogeneous crystallisation occurs as soon as the solute becomes supersaturated, due to the presence of a large quantity of clusters generated by *Hydro***FLOW** . As a result the old scale will ultimately completely return to solution and is converted to stable individual crystals. These stable amorphous crystals can be removed by filtration in circulating systems. In open systems they will pass harmlessly out with the flow.



Product Specification

Transducer Unit

Main unit: Anodized Aluminium
End plates: UL V-0 rated Polycarbonate

Water and Dust Protection

IP rating: IP66 IEC 60529

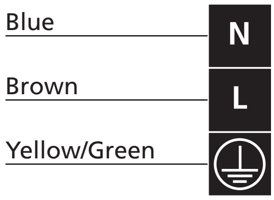
Built-in EMI Filter

Meets: FCC 20780 Class B
VDE 0871 Level A

Safety

Europe and World Wide:	IEC 1010-1:90 + A1:92 + A2:95 EN61010 Tested according to CENELEC National requirements
USA	UL3101-1
Canada	CSA22.2 No: 1010.1-92 CAN/CSA-22:2 No. 0.4-M1982

Europe



To be installed in accordance with the latest IEE wiring instructions
Fuse rating: 1A

North American Continent

To be installed in accordance with the latest local wiring instructions
Fuse rating: 1A

C US

Manufactured to BSEN9002

Over-voltage (Transients)

10 to 20% above nominal

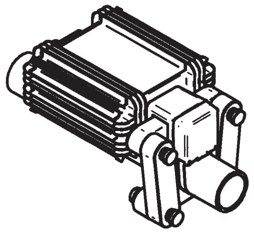
Remote Monitoring Facility

Normally open circuit or 5V output
(Special terminated cable can be provided to facilitate connection)

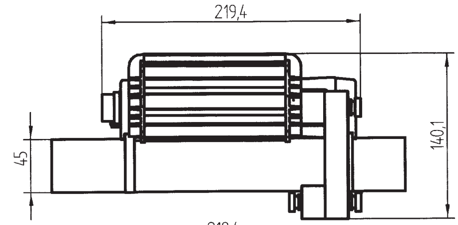
CB Test certificate, in accordance with the International (IEC) standards listed above

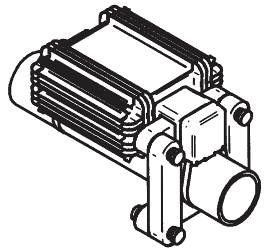
CSA Certification, in accordance with the UL / CSA standards listed above

MODEL	Maximum Pipe o.d. mm	Power Supply Rating	Input Current mA min	Input Current mA max	Dimensions mm	Weight in Kg
C45	45	87 to 240 VAC/47-63 Hz	20 mA	78mA	**All Models** See page 9	4
C60	60	87 to 240 VAC/47-63 Hz	31 mA	89mA		4
C100	108	87 to 240 VAC/47-63 Hz	20 mA	78mA		5
C120	130	87 to 240 VAC/47-63 Hz	29 mA	83mA		5
C160	200	87 to 240 VAC/47-63 Hz	32 mA	92mA		6



C45





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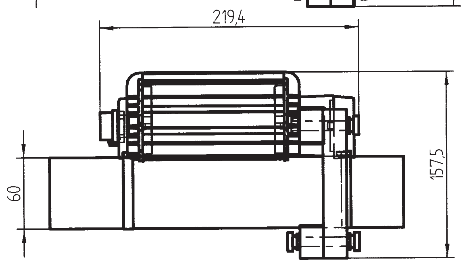
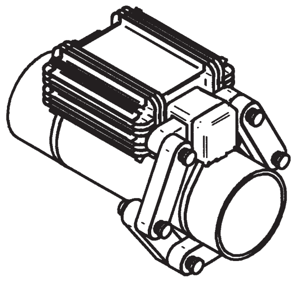
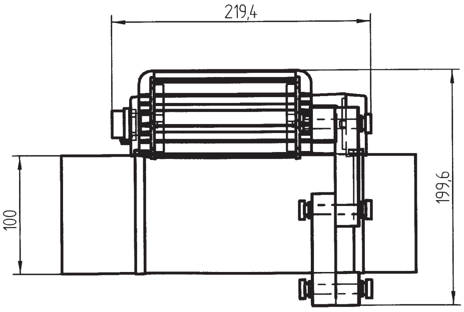
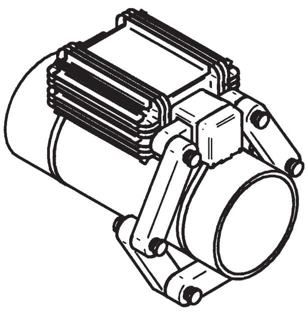




