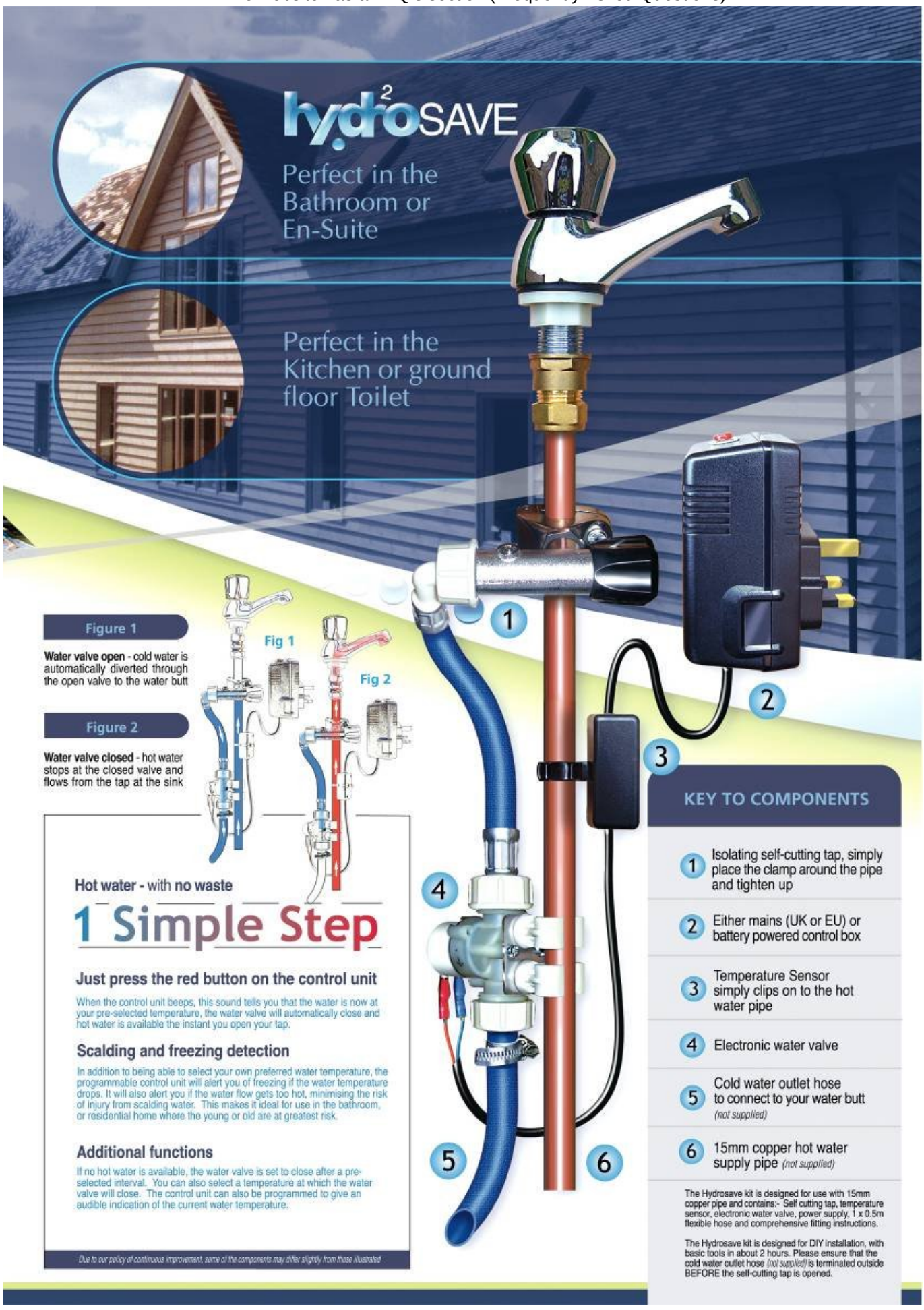
The website has a FAQ's section (Frequently Asked Questions)



The Hydrosave Installation Handbook

INTRODUCTION

Background - Primarily for use in domestic situations, this product can be used to save cold water that is normally wasted in the course of waiting for hot water to arrive at a hot water tap (sometimes called the dead leg). It has added features of freezing and scalding detection.

