FLOW MAX
Thermal Storage Cylinder and Combination Units

installation instructions
March 2000
FLOW MAX
Thermal Storage Cylinder and Combination Units

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1. SAFETY REGULATIONS

These instructions should be read in conjunction with those from the boiler manufacturers and other system components.

Flowmax must be installed in accordance with the relevant requirements of the Local Building Regulations, Building Standards (Scotland) Regulations, Current IEE Wiring regulations, Health and Safety Document 635 “The Electricity at Work Regulations 1989, Local Water Bylaws, BS6700 and BS5449.

Flowmax differs from the conventional cylinders in that the water stored in the Flowmax is not the same water that comes from your taps. It should be thought of as a store of heat. This heat store is typically maintained at 70 – 80°C dependant on model.

A 50mm thick layer of CFC free foam insulation keeps heat loss to a minimum. Inside every Flowmax is a heat exchange coil which uses specially designed finned copper tubing. Mains pressure cold water is heated instantaneously as it passes through this coil.

Hot water can leave this coil at over 60°C. A thermostat mixing valve (factory set at 55°C but user adjustable) ensures water is delivered at a safe temperature. The store is vented via a feed and expansion tank. Only the inside of the coil is at mains pressure.

Flowmax electric units are heated by two immersion heaters and provide hot water only. Boiler models are heated by gas or oil boilers and in addition to hot water can also provide heat directly to space heating (typically radiators).

When installed in the double pump format the system can be considered as being split into two circuits. In the boiler circuit the store thermostat (typically set at 75°C) controls the boiler to maintain the store at the correct temperature. When the room thermostat calls for heat the space heating pump circulates heat to the radiator.

Flowmax is a vented primary water thermal storage unit that supplies mains pressure domestic hot water at good flow rates in accordance with the requirements of BS 6700, NHBC and the British Gas Specification.

The Flowmax system facilities easy installation without the requirement for Building Control or BBA approval and is readily incorporated into traditional central heating systems.

Flowmax boiler models provide balanced mains pressure hot water and fast response radiators all form the store. Provision for an immersion heater gives a back up heat source.

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Flowmax boiler models are suitable for a maximum static head of 10m but other models are available.

Combination Unit (figure 2)

These units have an in-situ pre-plumbed primary feed and expansion cistern capable of accommodating expansion from up to 180L of primary water. It is normally supplied with a float operated valve and warning pipe (overflow) connection. Combination units eliminate all water tanks from the roof space.

Cylinder Unit (figure 3)

This unit is often used on retrofit situations where an existing feed and expansion tank is already present or where there are difficulties in achieving the minimum head requirement recommended by the boiler manufacturer. Standard Flowmax cylinder units are suitable for a maximum static head of 10m but other models are available.

Standard Boiler Models (figure 4)

The perfect partner for your gas or oil boiler Flowmax boiler models provide balanced mains pressure hot water and fast response radiators all from the store. Provision for an immersion heater gives a back up heat source.

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Flowmax models cater for applications ranging from the smallest flat to a 4-6 bed, two bathroom property.

### Specimen and Selection Guide

#### Dimensions: Combination Units (mm)

<table>
<thead>
<tr>
<th>Model</th>
<th>Height</th>
<th>Diameter Unlagged</th>
</tr>
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<tbody>
<tr>
<td>Standard Comb.</td>
<td>140 L</td>
<td>1275</td>
</tr>
<tr>
<td></td>
<td>180 L</td>
<td>1510</td>
</tr>
<tr>
<td></td>
<td>210 L</td>
<td>1725</td>
</tr>
<tr>
<td>Narrow Pattern Comb.</td>
<td>140 L</td>
<td>1275</td>
</tr>
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<td></td>
<td>175 L</td>
<td>2000</td>
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#### Dimensions: Cylinder Units (mm)

<table>
<thead>
<tr>
<th>Model</th>
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</thead>
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<td>1085</td>
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<td></td>
<td>210 L</td>
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<tr>
<td>Narrow Pattern Cylinder</td>
<td>140 L</td>
<td>1535</td>
</tr>
<tr>
<td></td>
<td>175 L</td>
<td>1810</td>
</tr>
</tbody>
</table>

### Multiple Heat Sources

Flowmax thermal stores form the ideal basis for a system with multiple heat sources. Fire back boilers, Solar heating and Solid fuel stoves (Aga, Rayburns etc.) can all be coupled up alongside the usual boiler or immersion heaters.

Boiler models have two spare bosses as standard, which can be used. With Electric and SSP variants the bosses are not standard but are fitted as an optional extra.