C100





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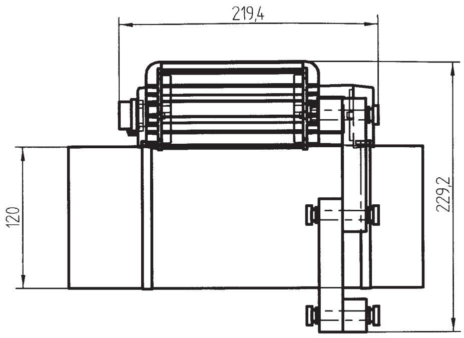
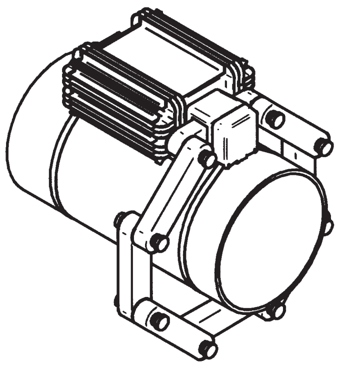
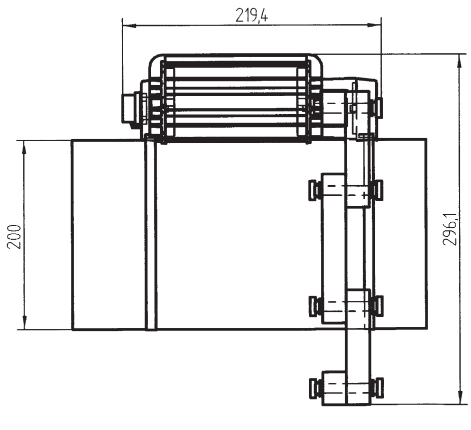




C160

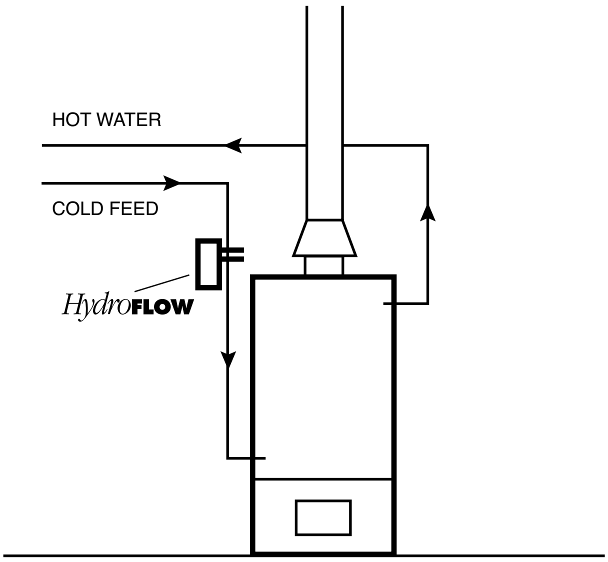


All measurements in mm

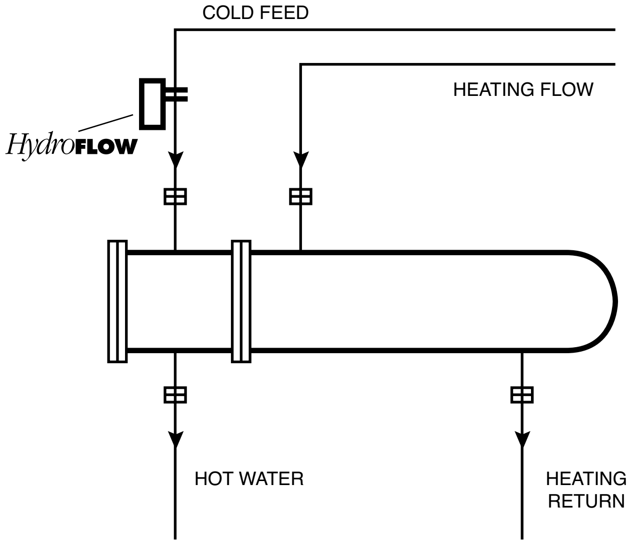
Installation Guidelines

*Hydro*FLOW is installed before the point of heat exchange or pressure change and on the outlet side of any pumps. *Hydro*FLOW is not flow dependent: choice of model is determined by pipework diameter.