HYDROSAVE EQUIPMENT

This is a list of items that you will have with the product:-

- Controller with 4 meters of 4 core cable (for temperature sensor junction box).
- Water valve assembly on metal plate with mounting pipe clips.
- Section of water pipe as the garden hose pipe connector attached to water valve push-in pipe fitting outlet.
- Temperature sensor junction box with 30 cm of 2 core cable terminated with shrouded crimp connectors (for water valve).
- Self cutting / self seal 15mm copper pipe isolating tap 'T' with integral double check valves.
- Standard domestic washing machine connection hose, 0.5 meter, with 3/4" BSP screwed female connectors at each end.
- 2 x rubber washers.
- This handbook.

INSTALLATION TOOLS REQUIRED

- Normal household tools:- small flat blade screwdriver, big flat blade screwdriver, a small Phillips screwdriver, wire strippers (or a pair of pliers), a small piece of medium grade sandpaper, a water cloth for spillages and a ½" jubilee hose clip.
- An electric drill with 4mm drill bit to pass the control cable through an obstruction (work surface, bath or sink front cover etc.).
- To pass the pipe through the wall, you will need an 18mm masonry drill bit with a reduced shank (the part that fits into the drill's chuck - most drill chucks accept up to 13mm bit shafts). You can buy one, 18mm diameter and 40cm long, from the HydrosaveOnline shop. Make sure that the bit is long enough to go through the wall before you buy.

FUNCTION CHECK BEFORE INSTALLING

It is always best to undertake a bench function check prior to installation. Follow the quick procedure below to establish that your Hydrosave functions correctly.

1. **Electrical connections in the temperature sensor junction box**
   Terminate the white cable cores as described in the Long Version section below but at this stage do not mount the temperature sensor junction box.
2. **Electrical connections on the water valve**
   Make the connections as described in the Long Version section below.
3. **Hydrosave operational testing**
   - The Hydrosave has already been set to it's default factory settings as described in **Setting your installation parameters** below.
   - Plug the HS300UK or HS400UN into a wall socket and switch the wall socket on.
   - Place the battery (not supplied as standard) into the HS200UN observing the correct polarity as marked on the bottom of the battery holder.
   - By blowing into the input end of the valve (indicated by the 'feather' of the arrow on the base of the valve body and mounting plate) you can establish if the valve is currently open (air passes with a strong puff) or shut (no passage of air). You might have to unscrew the push in fitting first, to get a good lip seal on the end of the valve. Make sure you know how to put it back together again correctly.
   - Place your hand around the water valve so that you can feel when it operates.
     HS200UN –
     - Press the red button and the valve will operate on and off up to 3 times in quick succession. While doing this, the Hydrosave is automatically finding out if the red and black wires have been connected the right way round. If not, it will know this and automatically leave the valve in the correct state, so you do not have to put the connections right unless you want to.

- The valve should then be open allowing the passage of air, while the controller beeps slowly. Check the valve state by blowing through the valve again.
- To check that the valve can shut, press the red button again (within 3 minutes) to abort the operation.
- The valve should operate on and off up to 3 times in quick succession again, as the controller checks the cable connections as it did when opening the valve. Check the valve state by blowing through the valve again.
- When the operation is aborted the controller gives 3 slow buzzes.
- Replace the push in fitting.
- Fault indication:- If the controller detects that the valve has NOT changed state correctly (usually battery power has run out) it gives 5 fast buzzes and then either continues with the slow beeps if the operation has just started, or 3 slow buzzes if an abort has been generated.
- The only time the controller stays silent is if the valve has changed state correctly AND the silent operation MODE 3 has been set up OR it is between saving operations of course.