### Sealed System Primary (SSP) Models

As the name suggests these models allow the primary system to be sealed (3.5 bar max on the standard units). The sealed system allows the radiator to be positioned above the Flowmax unit.

SSP models are plumbed in like conventional indirect cylinders. SSP units provide hot water only as space heating is supplied directly from the boiler usually via a diverter valve. This has two benefits. Firstly it allows a lower store temperature (typically 70°C) to be used. Secondly SSP units can be coupled with much larger boilers and space heating loads than with standard Flowmax models.

Usually supplied in the combination tank the top tank keeps the unit topped up as water is lost by natural evaporation.

### Central Boiler Models

Flowmax is the ideal partner for a central boiler plant. Installed in each property it allows for single metering of hot water usage and is economical in terms of installation and running costs. Usually based around the SSP versions, we can custom design units to suit your requirements.

### Seven Plus Electric Models

The Flowmax 7+ Electric model is designed to make the best use of cheap rate electricity from the wide variety of tariffs available such as Economy 7 or 10. The lower of the two immersion heaters is usually connected to the cheap rate supply and the upper one provides a boost facility for times when you need to reheat the unit but cheap rate electricity is not available.

The immersion heaters are supplied to the Mainstore specification. They are a low noise type so as not to disturb anyone when the unit is heating during the night.

Electric units provide hot water only, space heating is not fed from the store.

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**Fitted Units**

This consists of all the components of the unfitted (contract) package assembled onto the basic vessel with all the associated pipe work to save installation time when on site. These units are supplied in a protective box.

**Double Pump Package**

Boiler Models: Both combination and cylinder types are available as double pump packages. These consist of a fitted unit to which we add two pumps, a wiring centre (with a timed pump overrun circuit and a digital programmer). All items are pre-plumbed and pre-wired. These units are supplied in a protective box.

**Bosses**

| Heating flow & return | G1" Female |
| Space heating flow & return | G1" Female |
| Feed & expansion (cylinder only) | G1" Female |
| Primary Coil (SSP models only) | G1" Male |
| Domestic hot water inlet | 22mm compression |
| Domestic hot water outlet | 22mm copper tube |
| Immersion heater | 2 ½" Female |

**4. Water Supply**

It is essential that the mains water supply pressure and flow availability is capable of meeting both hot and cold water services demand. Flowmax is capable of delivering up to 22 litres/min of hot water with an inlet pressure of 2 bar.

Where the mains pressure is in excess of 5 bar, pressure reduction to between 2 to 3 bar is required for splash free tap operation. Flowmax is not recommended for use where the mains pressure is below 1.0 bar.

Unless consistently high mains pressure is available, it is unlikely that a mains service pipe of less than 22mm OD (copper) or 25MM OD (Blue MDPE) will provide an adequate flow rate to the system.

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**Terminal Water Fittings**

**Tags:**

- Ensure that all terminal fittings withstand mains pressure.

**Showers:**

- Because of the flow-off profile, thermostatic shower mixers are recommended to optimise performance; these must be suitable for mains pressure. Where it is possible for a flexible shower handset to reach below the bath spillover level compliance with the Water Bye-laws is essential.

**Use in Hard Water Areas**

In areas where temporary hardness exceeds 250mg/L, treatment of the mains water supplied to the appliance is recommended to maintain its performance. An in-line scale reducer (conditioner) or ion-exchange softener will be most effective when fitted immediately before the unit.

A good quality polyphosphate dosing device can inhabit the standard models but are ideal partners for the SSP models.

Experience has shown that a Thermal Storage system incorporating a boiler with a cast iron heat exchanger is far more tolerant of system design, commissioning and operational problems (typically noise) when compared with one incorporating a "low water content" heat exchanger.

**5. System Design**

**Choice of Boiler**

Flowmax is compatible with virtually any boiler, e.g. gas, oil, solid fuel, Aga's, Rayburn stoves, wood burning stoves, back boiler units, solar heating, electric boilers and may be heated with an electric immersion heater.

Due to the high operating temperature of thermal storage systems condensing boilers may not be cost effective with the standard models but are ideal partners for the SSP models.

When using a Thermal Storage system, such as Flowmax, it is essential that this overrun is timer controlled to ensure maximum efficiency.

When Flowmax units are to be used with a boiler that requires any form of pump overrun then the existing pump overrun device must be disconnected and our timed pump overrun device used in its place. The boiler pump overrun will be solely under the control of our timed pump overrun device and this will ensure maximum efficiency.

If you are installing a Double-Pump package then we will have been supplied with a timed pump overrun device. It is housed inside the wiring case.

The other levels of trim do not supply a timed pump overrun as standard. It can be ordered separately and comes complete with a suitable enclosure.