Storage Water Heater Gas/Oil



Tube and Shell Heat Exchanger



Calorifier Boiler or Electric

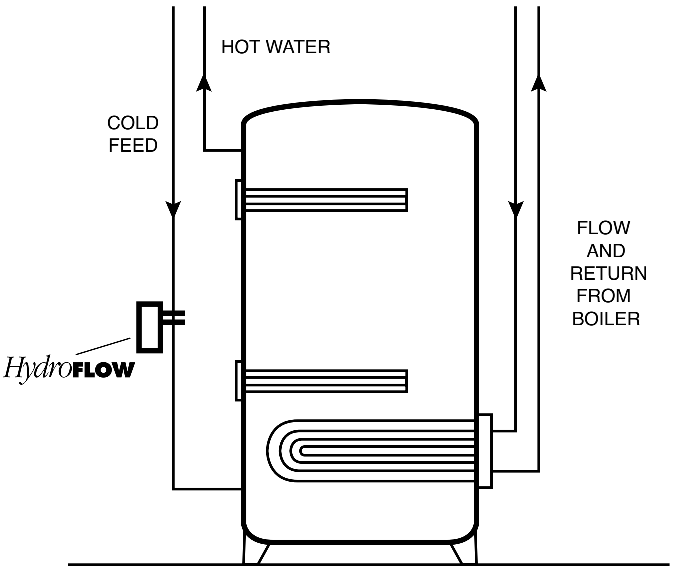
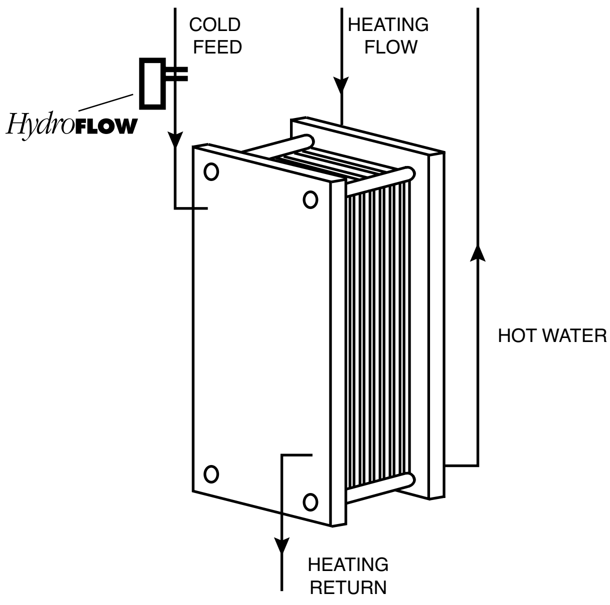
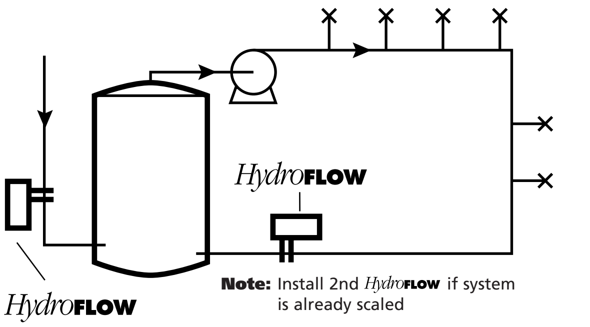