HS300UK & HS400UN –

- Press the red button and the valve will operate.
- The valve should then be open allowing the passage of air, while the controller beeps slowly. Check the valve state by blowing through the valve again.
- To check that the valve can shut, press the red button again (within 3 minutes) to abort the operation.
- The valve should operate again. Check the valve state by blowing through the valve again.
- When the operation is aborted the controller gives 3 slow buzzes.
- Replace the push in fitting.

INSTALLATION PROCEDURE – SHORT VERSION

4. **The isolating self cutting tap connector**
   Fix to the hot feed copper pipe near the hot tap.
5. **The control unit**
   Place in the position to be used.
6. **The cable**
   Run the cable down to the self cutting tap connector.
7. **The temperature sensor junction box**
   Choose the location, before the self cutting pipe (in terms of water flow) and prepare the contact point.
8. **Electrical connections in the temperature sensor junction box**
   Make the connections as described in the Long Version section below.
9. **The water valve**
   Choose the mounting location.
10. **The half metre connection hose**
    Connect between the isolating tap and the water valve input and include the washers.
11. **Electrical connections on the water valve**
    Make the connections as described in the Long Version section below.
12. **The outlet hose exit**
    Arrange to get the hose from the inside to the outside.
13. **The valve outlet hose connection**
    Connect the outlet hose to the short pipe hose connector and clamp tightly.
14. **Water leak testing**
15. **Hydrosave operational testing**
16. **Setting your installation parameters**

INSTALLATION PROCEDURE – LONG VERSION

Install in the order listed.

The isolating self cutting tap connector

- It is best to get hold of an old piece of 15mm copper pipe to practice on first.
- The self cutting tap will be placed between the temperature sensor junction box and the hot water tap.
- Mark the desired position on the hot pipe.
- Ensure that the self cutting tap is fully turned off.
- Turn the house water supply off.
- Clean the copper pipe with the sand paper all around where the self cutting tap is to be placed.
- Undo the slotted clamp bolt and remove it.

- Ensure that the concave rubber washer is seated correctly against the inside front part of the tap section and will line up neatly against the pipe curvature, as this provides the water seal to the pipe.
- Leave the rotating tap section in the boss by two full turns before you clamp the boss around the pipe with the tap assembly facing forward and being accessible. It is not possible to start the screw thread in the boss if the clamp bolt is tightened firmly before hand, as thread stripping WILL occur.
- Place the back hinged section of the boss body behind the pipe.
- Swing the tap section over the pipe to line up with the hinged section.
- Replace the clamp bolt and tighten slightly (note that the tap section may need to be backed off slightly to allow the screw to line up and take in the hinged section's thread. Once taken by a few turns, rotate the tap section back to the three turn position).
- Tighten the clamp bolt until it just nipps up, still being careful not to cross the thread. Do not tighten firmly or the pipe may be flattened by the cutter pushing into it and the seal will not work.
- Screw the tap section in a clockwise direction and the integral cutter will pierce the hot water feed pipe. This need only be done by hand as there is only a minimum of resistance when the cutter goes through the copper pipe.
- As the cutter begins its work and moves into the pipe, tighten the boss screw after each turn to maintain pressure on the rubber seal to prevent water leakage.
- While doing this, again ensure that the thread is not crossed. There will be a small amount of water spillage so have a cloth handy placed under the work.
- When the hole cutting is finished and there is no more resistance to rotation (after 3 turns), the tap is rotated another 2 full turns, left in the required orientation and the lock nut then tightened with a spanner.
- Tighten the slotted clamp bolt again very firmly as this ensures the water seal.
- Test the seal before proceeding with the installation by slowly restoring the house water supply and checking for leaks.
- If a leak occurs, turn the house water supply off, undo the self cutting tap assembly and check that it has been installed correctly as above. Correct, replace in the same position and retest.
- After testing, leave the isolating valve shut off.