**Boiler Sizing**

Calculate the space heating requirements in accordance with BS 5449. Add an allowance of 3 kW for hot water.

**Boiler Pump Overrun**

In a conventional system a pump overrun is often fitted to the boiler to dissipate excess heat from the boiler and so aid system efficiency.

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**System Design**

**System Layout 1 - Flowmax above the boiler**

**System Layout 2 - Dipped flow and return**

**System Layout 3 - Flowmax sited boiler boiler**

**System Layout 4 - SSP units**
STANDARD BOILER MODELS

The feed and expansion cistern should be positioned so that the unvented water level is at least 300mm above the highest point of the primary system. The boiler manufacturer’s instructions should be consulted. This applies with both cylinder and combination type Flowmax units.

The flow pipe from the boiler should rise continuously towards the Flowmax (Figure 6). Where the primary flow and return pipes between the boiler and the Flowmax are sloped e.g. Wall mounted boiler with the Flowmax sited at floor level, automatic air vents should be fitted on both the flow and the return together with a high limit thermal control on the boiler itself (Figure 7).

An ‘up and over’ installation is likely to give rise to gravity circulation which should be prevented by fitting a suitable non return / check valve on the return pipe to the boiler, or by an alternative arrangement.

Pumps should be sited at as low a level as practicable.

6. INSTALLATION PROCEDURE

OPEN VERTICAL PRIMARY SYSTEM

When installing standard Flowmax models the unit must be installed as part of an open vertical primary system. This ensures that the system is inherently safe, with pressure and temperature relief valves not being required. The maximum total volume of the primary circuit is the volume of the Flowmax + 180 litres.

SEALED SYSTEM PRIMARY MODELS

The extra collar fitted in SSP Flowmax models allows the unit to be installed with a sealed primary system operating at up to 3.5 bar.

LOCATION

Ensure that the location selected will accommodate the chosen unit (see dimension chart) whilst still allowing access for all the plumbing connections and components and not forgetting the routing of the discharge warning pipe (overflow).

The unit should be sited on a flat base capable of supporting the weight when full. This will range from 180-200 Kg. With combination units, to ensure compliance with the water bylaws, a minimum clearance of 225mm, between the top of the unit and the ceiling, is needed should the Float valve ever need maintenance.

When immersion heaters are fitted care should be taken to ensure that they can be withdrawn for servicing.

Care should be taken to ensure that the wiring centre and / or programmer are not sited such that they could be damaged by any escape of water.

PIE CONNECTIONS

This section should be used on conjunction with the diagram of your chosen system design. The following pipe connections are necessary.

22mm flow and return primaries from the boiler, unless the boiler manufacturer requires 28mm (Boiler models)

22mm flow and return pipes to the space heating (Boiler electric models).

Part 1 of the latest building regulations requires that all hot water pipe work within 1 metre of the cylinder should be insulated.

We recommend that all the primary pipe work in the airing cupboard should be insulated to reduce the standing heat losses and prevent high cupboard temperatures.

Static water supply should usually be 22mm old pipe. See section on water supply. With cylinder type units the water level in the primary feed and expansion cistern should not be more than 10 metres above the bottom of the Flowmax. These units require a 22mm open vent pipe from the top connection. This vent must rise continuously, unobstructed to the primary feed and expansion cistern. No valves are permitted in this pipe so that an open vent is always maintained in case a heat source runs out of control.

A feed pipe (15mm minimum) must be provided from the store, alternative methods of dispersing the excess heat is needed. A heat leak radiator in the gravity circuit of the solid fuel boiler is the usual method.

If immersion heaters with integral high limit cutouts are used then care should be taken to avoid nuisance tripping from the additional heat source.

CONNECTING ADDITIONAL HEAT SOURCES TO FLOWMAX UNITS

Back boilers and solid fuel boilers can be connected easily to Flowmax units.

Standard boiler models have two extra bosses as standard. On Electric and SSP models these bosses are an optional extra.

Either pumped or gravity circulation can be used.

Overheat protection for the system should be provided as follows.

When space heating is provided from the store a high limit thermostat should be fitted on the flow pipe from the solid fuel boiler. The high limit thermostat should operate at temperatures not to exceed 85°C.

The stat should be wired so as to trigger the space heating pump. The triggering of the space heating pump should happen regardless of the setting of the programmer and one of the radiators must be fitted with a thermostat radiator valve to allow for expansion.

With Electric and SSP models, where space heating is not provided from the store, alternative methods of dispersing the excess heat is needed. A heat leak radiator in the gravity circuit of the solid fuel boiler is the usual method.