Plate Heat Exchanger

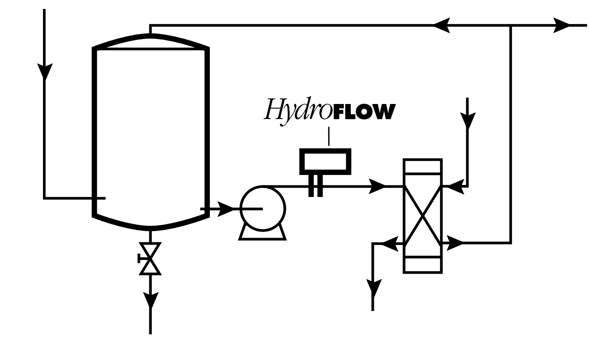


Hot Water System

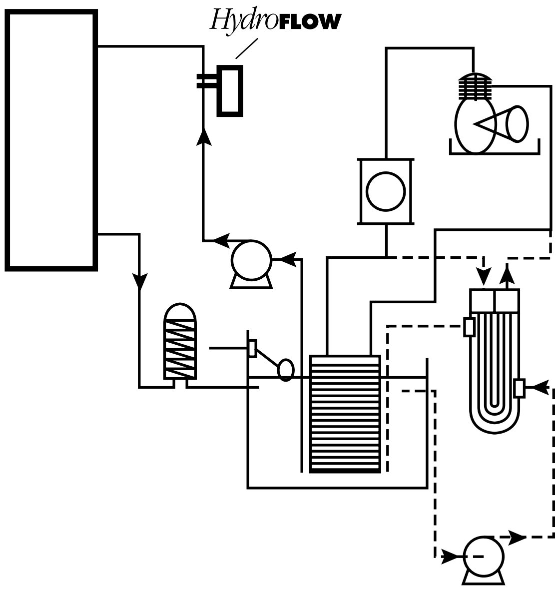
System with secondary circulation



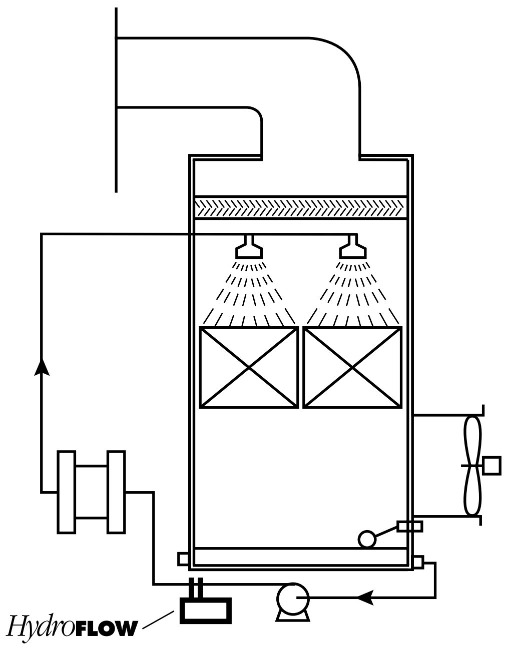
System with plate heat exchanger



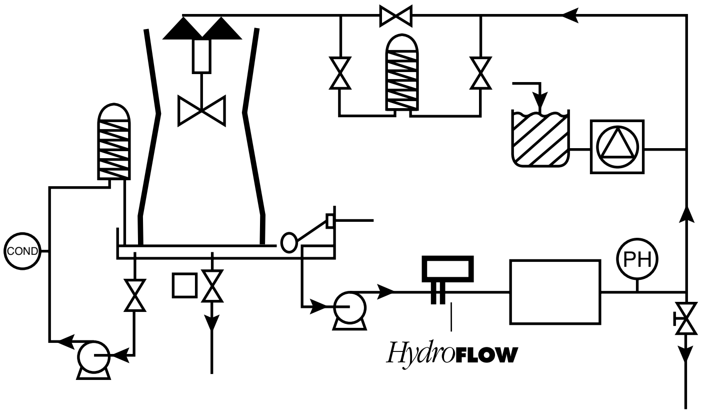
Chiller System Direct/Indirect



Cooling Tower Forced Draft



Cooling Tower Open System



Location Criteria

Protecting Heat Exchangers

*Hydro*FLOW is best fitted to the cold water supply or make up water to a heat exchanger.

Fit *Hydro*FLOW to the circulating water return to the heat exchanger:-

- if the flow of make up water is low;
- if the make up water pipe is short;
- to avoid an electrical loop. (See loops below.)

DO use the unique protection zone to protect appliances supplied with water that is not normally flowing.

DO consider signal propagation barriers when determining the size of the seed generation zone. Such barriers include non-conducting valves, sand filters, pumps and large tanks. In addition the protection zone is decreased by complexities in the plumbing system. When protecting mixer valves, showers, etc, that are supplied with hot water from a recirculating system, install *Hydro*FLOW on the recirculating water. If there is a large hot water tank, choose the flow out of that tank.

DO ensure that *Hydro*FLOW is protected from surfaces that may exceed 55°C. Use insulating material and select a larger model if necessary.

DO remember that *Hydro*FLOW descales and that after installation greater than usual quantities of precipitate may be released.