The control unit

- This is intended to be placed above the work surface near the hot tap.
- Battery Powered Version HS200UN:- The control box containing the red user operated push button, is located on a wall near the hot water tap using foam backed double sided sticky tape (not supplied) or left free standing. A PP3 battery is not supplied as standard.
- Mains Powered Version HS300UK:- The control box containing the red user operated push button, is located visibly near the hot water tap and will later be plugged into a local standard mains socket.
- Mains Powered Version HS400UN:- The control box containing the red user operated push button, is located visibly near the hot water tap and will later be plugged into a local standard mains socket.
- **Do not** actually plug the controller into the socket or insert the battery until all cables have been terminated and checked.

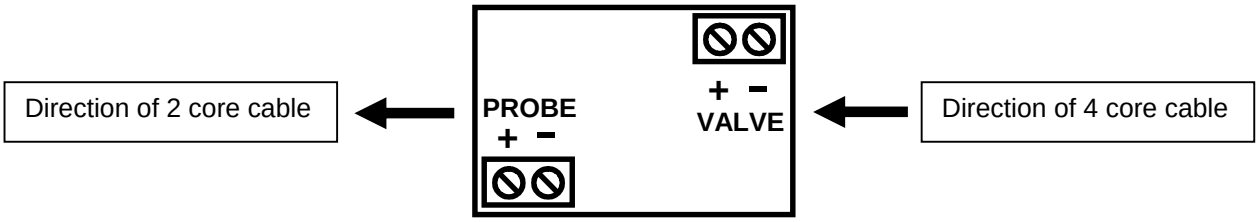
The cable

- The 4 core cable is connected between the control unit and the temperature sensor junction box and may be cut to length.
- EITHER – drill a 4mm hole in the work surface and pass the cable down behind the kitchen floor mounting units and thread to the water valve location.
- OR – pass the cable along the work surface to a kitchen unit side panel and then drill a 4mm hole in the side panel and pass the cable through and thread to the water valve location.
- OR – decide your own way of reaching the water valve location.

The temperature sensor junction box

- Clean the surface of the hot copper feed pipe with sand paper where the central sensor tip is to make contact. Ensure that shinny copper is visible at this point.
- The junction box must be clipped onto the existing 15mm copper hot water feed pipe before the self cutting pipe (in terms of water flow). This is best done after the electrical connections are made next.

Electrical connections in the temperature sensor junction box



- These are made inside the temperature sensor junction box.
- Remove the two small Phillips screws in the lid of the box and keep the lid and screws safe.
- Pass the cable through the free grommet.
- Leave a 2" tail inside the box and tie a single knot to be left inside the box as a cable retainer stopping the cable from being pulled back out.
- Cut back the outer sheath of the cable being careful not to damage the inner cores.
- Strip back by 5mm, each of the 4 core's coloured sheaths to show the bare cable strands inside.
- Twist each core's metal strands to prevent fraying.
- Place the 5mm bare twisted metal ends of each core into their respective terminals as described next.
- Connect the red cable (powers the valve) to the 2 way terminal block marked **VALVE +**.
- Connect the black cable (powers the valve) to the 2 way terminal block marked **VALVE -.**
- Connect the yellow cable (reads the temperature sensor) to the 2 way terminal block marked **PROBE +.**
- Connect the blue cable (reads the temperature sensor) to the 2 way terminal block marked **PROBE -.**
- Ensure that each terminal screw is not over tightened or the bare twisted ends may be cut by the screws tip.
- Replace the lid and screws.
- Clip the junction box over the cleaned area of the pipe.

The water valve

- Choose which way round the valve should be placed depending on the direction of approach of the hose from the self cutting tap.
- The water flow through the valve must be in the direction of the arrow. The input end is indicated by the 'feather' of the moulded arrow on the under side of the valve body and marked on the mounting plate. The output end is shown by the 'tip' of the arrow.
- This valve is clipped onto any nearby water pipe or can be left hanging free. It is easiest to connect the short hose first.

The half metre connection hose

- This is connected between the self cutting tap and the water valve.
- Ensure that the rubber washers at each end are in position.
- Decide which way round the hose should be to get the best direction, as one end has a straight connector and the other a 90° connection.
- Attach the hose between the tap connector and the valve input. The input end is indicated by the back end of the moulded arrow on the under side of the valve body and marked on the mounting plate.
- Make sure that both connectors are tight, using a cloth to get a good grip. These type of connectors take quite a force to ensure a good seal.