When making solder connections to the blender, remove the solder tails from the valve whilst applying heat to avoid damage to the valve seals.

ELECTRICALLY HEATED UNITS

Where electricity is used as the primary heat source it is important that immersion heaters manufactured to the ‘mandate’ specification are used. Their low noise design will prevent the householders sleep being disturbed. The immersion heaters should be set to 75°C.

A copper tail valve and float should be used with electricity heated units. The overflow should be plumbed away to copper.
8. COMMISSIONING

Prior to turning on water to the secondary system check that the pressure in the expansion vessel is approximately 3.5 bar (50 PSI).

Filling the system should be carried out slowly via the float operated valve, constant checks being made for leaks until the system is being filled.

It is essential to flush the complete system thoroughly, to remove any contamination from the pipe work and the Flowmax.

Comersion inhibitor is required in all Flowmax models. Sentinel X30, Fernox MBI or an equivalent should be added gradually into the stream of water form the ball valve as the unit fills to ensure its even distribution throughout the system.

When calculating the amount of inhibitor to use take account of the Flowmax volume that is part of the primary system. On SSP models you should dose both sections of the primary circuit i.e. that contained in the store and that in the radiator / boiler circuit.

Add inhibitor and where necessary anti-scalant to the system in accordance with the manufacturer's instructions.

Following standard installation procedures, air should be bled from the radiators and high points in the pipe work.

COMMISSIONING - BOILER MODELS

If the boiler has a range of outputs it should be set to the maximum output.

The boiler thermostat must be set to maximum. This will ensure Flowmax operates at maximum efficiency.

In order to ensure optimum performance without boiler cycling the Flowmax store thermostat must be set 3-4°C below the setting of the boiler thermostat.

The following procedure is the best way of achieving this critical setting.

FLOWMAX STORE SETTING PROCEDURE

1) Check the boiler thermostat to set the maximum and the boiler pump to high.
2) The cover of the store thermostat is secured with a single screw. Remove this gives access to the yellow differential dial. This should be set between 4 and 6. Replacing the small dark grey upper part of the thermostat cover reveals the green dial that controls the thermostat setting.
3) Turn the insertion thermostat to 85-90°C temporarily.
4) Fire up the system with the programmer set to hot water only.
5) Wait until the boiler has stopped firing.
6) Turn the boiler thermostat to between 65 and 75°C.
7) Once the thermostat has clicked off turn down a further 1mm (boiler models). With SSP models then turn the stat down a further 5°C.

The hot water system is now commissioned. If commissioned correctly the store thermostat controls the system. There should be no on/off cycling in a hot water only mode or boiler pump running continuously.

7) Test the insertion thermostat is correctly set by cooling the store to energise the thermostat. (see fig 15).
8) Temporarily cut hot taps or switch the heating on until the boiler re-ignites, switch off hot taps or heating and allow store to reheat on hot water only to check that the insertion thermostat is in control of the system.

Check that the hot water forms the taps at the temperature required by the householder and adjust the blender if necessary. Note the blender is factory preset to approx. 55°C. Adjust the blender gradually setting about 20 seconds each time for the adjustment to be reflected at the taps.

Ensure the protective cap is secure in position after making any adjustment.

The fact that all hot and cold water is supplied directly from the mains means that more care is needed in balancing the system than in conventional cistern fed systems. The use of sensing valves often serves as a convenient means of achieving this balance.

The boiler pump should be adjusted to give maximum flow without producing excessive noise.

To ensure efficient operation of the Flowmax unit it is essential that the insertion type thermostat supplied with our unit is used. Stop on thermostats are not suitable.

SETTING THE PROGRAMMER

You have two options – set the hot water to constant (24 hour). Alternatively you can set the hot water to come on one hour before central heating is required.

You cannot have the central heating on without the hot water

COMMISSIONING - ELECTRIC MODELS

Set the overnight immersion heater thermostat to 75°C and the boost thermostat to between 65 and 75°C depending on application.
9. FAULT FINDING

It is important to bear in mind that the Flowmax system effectively works in reverse to conventional systems. i.e. the primary water is in the storage vessel. Unlike a conventional system, hot water draw-off temperature will be flow dependent and this factor must be taken into account when assessing system performance. Symptoms and likely causes to investigate.

LOCATING THE CAUSES OF A NOISY SYSTEM

Boiler Noise

Boiler noise is usually caused by not taking the heat away from the boiler heat exchanger. Check the temperature differential between the primary flow and return. It should be between 7 and 11 °C. Adjusting the pump speed may help.

STORE HOT BUT NOT HOT WATER

If hot water performance deteriorates suddenly, this usually points to a problem with the blender. If it has deteriorated gradually then this points to scale build up.