Protecting remote valves and appliances

If these devices are supplied with hot water from a recirculating system, *Hydro*FLOW is best fitted to the hot water flow from the heat exchanger or calorifier. If the remote devices are not supplied from a hot water recirculating system, they are best treated using *Hydro*FLOW fitted on the cold water supply.

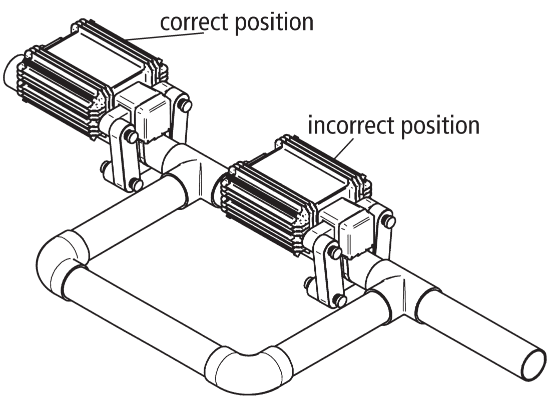
DO NOT install *Hydro*FLOW inside an electrical loop. (See the two diagrams at the foot of this page.)

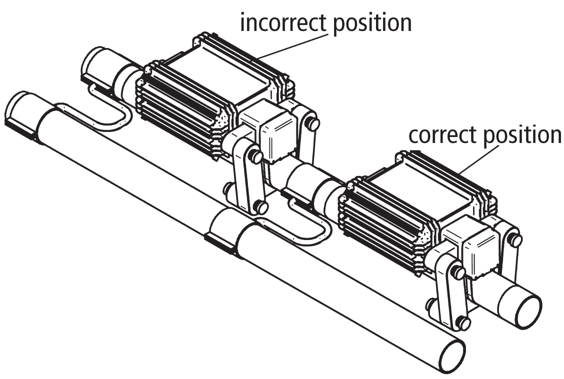
DO NOT locate *Hydro*FLOW on the water supply into a cold water tank or sand filter. The signal will be lost with little user benefit.

DO NOT think of *Hydro*FLOW as a water softener. *Hydro*FLOW treats the temporary hardness salts and not the permanent hardness salts. These can form scale when the water evaporates. A good quality water softener will remove almost all salts but it needs maintenance, causes corrosion and produces non-potable water.

DO NOT fit *Hydro*FLOW before a pump or a large filter or large volumous tanks.

DO NOT expect *Hydro*FLOW to descale a pipe through which the water has almost stopped flowing.





Operational Guidelines

Scale Prevention

*Hydro*FLOW prevents the formation of hard scale due to increases of temperature and pressure change, under all normal operating conditions. Users are advised to contact Hydropath Technical Support if they suspect that conditions are unusual.

Scale Removal

Existing scale is normally broken down. The time taken depends on the volume of water, the flow of water to remove the excess scale crystals, the porosity of the old scale and variations in the temperature and the pressure of the water. In most cases the process is fairly rapid and up to 95% or more of old scale is broken down and treated within the first three months.

Hard scale may be slow to break down where there is low water volume and little variation of temperature, flow, hardness and pressure. In such cases *Hydro*FLOW is best fitted from new or after chemical cleaning.

If *Hydro*FLOW is applied to a heavily scaled system, where scale may have formed on the inside of a narrow pipe or plate heat exchanger there is a small risk of blockage due to dislodged pieces of scale. The user is advised to have a system cleanse or to install suitable coarse filters prior to fitting.

The *Hydro*FLOW signal is effective both up and down stream and can cause a large quantity of scale to be broken down. In most cases the only effect may be that users see the crystals as they emerge from open taps. This does not always happen and stops within three months. There will be no adverse effect in a closed recirculating system unless there is significant evaporation or there has previously been some significant leakage.

Corrosion

The application of *Hydro*FLOW cannot itself cause corrosion or leaks. Scale is a direct cause of corrosion and its removal may reveal leaks. Rust coatings in mild steel pipework are altered, resulting in a hard black surface deposit, magnetite, rather than normal rust and further corrosion is prevented. This effect is due to an interference with the electro-chemical reaction needed for corrosion to take effect.

Maintenance

*Hydro*FLOW uses solid state circuitry and does not require maintenance. Its signal cannot create films which would reduce performance. There is a red light which is powered directly by the generated signal and is a positive indication of correct operation. If the operation of the device is critical, users should monitor this light as part of a planned maintenance procedure.