Electrical connections on the water valve

- Connect the shrouded crimped terminals on the 2 core cable coming out of the temperature sensor junction box to the valve as described next.
- Place the brown cabled connector to the **+ ve** (positive) spade terminal on the water valve.
- Place the blue cabled connector to the **- ve** (negative) spade terminal on the water valve.

The outlet hose exit

- Plan the hose exit first.
- You must decide how your outlet hose or pipe is to get to the final destination of your choice.
- The easiest and best way is to go straight out through the wall if you are working at an outside wall.
- The best piping method (and cheapest) is to use a cheap garden hose poked straight through the wall.
- Don't forget that walls are quite thick, approximately 8" to 12" (but could be more depending on the age of the house) and you need to survey and plan your pipes exit route and record anything you don't want to damage when drilling (18mm hole is best), before you start the outlet hose installation.
- Every house is different which is why a plan is very important.

- Seal around the exit point with some form of external silicone based sealant to stop rain water ingress.

The valve outlet hose connection

- The garden hose must now be connected to the outlet pipe on the water valve (the 'tip' end of the moulded arrow on the underside of the valve).
- Danger of scalding ! Wear gloves ! Only a competent adult should follow this procedure !
- Place boiling water in a coffee mug.
- Place the end of the garden hose into the boiling water and leave for approximately 1 minute. This will soften the hose material.
- Remove the hose from the mug ensuring that you do not touch the heated hose area or drop hot water onto your hand.
- Immediately push the hose, forcing if necessary, over the end of the hose connector. While pushing, rock the hose end up and down and the hose will slide up the connector.
- Ensure that approximately 1.5 cm of hose covers the hose connector.
- The hose will become stiff again within 2 minutes in free air as it contracts onto the hose connector.
- The jubilee clip is a must to keep the hose end in place.

Water leak testing

- Ensure that the output of the valve is either blocked off (with a pipe cap - not supplied) or is piped to a sensible place before operating the Hydrosave.
- Restore the house water supply, as you have already tested for leaks from the isolating tap.
- Test the Hydrosave installation by slowly opening the isolating connector tap and checking for leaks up to the water valve.
- If a leak occurs, turn the isolating connector tap off. Fix the leak by checking washer positions and tightening connectors then retest.

Hydrosave operational testing

- The Hydrosave has already been set to it's default factory settings as below.
- Plug the HS300UK or HS400UN into the wall socket and switch the wall socket on.
- Place the battery (not supplied as standard) into the HS200UN observing the correct polarity as marked on the bottom of the battery holder.
- Ensuring that the isolating tap is open, the house water supply is turned on and the outlet hose is positioned at your chosen final destination, press the red button on the controller.
- If water leaks from the water valve outlet hose connection, press the red button to abort the operation and shut the water valve, shut the isolating tap. Fix the leak and retest.

Setting your installation parameters

These modes will need setting by following the procedures explained in their sections below. They do however have factory settings which will allow you to use the Hydrosave straight away but you should set them according to your preference.

Modes 2 & 3	Normal operation buzzer setting	Factory setting = Continuous
Mode 4	'No hot water available' time	Factory setting = 3 minutes
Mode 5	Preferred temperature	Factory setting = 20°C

MODE SELECTIONS

All modes are stored in non-volatile memory. i.e. they are retained even if all mains or battery power is removed. Normal operation is defined as when water is being saved.

User modes:-

Mode 2	Normal operation buzzer Enable
Mode 3	Normal operation buzzer Disable
Mode 4	'No hot water available' valve shut off auto calibration time
Mode 5	Set preferred temperature

Engineer modes:-

Mode 6	Continuous audible temperature indication Enable
Mode 7	End of normal operation, audible temperature indication Enable
Mode 8	End of normal operation, audible temperature indication Disable

MODES 2 & 3 - NORMAL OPERATION BUZZER DISABLE

If the user does not want to hear the buzzer continuously pulsing once every 2 seconds during normal operation, then ALL but the first and last buzzes can be silenced.