The following procedure allows you to check for scale build up and blender function.

1) Isolate the water supply to the unit and open a hot tap to release the pressure.
2) Isolate the water supply to the cold port of the blender. A simple way of doing this is to undo the union nut on the blender cold port and remove the washer. Use this as a template to make a solid washer from rubber or plastic which can be put in back in place and used to temporarily block the blender cold port.
3) Remove the brass lock-shield cap from the top of the blender. Gently lever off the plastic cap. Undo the largest nut beneath.
4) Take out the sensing element from the blender and replace the largest nut to seal the top of the blender once more.
5) With the blender effectively removed, form the circuit the water will be forced through the coil. This will show you exactly what the unit can produce.

If the performance improves then this indicates a problem with the blender. This is often caused by a loss of pressure from the expansion vessel. See annual maintenance notes. If there is no improvement then it is likely that there is scale in the inside of the coil.

The scale can be removed with the Flowmax in situ by a qualified technician using a high pressure de-scaling pump and suitable acidic de-scaling chemical (e.g. Fernox DS3). The store must be cooled to between 30 and 40°C before commencing the de-scaling. This is not a job to DIY because of the specialist equipment needed. If you have difficulty locating a technician please contact Lime Guard UK (No. 01284 700 855) who are experts in this field.

Check the blender for scale at the same time.

WATER COMING FROM THE FEED AND EXPANSION CISTERN WARNING PIPE

An occasional small discharge is normal and is generally due to condensation. In severe cases a first guard may be necessary.

Continual overflow should be investigated as follows. Isolate the ball valve. This cures the problem if it is the ball valve that leaks. Secondly inspect the ball valve seat. If the ball valve is OK, isolate the cold water supply if it stops then there may be a leak in the coil. Test this will be continuous. The entire Flowmax unit will require replacement.

10. ANNUAL MAINTENANCE

1. Checking the pressure in the expansion vessel.

The expansion vessel is the cricket ball sized blue or silver vessel with the cap type valve that screws into the brass strainer assembly.

The pressure can only be accurately checked with the pressure relief on the other side of the diaphragm. To do this isolate the water supply to the Flowmax and open a hot tap. Water will run for a few seconds then stop.

The pressure should be between 3 and 4 bar.

2. Checking the in line strainer.

Whilst the water is off, remove and clean the gauge in the brass strainer assembly. To remove the gauge for cleaning unscrew the brass plug opposite where the expansion vessel screws in.

3. Checking the ball valve (combination types only).

Flowmax combinations have a small integral feed cistern for the primary (boiler & radiator) circuit. A 15mm pipe runs from just below the blender via a brass isolating valve to the ball valve in the top tank. Remove the lid and check the condition and operation of the ball valve and float. If you have a plastic float, check for cracks and signs of damage due to excessive temperature. This is almost always caused by failure of the store or boiler thermostat. Copper floats are factory fitted to Electric Flowmax units and are recommended for any Flowmax used in conjunction with a back boiler or a solid fuel boiler.

Check for signs of corrosion or leakage.

Check the water level in this tank is between 50 to 150mm deep. It is normal for the water to be warm and it will often be discoloured by the anti corrosion additives put into the primary system during commissioning.

Check that when the ball valve is held open simulating a fault condition that the water flow into the top tank does not exceed the ability of the overflow pipe to take it away. Adjust the brass ‘Ballofix’ isolating valve to suit.

Only the smallest flow rate is needed, as this ball valve only has to supply sufficient water to make up any lost through evaporation.

4. Checking the concentration of corrosion inhibitor.

The maintenance of sufficient concentration of corrosion inhibitor in your Flowmax system is vital to prevent corrosion. We would recommend Sentinel X120 or Fernox equivalent. When your unit also supplies the radiator system add extra 70 litres to the volume your Flowmax and dose appropriately.

Although Electric models are not subjected to corrosion problems from the radiator system corrosion prevention is still necessary. As water is lost due to evaporation chemicals in the water become more concentrated and can become corrosive.

We recommend that the unit is drained down every year and refilled with fresh water.

5. Preventing pump failure in summer.

To prevent seizure of the central heating pump we recommend you turn the central heating on for 30 seconds or so every few weeks throughout the summer.

Sealed pumps can usually be fixed. On some pumps the air release can be completely removed. A flat blade screwdriver can be inserted into a slot inside and related to the free the pump. On models without this feature a tap with a wooden mallet often works.

6. Holidays

You can safely turn the unit off and isolate the water if you go on holiday.

If you want to leave the central heating on at a low level simply turn the room thermostat down. Do not isolate the water supply to the unit in this case.