Residual Effect

Once water has left the plumbing system or left the protection zone, it can no longer be subjected to the *Hydro*FLOW conditioning field. 30 minutes may be taken as a conservative guide to the time that the water retains its full scale prevention ability.

System Turbulence

In systems with no turbulence the crystals can settle. This can occur in commercial kettles, coffee machine reservoirs, large calorifiers and cooling tower pools. The resulting soft scale should be removed during maintenance or using filters.

Recirculating Systems with Evaporation

Where a recirculating system involves evaporation, e.g. cooling towers or humidifiers, the suspended crystals must be removed using filtration (<50 microns) or blow down to avoid concentration. On initial application existing scale will be broken down leading to an excess of precipitate which users must address. The easiest approach is to introduce an automatic blowdown system. The ideal would be to fit a suitable filter with an automatic back wash system. Other methods include pH control.

Plate Heat Exchangers

When using *Hydro*FLOW to protect plate heat exchangers, existing scale in the pipes upstream of the device will be broken down. This will lead to excess precipitate in the heat exchangers which can continue to cause scale for the first few weeks. If the plate heat exchanger is heated using steam it is advised that the hot steam supply is connected to the same side as the water return. The heat exchanger will give increased performance through the avoidance of boiling.

Installation Made Easy

Secure the *Hydro***FLOW** unit firmly to the pipe using two stainless steel ties provided. The ties are installed through the slots incorporated in the lower section of both end caps, passed around the pipe and secured: initially pulled hand-tight, then secured more firmly by a screwdriver.

Fit two hexagon nuts into the holes provided in the end plate, next to the ferrite retaining cage, (see Fig. 1). Where the installation is on a vertical pipe, it is recommended that the unit is fitted with the ferrite cage uppermost to ease fitting of hexagon nuts.

Insert a **long** ferrite bar through aperture in retaining cage until both holes line up with the two hexagon nuts in the end plate, (see Fig. 1). Take second ferrite and line up with hole in ferrite through retaining cage, insert plastic bolt through both ferrite bars and tighten into hexagon nut. Assemble other ferrites around pipe (see Fig. 2) and secure with nuts and bolts making the final connection into the hexagon nut on the other side of the ferrite cage. Tighten all nuts and bolts until hand tight, **do not** over tighten.

Install Power Supply Unit (P.S.U.) in a convenient position adjacent to the mains electric (90V-260V) supply point, so that the L.E.D.'s can be easily viewed. A special extension cable can be obtained from the supplier if required.

Connect to mains electric supply in accordance with the Regulations. Switch on mains supply and ensure that the red and green L.E.D.s are glowing brightly on the Power Supply Unit (P.S.U.). The green L.E.D. confirms there is power to the unit; the red L.E.D. confirms a signal has been induced in the system.

NOTE: If the red light does not glow please check to ensure the unit is not fitted inside an electrical loop.

The **remote monitoring** facility should be plugged into the second connector on the Power Supply Unit (P.S.U.).