Set to all buzzes – Enable mode 2:-

- Press and hold the button for at least 3 seconds and on hearing the buzzer, press **2** times quickly in succession while the buzzer is still sounding. The buzzer will continue to sound for a short while longer.
- The unit confirms this mode by repeating the 2 presses as 2 buzzer pulses.
- The unit is then in the normal operation buzz Enable mode.

Set first and last buzzes only - Disable mode 3:-

- Press and hold the button for at least 3 seconds and on hearing the buzzer, press **3** times quickly in succession while the buzzer is still sounding. The buzzer will continue to sound for a short while longer.
- The unit confirms this mode by repeating the 3 presses as 3 buzzer pulses.
- The unit is then in the normal operation buzz Disable mode.

MODE 4 - 'NO HOT WATER AVAILABLE' CALIBRATION TIME

Normally it will take the same time for the hot water to arrive. If the hot water should ever run out, it would be a waste of water to leave the valve open all the time. The Hydrosave has to 'learn' how long it should wait for the hot water to arrive, before deciding that there will never be any hot water to detect, so shutting the water valve.

This learning is achieved by placing the control unit into Mode 4 where it waits until the user's preferred temperature arrives and then stores this 'normal arrival time'. The time actually used when the Hydrosave operates is double this time, as the arrival time will be longer in the winter than in the summer due to the colder pipes taking the heat out of the water as it passes through.

Start calibration:-

- This should be done for the first time when the pipes are cold (in the morning) or had a chance to cool down (about 40 minutes minimum).
- Press and hold the button for at least 3 seconds, and on hearing the buzzer, press **4** times quickly in succession while the buzzer is still sounding. The buzzer will continue to sound for a short while longer.
- The unit confirms this mode by repeating the 4 presses as 4 buzzer pulses.
- The buzzer will give a continuous series of 2 rapid buzzes while the Hydrosave waits for the preferred temperature (Mode 5 setting) to arrive.
- The buzzer will stop when the preferred temperature has been detected OR the button is pressed OR the maximum time allowed of 3 minutes has expired.
- The water valve will then shut and the time reached is stored.
- The unit confirms the end of the calibration with 4 buzzer pulses.

MODE 5 - SET PREFERRED TEMPERATURE

The label on the Controller explains this procedure.

- Press and hold the button for at least 3 seconds and on hearing the buzzer, press **5** times quickly while the buzzer is still sounding. The buzzer will continue to sound for a short while longer.
- The unit confirms this mode by repeating the 5 presses as 5 buzzer pulses.
- The preferred temperature is immediately reset to the default of 20°C.
- When the buzzer sounds again, the user can press up to 10 times with each press representing an increase in preferred temperature of 2°C starting from 20°C. The upper temperature detection limit is 40°C.
- The number of presses received will be repeated by buzzer pulses (up to 10 max), and therefore the preferred temperature setting can be checked.

MODE 6 - CONTINUOUS AUDIBLE TEMPERATURE INDICATION

This is a fault finding feature and the way the temperature is indicated is shown in section Mode 7& 8 below.

If the actual temperature needs to be identified continuously, then this can be achieved as follows:-

Enable mode 6:-

- Press and hold the button for at least 3 seconds, and on hearing the buzzer, press **6** times quickly in succession while the buzzer is still sounding. The buzzer will continue to sound for a short while longer.
- The unit confirms this mode by repeating the 6 presses as 6 buzzer pulses.
- The Hydrosave is then set to sound temperature continuously.

Disable mode 6:-

- The next press of the button cancels this mode, after the current temperature indication has completed.

MODES 7 & 8 - TEMPERATURE INDICATION AT END OF NORMAL OPERATION

This is a fault finding feature.