Fig. 1

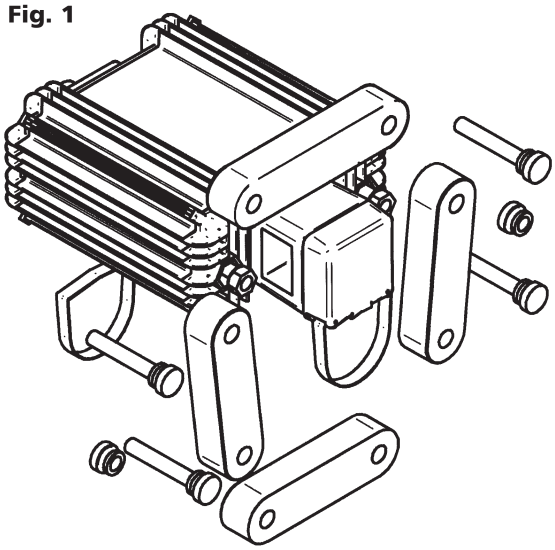
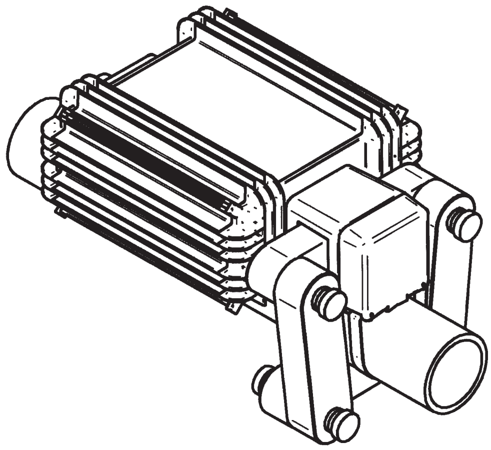
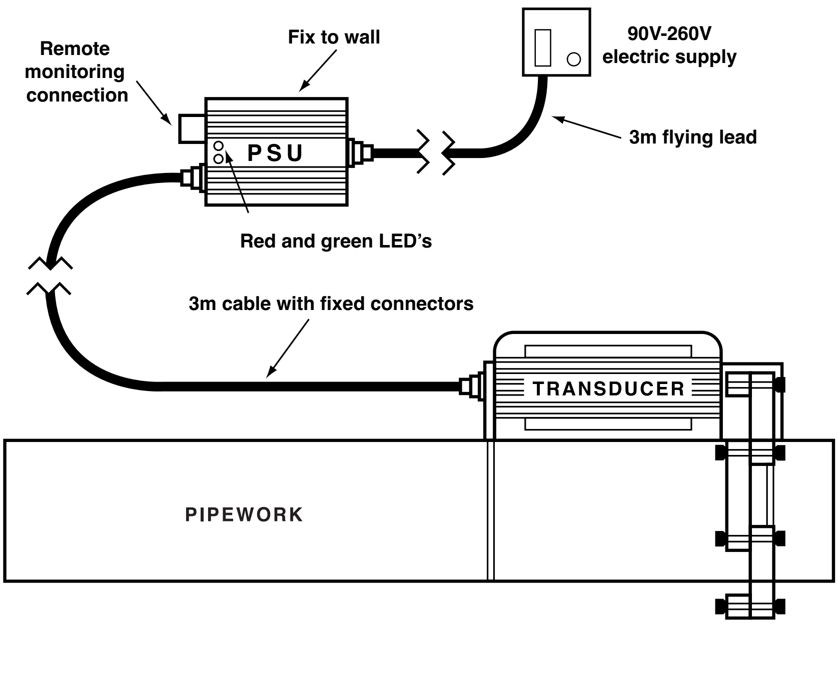


Fig. 2





Guarantee

HydroFLOW units are guaranteed for a period of three years from date of purchase. If the red light does not glow and the water conditioner has not been physically broken through misuse, it will be repaired or replaced free of charge.

The HydroFLOW units should be returned direct to the Company with proof of purchase. Any unauthorised attempt to repair the unit will invalidate this guarantee. Your statutory rights are not affected.

Warranty – Money Back Offer

The warranty period with respect to fitness for purpose for HydroFLOW unit/s is twelve months from date of purchase. If after a period of more than six months after installation but not later than twelve months after installation the end user demonstrates that the HydroFLOW unit/s failed to prevent build-up of encrusting scale, the Company will refund to the merchant the cost of the HydroFLOW unit/s. The merchant will reimburse the contractor who will in turn reimburse the end user. The money back offer applies only where the HydroFLOW units has been installed in accordance with the Company's recommendations. The Company will not accept responsibility for the build-up of encrusting scale on heating and hot water equipment which has not been installed in accordance with the manufacturer's instructions. Your statutory rights are not affected.

Limitations

Under no circumstances will the Company accept claims arising out of failure of the HydroFLOW unit/s, nor will the Company accept any liability for consequential damage caused by the effectiveness and efficiency of the HydroFLOW unit/s e.g. where there is the possibility of loose scale particles being allowed to enter the system or process unfiltered. An end users rights are restricted to those set out in the guarantee and the money back offer.

The Company will not accept responsibility for water leaks that are revealed by the dissolving of scale. The Company will not accept responsibility for any problems resulting from the disconnection of the power supply to the HydroFLOW unit.

The Company accepts that certain types of encrusting scale once formed e.g. those with high concentrations of silicates, sulphates and phosphates, will not quickly be dissolved by the HydroFLOW unit. In such cases it is recommended that systems containing such encrusting scale should be chemically cleaned. Once cleaned the system should stay clear thereafter.

The HydroFLOW unit/s comply fully with EMC Regulations. However, in the presence of a weak or attenuated signal, interference on radio equipment operating on the long wave band may be experienced.