If the actual temperature needs to be identified at the end of each normal operation, this can be achieved as follows:-

Enable mode 7:-

- The user presses and holds the button for at least 3 seconds, and on hearing the buzzer, press **7** times quickly in succession while the buzzer is still sounding. The buzzer will continue to sound for a short while longer.
- The unit confirms this mode by repeating the 7 presses as 7 buzzer pulses.
- This feature is then enabled.
- After the normal operation has completed and the water valve is shut, the temperature is indicated by a series of buzzes as follows:-

  5 very rapid buzzes - temperature sampled and about to be indicated
  One long buzz only if the temperature is below zero degrees C
  A number of buzzes between 1 and 10 inclusive, indicating the tens of degrees (10 represents a zero - 0)
  A number of buzzes between 1 and 10 inclusive indicating the units of degrees (10 represents a zero - 0)
  5 very rapid buzzes - temperature indication complete

i.e. 5 - **1** - **7** - 5 represents :-	start - 1 (x 10 multiplier) then 7 - stop = 17 °C
i.e. 5 - **4** - 5 represents :-	start - then 4 - stop = 4 °C
i.e. 5 - **2** - 1**0** - 5 represents :-	start - 2 (x 10 multiplier) then 0 - stop = 20 °C
i.e. 5 - long - **1** - 5 represents :-	start - minus then 1 - stop = -1 °C

Disable mode 8:-

- Press and hold the button for at least 3 seconds, and on hearing the buzzer, press **8** times quickly in succession while the buzzer is still sounding. The buzzer will continue to sound for a short while longer.
- The unit confirms this mode by repeating the 8 presses as 8 buzzer pulses.
- This feature is then disabled.

HYDROSAVE AUTO SAFETY CHECKS BATTERY VERSIONS HS200UN & HS100UN

In order to conserve battery power the main processing electronics is powered down until the user presses the activation button. The unit also has a continuously powered 1 hour delay timer which will 'wake up' the processor automatically, approximately 1 hour after the last user activation.

Each time the processor is awakened and as long as the normal mode or calibration mode has not been entered, it will check to see if:-

- the temperature is scalding above 55°C
- the temperature is approaching freezing at less than 2°C
- the battery voltage is low

The safety check monitoring continues for 1 minute. After this minute has expired, the 1 hour timer is reset just prior to going back to low power sleep mode.

It should be noted that the temperature probe, when detecting freezing, is able to detect the reducing air temperature well before the water inside the pipe reaches the same air temperature due to the fact that an external pipe contact method is used rather than a total immersed internal detection method. This speeds up freezing detection in the winter and will delay slightly, but not significantly, the normal detection temperature.

HYDROSAVE AUTO SAFETY CHECKS MAINS POWERED VERSIONS HS300UK & HS300EU & HS400UN

The power is constantly applied, so these Hydrosave models do not power down.

The following safety checks are undertaken and the controller will check to see if:-

- the temperature is scalding above 55°C
- the temperature is approaching freezing at less than 2°C

HYDROSAVE AUDIBLE FEATURES

For all types

The operation has started	1 buzz
The operation has completed	1 buzz
The operation is in progress	1 buzz every 2 seconds (or can be programmed to be silent)
The user aborted the operation	3 slow buzzes
Temperature dropped by 3°	5 rapid buzzes (during normal operation)
'No hot water available' calibration	continuous series of 2 rapid buzzes

For Mains versions only

Freezing approach detected at 2°C	2 slow buzzes - (detection at power on and active for 1 minute only after normal operation complete)
Scalding water detected at 55°C	1 series only of 10 rapid buzzes - (detection at power on and active for 1 minute only after normal operation complete)

For Battery versions only

Battery voltage low	1 buzz (detection active once per hour)
Valve will not change state	5 slow buzzes (usually indicates not enough battery power left)
Freezing approach detected at 2°C	2 slow buzzes - (detection active once per hour and for 1 minute only after normal operation complete)
Scalding water detected at 55°C	1 series only of 10 rapid buzzes - (detection active once per hour and for 1 minute only after normal operation complete)

End of Handbook